BLOOD
URINE
SWEAT
and even
TEARS

Medical pathology tests explained for nurses and patients

Dr. Warwick Carter
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URINE
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MEDICAL PATHOLOGY TESTS
EXPLAINED FOR NURSES
AND PATIENTS

Dr. Warwick Carter
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See Disease Definitions section at back of book for explanation of unusual diseases.
A simple explanation of what all blood, urine, faeces and other pathology tests mean.

The reason for performing them, the normal range of results, what abnormalities may mean and the way in which they work.

Written for nurses and patients who wish to know more about the way in which doctors investigate illnesses.

Written by the author of a pathology guide for doctors that has been published in 85 countries and eleven languages.

See Disease Definitions section at back of book for explanation of unusual diseases.
Doctors, when faced with a challenging or sometimes relatively routine problem in a patient, reach for a pad of pathology request slips, and start ordering tests, often using obscure abbreviations and terms that are totally beyond the comprehension of those without a medical degree. When the results return, the patient is usually told no more than they are all right or not, and the further explanation is left in the hands of the doctor.

Many patients would like to know more. Why is the test being ordered? What is the test? How does it work, and not only what the normal results should be, but what does an abnormal result mean.

Nurses also often want to know why their patient is being investigated and what the results may mean.

This book will answer those questions in terms that nurses and the average lay person should be able to understand.

Every pathology test that can be performed on any bodily fluid is included in this extraordinarily comprehensive guide, from common tests such as a full blood count, to esoteric tests for unusual inherited diseases.

Tests can be looked up under both their full name and their abbreviation, and they are arranged under the substance being tested, so that all blood tests are in one section (by far the largest) while urine tests are in another, and even the more obscure tests on substances such as amniotic fluid (around the baby in a pregnant woman’s uterus) and cerebrospinal fluid (from the spinal cord and around the brain) are in their own sections.

Each section starts with an explanation of the test substance (eg. blood, urine and how it is collected and tested. Tests that are commonly known (eg. PSA for prostate cancer) and the extremely rare are all covered in this very comprehensive book.

Any terms or abbreviations that may be unfamiliar to the reader should be defined in the Definitions or Abbreviations sections near the beginning of the book.

At the back, this book has a guide to the less common diseases that may be mentioned in the text so that the conditions mentioned in the pathology section can be better understood.

I trust that you will find the book both educational and useful, for patients in managing their own health, and for nurses, the health of their patients.

Dr. Warwick Carter
Brisbane
CONTENTS

Definitions
Abbreviations
Units of measurement

PATHOLOGY TESTS
Format
Amniotic fluid
Blood
Bone marrow
Cerebrospinal fluid
Faeces
Joint fluid
Urine
Other test substances
(Breath, Breast Milk, Cells, Lungs, Placenta, Semen, Skin,
Sputum, Stomach Fluid, Stones, Sweat, Tears, Tissue)

DISEASE DEFINITIONS

INDEX

In the first section of the book, pathology tests are arranged under the substance being tested.

In the second section, diseases mentioned in the pathology tests are explained.

See Disease Definitions section at back of book for explanation of unusual diseases.
DEFINITIONS

The definitions below represent the medical meanings of a word that may have a different meaning in another context.

Acids
A diverse group of compounds containing hydrogen that can react with a base or metal to form a salt. They taste bitter and cause the pH (acidity) of a mixture to reduce, and turn litmus paper red.

Acute
A condition that is of recent or sudden onset.

Adrenal glands
Gland that produce some of the body's hormones (eg. adrenaline, steroids). One gland sits on top of each kidney.

Adrenaline
A hormone produced in the adrenal glands which causes a sudden increase in blood pressure and heart rate in response to danger.

Agglutination
The clumping together of a group of molecules, particles or cells.

Albumin
A water soluble protein.

Amino acids
20 different organic substances that in various combinations form all proteins. All amino acids contain NH2 connected to carbon, hydrogen and oxygen atoms.

Anabolic
A constructive metabolic process in which smaller proteins or amino acids join together to form larger molecules.

Anaemia
A low level of haemoglobin in the blood.

Analgesic
Medication used to ease pain.

Anion
A negatively charged atom or molecule.

Antibody
A protein produced in the spleen, lymph nodes, thymus gland, liver or bone marrow in response to an antigen (foreign protein). Antibodies attack antigens to render them inactive and no longer infective.

Anticoagulant
Substance (eg. a drug) that stop blood from clotting at the normal speed.

Antigen
Any foreign matter containing a protein that enters the body to trigger an antibody response. It may be a virus, bacteria, fungus, snake venom, a splinter or a transplanted organ.

Autoantibody
An antibody that acts against normal body tissue.

Base
A substance that reacts with an acid to form a salt.

Basophil
A type of white blood cell that predominates in inflammatory and allergic reactions and stains with base dyes.

Carcinoma
Cancer.

Cardiac
The cardia is the heart in Latin, so cardiac is anything pertaining to the heart.

Catabolic
A destructive metabolic process in which large proteins break down into amino acids or smaller proteins.

Cation
A positively charged atom or molecule.

Cell
The basic structural element of all living organisms, surrounded by a supporting membrane and containing a nucleus and other material to sustain self reproduction.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Chromosome  The structure which carries the genetic information in every cell. Every human cell (except sperm and ova) has 46 chromosomes in 23 pairs.

Chronic  A condition that is persistent or long standing

Coagulation  The process by which liquid blood turns into a solid clot.

Collagen  The protein from which connective tissue is predominantly made.

Corpuscle  A cell, often a red blood cell.

Cytoplasm  The contents of a living cell other than the nucleus.

Cytotoxics  Cell destructive drugs used in the treatment of cancer.

Density  The mass of a substance compared to its volume.

Diuretics  Medications that remove fluid from the body by increasing urine production.

Electrolytes  The ions (electrically charged particles) of sodium, potassium, chloride and bicarbonate in the blood are collectively known as electrolytes.

Embryo  A developing child during the first three months of life in the uterus.

Enzyme  A protein that allows or encourages a chemical reaction to occur.

Erythrocyte  Red blood cell (see below).

Expiration  Breathing out.

Factor  Any one of 13 substances that allows the process of blood clotting to occur.

Fat  A yellowish white tissue that is the body’s reserve energy store and acts as a shock absorber between various organs and structures.

Fibrin  A protein created during the formation of a blood clot.

Foetus  A developing child during the period from three to nine months while in the uterus.

Gastric  The *gastrum* is the stomach in Greek, so gastric is anything pertaining to the stomach.

Globulin  Any one of the proteins present in blood.

Glomerulus  The primary microscopic filtration apparatus of the kidney.

Half-life  Time taken for half the medication or substance present to be removed.

Hormone  Chemicals that move from the producing gland directly into the blood, to act upon every cell in the body and affect the function of cells.

Hydroxy-  A prefix used for substances that contain oxygen and hydrogen in combination (as -OH).

Hyper-  Prefix indicating that something is increased.

Hypo-  Prefix indicating that something is reduced.

Iatrogenic  A disease or condition caused by the action of doctors or medical staff.

Idiopathic  A disease or condition that occurs for no known reason.

Immunoassay  The measurement of a substance by detecting its ability as an antigen to bind to an antibody.

Inspiration  Breathing in.

Jaundice  A yellow discolouration of the skin and the whites of the eyes due to excess bilirubin in the blood, which in turn is usually due to liver damage.

Lactose  The sugar found in milk.

Leucocyte  White blood cell.

Lipid  Any form of fat.

Lipoprotein  A molecule formed by the combination of a fat and a protein.
**Medical Tests Explained**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>The liver is lies behind the ribs on the right side of the abdomen. It regulates the levels of blood sugar, assists in producing the blood clotting mechanisms, helps to nourish new blood cells, destroys old blood cells, breaks down excess acids, stores and modifies fats, stores certain vitamins and minerals, and removes poisons from harmful substances such as alcohol and drugs. It is also an important source of the heat to maintain the body's temperature.</td>
</tr>
<tr>
<td>Lymphocyte</td>
<td>A type of white cell that increases in the presence of many bacterial infections, and is present mainly in blood and lymph nodes.</td>
</tr>
<tr>
<td>Macro-</td>
<td>Prefix indicating that something is large.</td>
</tr>
<tr>
<td>Micro-</td>
<td>Prefix indicating that something is small.</td>
</tr>
<tr>
<td>Mitochondria</td>
<td>Microscopic structures within cells that act as their energy source.</td>
</tr>
<tr>
<td>Mol or Mole</td>
<td>The mass of a substance expressed as an atomic weight.</td>
</tr>
<tr>
<td>Monocyte</td>
<td>The largest form of white cell that can engulf foreign material such as bacteria.</td>
</tr>
<tr>
<td>Mutation</td>
<td>Abnormal change from one form to another.</td>
</tr>
<tr>
<td>Neonatal</td>
<td>The neonatal period is the first month of life of a child.</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>A common form of white cell that stains with neutral dyes.</td>
</tr>
<tr>
<td>NSAID</td>
<td>Nonsteroidal anti-inflammatory drugs used in the treatment of arthritis and pain.</td>
</tr>
<tr>
<td>Occult</td>
<td>Hidden or not-obvious.</td>
</tr>
<tr>
<td>Oestrogen</td>
<td>The female sex hormone.</td>
</tr>
<tr>
<td>Osmolality</td>
<td>The concentration of particles in a solution.</td>
</tr>
<tr>
<td>Ovary</td>
<td>The two ovaries are the main female reproductive organs. Each is about 3cm by 1.5cm by 1cm. They lie in the pelvis, one on either side of the uterus. They have two functions - the development and release of eggs, and the production of female sex hormones.</td>
</tr>
<tr>
<td>Parathyroid gland</td>
<td>The 4 tiny parathyroid glands lie in the front of the neck, two behind each lobe of the thyroid gland. They produce a hormone (parathormone) that regulates the amount of calcium and phosphorus in cells, blood and bones.</td>
</tr>
<tr>
<td>Peptide</td>
<td>A particular bonding arrangement of two or more amino acids into a protein.</td>
</tr>
<tr>
<td>Pericardium</td>
<td>The membrane that surrounds the heart.</td>
</tr>
<tr>
<td>Peritoneum</td>
<td>The smooth slippery membrane that lines the abdominal cavity and contains the intestine, liver, pancreas and other organs of the belly.</td>
</tr>
<tr>
<td>Pituitary gland</td>
<td>The pituitary gland is situated at the base of the brain in the centre of the skull and is connected directly to the hypothalamus - a part of the brain. It produces hormones that control growth, urine production, the menstrual cycle, labor of pregnancy, and also regulate the activity of all other glands.</td>
</tr>
<tr>
<td>Placenta</td>
<td>A special outgrowth of the foetus that is attached to the inside of the uterus and has blood vessels that penetrate into the wall of the uterus and interact with the mother's arteries and veins to enable the foetus to draw oxygen and food from the mother's system and send waste products to the mother for removal.</td>
</tr>
<tr>
<td>Plasma</td>
<td>The liquid part of blood without the cells.</td>
</tr>
<tr>
<td>Pleura</td>
<td>The membrane surrounding and supporting the lungs.</td>
</tr>
</tbody>
</table>

*See Disease Definitions section at back of book for explanation of unusual diseases.*
### Medical Tests Explained

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate gland</td>
<td>Situated behind the base of the penis, the prostate is about the size of a</td>
</tr>
<tr>
<td></td>
<td>golf ball and consists of glands, fibrous tissue and muscle. Its primary</td>
</tr>
<tr>
<td></td>
<td>purpose is to produce a substance that makes up part of the semen a man</td>
</tr>
<tr>
<td></td>
<td>ejaculates that is essential for the nutrition of sperm.</td>
</tr>
<tr>
<td>Protein</td>
<td>A complex molecule that forms the basis of all life, and is composed of two</td>
</tr>
<tr>
<td></td>
<td>or more amino acids. Protein is essential in the diet for growth, repair</td>
</tr>
<tr>
<td></td>
<td>and replacement of tissue.</td>
</tr>
<tr>
<td>Prothrombin</td>
<td>A protein that is one of the factors responsible for the formation of a blood</td>
</tr>
<tr>
<td></td>
<td>clot.</td>
</tr>
<tr>
<td>Ratio</td>
<td>The numerical relationship between the quantity of two substances.</td>
</tr>
<tr>
<td>Red blood cell</td>
<td>Cells in the blood that contain red coloured haemoglobin which is used to</td>
</tr>
<tr>
<td></td>
<td>transport oxygen.</td>
</tr>
<tr>
<td>Renal</td>
<td>Used to indicate any condition relating to the kidneys.</td>
</tr>
<tr>
<td>Reticulocyte</td>
<td>Immature red blood cell.</td>
</tr>
<tr>
<td>Salicylates</td>
<td>A class of medications that are derived from salicylic acid and includes</td>
</tr>
<tr>
<td></td>
<td>aspirin and numerous liniments.</td>
</tr>
<tr>
<td>Semen</td>
<td>The fluid ejaculated by men containing both sperm and seminal fluid.</td>
</tr>
<tr>
<td>Seminal fluid</td>
<td>The fluid produced by the seminal vesicles in the groin and the prostate</td>
</tr>
<tr>
<td></td>
<td>gland, that supports and nurtures the sperm during and after ejaculation.</td>
</tr>
<tr>
<td>Serology</td>
<td>The study of serum (see below).</td>
</tr>
<tr>
<td>Serum</td>
<td>The clear straw coloured liquid left after both cells and clotting factors</td>
</tr>
<tr>
<td></td>
<td>are removed from blood.</td>
</tr>
<tr>
<td>Skeletal muscle</td>
<td>The type of muscle used to move the limbs, head and body, and to breathe.</td>
</tr>
<tr>
<td>Smooth muscle</td>
<td>The type of muscle found in internal organs such as the gut.</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>The ratio of the mass of a specific volume of a substance compared to the</td>
</tr>
<tr>
<td></td>
<td>same volume of water.</td>
</tr>
<tr>
<td>Spleen</td>
<td>A soft dark red organ that weighs about 100g and is lies in the abdominal</td>
</tr>
<tr>
<td></td>
<td>cavity behind the lower ribs on the left side. Its main functions are</td>
</tr>
<tr>
<td></td>
<td>removing damaged blood cells and extracting and storing reusable elements</td>
</tr>
<tr>
<td></td>
<td>such as iron, storing antibodies and producing new red and white blood cells.</td>
</tr>
<tr>
<td>Squamous</td>
<td>Used to indicate any condition relating to the skin.</td>
</tr>
<tr>
<td>Steroid</td>
<td>A lipid that can affect the functioning of a cell in a specific way.</td>
</tr>
<tr>
<td>Synovium</td>
<td>Used to indicate any condition relating to the synovial membrane which</td>
</tr>
<tr>
<td></td>
<td>lines all moveable joints.</td>
</tr>
<tr>
<td>Testes</td>
<td>The male sex glands that have two functions - to produce sperm, and to</td>
</tr>
<tr>
<td></td>
<td>manufacture testosterone.</td>
</tr>
<tr>
<td>Testosterone</td>
<td>The male sex hormone.</td>
</tr>
<tr>
<td>Thrombin</td>
<td>An enzyme that acts in the formation of a blood clot.</td>
</tr>
<tr>
<td>Thyroid gland</td>
<td>Produces the hormone thyroxine which controls the rate with which the whole</td>
</tr>
<tr>
<td></td>
<td>body functions, the rate at which it converts food into energy (metabolism),</td>
</tr>
<tr>
<td></td>
<td>and the rate of development in adolescence. It is situated at the front of</td>
</tr>
<tr>
<td></td>
<td>the throat just below the Adam's apple and consists of two wings, one on</td>
</tr>
<tr>
<td></td>
<td>each side of the windpipe.</td>
</tr>
<tr>
<td>Titre</td>
<td>The exact minimum amount or maximum dilution of a substance necessary to</td>
</tr>
<tr>
<td></td>
<td>cause a specific chemical reaction.</td>
</tr>
</tbody>
</table>

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Virus
An infective agent smaller than a bacteria, is not a cell, is unable to be seen using a light microscope, has no internal metabolic processes, and is unable to replicate without the use of a living cell.

Vitamin
A group of totally unrelated chemicals that have only one thing in common - they are essential in tiny amounts for the normal functioning of the body. They have been given letter and number codes for ease of description compared to their chemical names.

See Disease Definitions section at back of book for explanation of diseases.
# ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIDS</td>
<td>Acquired immune deficiency syndrome</td>
</tr>
<tr>
<td>BCC</td>
<td>Basal cell carcinoma</td>
</tr>
<tr>
<td>CSF</td>
<td>Cerebrospinal fluid</td>
</tr>
<tr>
<td>DNA</td>
<td>Deoxyribonucleic acid</td>
</tr>
<tr>
<td>Hb</td>
<td>Haemoglobin</td>
</tr>
<tr>
<td>HIV</td>
<td>Human immunodeficiency virus</td>
</tr>
<tr>
<td>Ind</td>
<td>Indication</td>
</tr>
<tr>
<td>Int</td>
<td>Interpretation</td>
</tr>
<tr>
<td>NR</td>
<td>Normal range</td>
</tr>
<tr>
<td>NSAID</td>
<td>Nonsteroidal anti-inflammatory drugs (used for arthritis)</td>
</tr>
<tr>
<td>Phys</td>
<td>Physiology</td>
</tr>
<tr>
<td>RNA</td>
<td>Ribonucleic acid</td>
</tr>
<tr>
<td>SCC</td>
<td>Squamous cell carcinoma</td>
</tr>
<tr>
<td>SLE</td>
<td>Systemic lupus erythematosus</td>
</tr>
<tr>
<td>TB</td>
<td>Tuberculosis</td>
</tr>
</tbody>
</table>

See also Units of Measurement on following pages. Most abbreviations are explained as cross references in the main text.
# UNITS OF MEASUREMENT

The units used to indicate the amount of a particular substance present in a sample.

- $10^{12}/L$: 1,000,000,000,000 per litre (tera per litre)
- $10^9/L$: 1,000,000,000 per litre (giga per litre)
- d: day
- fL: femtolitre ($10^{-15}$ of a litre or 0.000,000,000,000,001 of a litre)
- g: gram (measure of mass - weight)
- g/100 mL: grams per 100 millilitres (grams per 100 one hundredths of a litre)
- g/dL: grams per decilitre (grams per one hundredth of a litre)
- g/L: grams per litre
- HPF: high power field - area seen through a microscope using a powerful lens.
- IU: international units
- IU/L: international units per litre
- IU/mL: international units per millilitre (IU per one thousandth of a litre)
- kJ: kilojoule (measure of energy)
- kJ/100 mL: kilojoules per 100 millilitres.
- kU/L: kilounits per litre (one thousand units per litre)
- L: litre (1000 mLs - measure of volume)
- L/min: litres per minute
- M: metre (measure of length)
- mEq/h: milliequivalents per hour
- mEq/L: milliequivalents per litre
- mg: one thousandth of a gram
- mg/100 mL: milliequivalents per 100 millilitres
- mg/L: milligrams per litre (one thousandth of a gram per litre)
- mL: millilitre (one thousandth of a litre)
- mL/min: millilitres per minute
- mm: millimetre (one thousandth of a metre)
- mm/h: millimetres per hour
- mm$^3$: cubic millimetre (cube with measurements of one millimetre on each side)
- mmol: millimol
- mmol/d: millimol per day (one thousandth of a mol per day)
- mmol/L: millimols per litre
- mol: mole (measure of mass)
- mPa.s: millipascals
- mU/100 mL: microunits per 100 millilitres
- mU/g Hb: microunits per gram of haemoglobin
- ng: nanogram ($10^{-9}$ of a gram or 0.000,000,001 of a gram)
- ng/L: nanograms per litre
- ng/mL: nanograms per millilitre
- nmol: nanomol ($10^{-9}$ of a mol)
- nmol/g Hb: nanomols per gram of haemoglobin

See Disease Definitions section at back of book for explanation of unusual diseases.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>nmol/L</td>
<td>nanomols per litre</td>
</tr>
<tr>
<td>pg</td>
<td>picogram (10^-12 of a gram or 0.000,000,000,001 of a gram)</td>
</tr>
<tr>
<td>pg/mL</td>
<td>picogram per millilitre</td>
</tr>
<tr>
<td>pmol/L</td>
<td>picomol per litre</td>
</tr>
<tr>
<td>U</td>
<td>unit</td>
</tr>
<tr>
<td>U/gHb</td>
<td>units per gram of haemoglobin</td>
</tr>
<tr>
<td>U/L</td>
<td>units per Litre. Undefined unit measurement.</td>
</tr>
<tr>
<td>U/mL</td>
<td>units per millilitre</td>
</tr>
<tr>
<td>µg</td>
<td>microgram (10^-6 of a gram or 0.000,001 of a gram)</td>
</tr>
<tr>
<td>µg/100 mL</td>
<td>micrograms per 100 millilitres</td>
</tr>
<tr>
<td>µg/d</td>
<td>micrograms per day</td>
</tr>
<tr>
<td>µg/g</td>
<td>micrograms per gram</td>
</tr>
<tr>
<td>µg/L</td>
<td>micro grams per Litre (one thousandth of a gram in every litre of fluid).</td>
</tr>
<tr>
<td>µg/mg</td>
<td>micrograms per milligram</td>
</tr>
<tr>
<td>µg/mL</td>
<td>micrograms per millilitre</td>
</tr>
<tr>
<td>µg/mmol</td>
<td>micrograms per millimol</td>
</tr>
<tr>
<td>µmol</td>
<td>micromol (measure of mass)</td>
</tr>
<tr>
<td>µmol/d</td>
<td>micromol per day</td>
</tr>
<tr>
<td>µmol/L</td>
<td>micromol per litre</td>
</tr>
</tbody>
</table>
PATHOLOGY
TESTS
Format

Each pathology test entry is arranged in the following way :-

Test Name
[Abbreviation]
(Alternate Name) [Abbreviation]
NR: Normal range (or value), and units. The range of results which would be considered normal in the average person. System Internationale (SI or metric) units are used where possible. (Alternative units used in the United States may be shown in brackets with some results). 90% of the population have results that lie within this range.
Ind: Indications. The suspected diseases and conditions which may lead a doctor to order the test.
Int: Interpretation of the results. The diseases, conditions, syndromes etc. that may be considered by a doctor with results that vary from normal. The interpretation of results that are above (HIGH), below (LOW), or VERY HIGH or VERY LOW when compared to the normal range. An explanation of the most common diseases encountered with these results is also given. With a history, examination and possibly other tests, a doctor may be able to make a definite diagnosis from the list of diagnoses suggested.
Phys: Physiology. A basic explanation of how the test works, to enable the significance of an abnormal result to be better understood.

See also Other Relevant Tests

Abbreviation
See Test Name

Alternate Name
See Test Name

See Disease Definitions section at back of book for explanation of unusual diseases.
Amniotic Fluid

Amniotic fluid is the liquid surrounding a foetus in the uterus of a pregnant woman. It is obtained in a process called amniocentesis by putting a needle through the skin of the lower abdomen and into the uterus and drawing off a small amount of fluid. The procedure is normally only done after the fifteenth week of pregnancy. The doctor should be experienced in the procedure, and it must be performed under strictly sterile conditions with extreme care, and normally with the position of the needle being controlled by an ultrasound probe to ensure that the foetus and the placenta are not damaged.

The amniotic fluid is created by the urine and faeces of the foetus, and by secretions from the placenta. The foetus is constantly swallowing and processing the fluid from about 15 weeks onwards, and it aids the growth and nutrition of the foetus.

It is normally a pale yellow colour, but may be darker if the foetus is distressed. The dark colouration may only be noticed at the beginning of labour when the waters break with the rupture of the amniotic sac in which the fluid and foetus are contained.

The volume of amniotic fluid steadily increases throughout pregnancy until about 36 weeks, after which it slowly decreases. At its peak, between 600 and 800 mLs of fluid are present.

The amniotic fluid acts as a cushion for the foetus, protecting it from external bumps, jarring and shocks. It also allows the foetus to move relatively freely, and allows equal growth in all directions. It contains protein, sugars, fats and electrolytes (sodium, potassium, salt etc.). Hormones and waste produced by the foetus are also present as these are excreted in the urine of the foetus.

Measuring substances in the amniotic fluid can give a vital insight into the health of the foetus, and as cells shed from the foetal skin and through urine and faeces are also present, chromosomal tests can be performed on these cells to detect the sex of the foetus and some chromosomal abnormalities.
Tests on Amniotic Fluid

Acetylcholinesterase
[AChE]
NR: Second trimester (from about 3 to 6 months) less than 9 U/L.
     Third trimester (after 6 months) less than 7 U/L.
Ind: Suspect defects in the development of the spine (neural tube) of the foetus.
Int: HIGH - Significant risk of a spinal (neural tube) defect such as spina bifida (abnormal development and function of the spinal cord), anencephaly (no brain formation) and microcephaly (small head and brain).
Phys: Still an experimental test, but it is a cheap and reliable screening test. A small numbers of false positive results may occur

AChE
See Acetylcholinesterase

AFP
See Alpha-Fetoprotein

Alpha-Fetoprotein
[AFP]
NR: 16 weeks pregnancy 8 to 24 µg/L.
     18 weeks pregnancy 7 to 23 µg/L.
     20 weeks pregnancy 3 to 16 µg/L.
Ind: Monitoring the progress of a pregnancy.
Int: SLOW DECREASE - Normal pregnancy.
     RISE - Foetal distress, defect of spinal development (neural tube defect), kidney disease (eg. nephrotic syndrome), twins.
     V.LOW - Down syndrome.
Phys: Level should slowly drop throughout the middle three months of a pregnancy
See also  Alpha-Fetoprotein, Blood; Oestriols, Blood

Lecithin-Sphingomyelin Ratio
[L-S Ratio]
NR: Measured as a ratio of lecithin to sphingomyelin. A ratio of more than 2 to 1 is good.
Ind: Assessment of foetal maturity and readiness for birth.
Int: HIGH (greater than 2 to 1) - Foetal lungs are mature
     LOW (less than 2 to 1) - Foetal lungs are not mature
Phys: Lecithin is a fat from the foetal lung that is produced in increasing quantities in relation to another fat, sphingomyelin, after 34 weeks of pregnancy
See also Alpha-Fetoprotein; Oestriols, Blood; Phosphatidyl Glycerol

See Disease Definitions section at back of book for explanation of unusual diseases.
L-S Ratio
See Lecithin-Sphingomyelin Ratio

Phosphatidyl Glycerol
NR: This particular substance should be present
Ind: Determination of foetal lung maturity.
Int: ABSENT - Foetal lungs not mature
    PRESENT - Foetal lungs mature and the baby is ready to be born.
Phys: This test is more reliable than the usually performed lecithin-sphingomyelin ratio in diabetic mothers
See also Lecithin-Sphingomyelin Ratio
Blood

The average male has about 4500 mLs of blood and a female 3600 mLs.

Blood tests are the most useful and commonly ordered of all diagnostic tests. A blood test can not only give information about the blood (eg. whether it contains infection-causing bacteria, drugs or alcohol), but also shows many changes involving virtually all organs. For example, if the liver is malfunctioning, the problem will almost certainly show up in blood tests. Consequently, blood tests are used not only for information on the blood itself but to diagnose disorders of many of the organs and systems of the body.

Blood is a liquid that transports the necessary elements of existence to every cell in the body, but if allowed to leak out of a vein, artery or capillary, will rapidly solidify to prevent further loss. Clotting is accepted as normal, but more than a score of different chemicals, cells and enzymes are involved in an extremely complex interaction to convert this liquid into a solid.

Blood also delivers oxygen collected from the air and nutrients extracted from food to every cell, and it also gathers up waste products such as carbon dioxide and uric acid and transports them to appropriate organs for eventual disposal. Blood also protects against infection and regulates temperature and fluid levels.

About 55% of blood is a straw-coloured fluid called plasma. The rest is made up of three different types of cells with totally different functions. Red blood cells transport oxygen and carbon dioxide, white blood cells help to fight infection, and platelets assist in blood clotting.

Plasma itself is over 90% water. The remaining 10% contains just about everything the body needs to function - glucose, protein, salts, vitamins, chemicals, hormones and infection-fighting antibodies - as well as the waste products to be discarded. The proportions vary according to the particular needs of the body.

Serum is the clear yellowish watery fluid that remains if the chemicals responsible for clotting are removed from plasma.

Blood tests may be performed on whole blood (everything that comes out of a vein), plasma, serum or the cells within blood, particularly the red blood cells.

Blood is extracted by inserting a hollow needle into a vein and allowing an amount of blood to flow into an attached tube. The blood will usually be taken from a vein at the bend in the elbow, but if that is not sufficiently prominent, it may be taken the forearm or the back of the hand. For very minor blood tests where not much blood is needed, such as for a simple sugar test, enough blood may be obtained from a prick in the finger. Once sufficient blood has been obtained, the needle is withdrawn and a pad of dressing or cotton wool pressed on to the point of entry to stop the blood flow. Taking blood is far less uncomfortable than having an injection such as a tetanus or flu vaccine, as something is being taken out of the body rather than put in.

If the blood test is to measure the proportions of oxygen and carbon dioxide in the blood (a blood gas analysis), it will be taken from an artery, because arterial blood contains oxygen absorbed from the air in the lungs. In this case, blood will be taken with a needle and syringe from the arm, wrist or groin. This is more uncomfortable than taking blood from a vein and the patient may be given a local anaesthetic.
When blood is collected, it is placed in a plain glass or plastic tube in which it clots. If the blood cells or plasma are to be examined, some of the sample is put into a different tube containing a chemical that stops it clotting (a whole blood sample). The cells and clot are then separated from the plasma or serum by spinning the tube in a centrifuge.

Usually the blood can be taken at any time of the day, unless the test is for glucose, cholesterol, triglycerides or other measures of metabolism (how the body converts food into energy), in which case the test is ordered in the morning after a 12 hour fast, or at particular times after eating a certain measured amount of food. Blood tests to measure the amount of some drugs in the body are also taken at specific times after the medication is swallowed.

Most blood tests are carried out by machines called auto-analysers and are available within 12 hours of the sample reaching the laboratory. Unusual or specialised tests may take a few days, since they are performed in batches once or twice a week.
Tests on Blood

Numbers

25-Hydroxyvitamin D
NR: 45 to 150 nmol/L
Ind: The investigation and diagnosis of osteomalacia and rickets, diseases which are caused by a lack of calcium.
Int: LOW - Poor diet, food malabsorption syndromes, lack of sun exposure, chronic liver disease, chronic kidney disease, hyperthyroidism (over active thyroid gland), and medications used to treat epilepsy.
HIGH - Vitamin D intoxication from excess use of vitamin supplements.
Phys: 25-Hydroxyvitamin D is the main chemical forming vitamin D and is essential for the absorption of calcium from the gut.

A

AAT
See Alpha1-Antitrypsin

ACE
See Angiotensin Converting Enzyme

Acetaminophen
See Paracetamol

Acetone
NR: 0.05 to 0.35 mmol/L (0.3 to 2 mg/100 mL).
Ind: May be used to determine if a patient who has collapsed or is in a coma is suffering from diabetes.
Int: HIGH - Diabetic coma (acidosis) from untreated diabetes.
A lack of glucose within cells prevents them from functioning properly, and the destruction of waste products such as acetone cannot occur, leading to a build up of acetone in the blood.

See also Glucose

Acetylcholine Receptor Antibody
See Anti-Acetylcholine Receptor Antibody Titre

Acidified Serum Test
(Ham Test)
NR: Negative.
Ind: Test for some types of haemolytic anaemia, diseases in which red blood cells are destroyed.
Int: POSITIVE - May be due to the unusual diseases paroxysmal nocturnal haemoglobinuria or congenital dyserythropoietic anaemia.
Phys: Washed red cells are mixed and warmed with fresh serum to which an acid has been added. Lysis (break down) of red blood cells examined under a microscope is a positive sign.

Acidosis
See Base excess; Bicarbonate; Lactate; pH

Acid Phosphatase, Total
[ACP]
NR: 2.3 to 5.7 U/L
Ind: Any disease of the prostate gland.
Int: HIGH - Prostate gland cancer or acute myelocytic leukaemia.
Phys: Acid phosphatase is present in high concentration in the prostate gland. It is released only when a cancer spreads beyond the gland capsule. It may also be high after a rectal examination of the prostate gland.
See also Prostate Specific Antigen

ACLA
See Cardiolipin Autoantibodies, Blood

ACTH
See Adrenocorticotropic Hormone, Plasma

Activated Partial Thromboplastin Time
[APTT]
NR: 30 to 45 seconds
Ind: Blood clotting (coagulation) disorders
Int: HIGH - Treatment with the medication heparin, or blood clotting disorders that require further investigation

See Disease Definitions section at back of book for explanation of unusual diseases.
Phys: Nonspecific test measuring numerous blood clotting factors, but not factors VII and XIII
See also Coagulation Screen

Activated Protein C Resistance
[APC Resistance]
(Factor V Leiden Mutation)
NR: Negative (ratio greater than 2.2)
Ind: Recurrent abnormal blood clotting (thromboembolism).
Int: POSITIVE (less than 2.0) - Familial thrombophilia (an inherited tendency to develop blood clots in the body).
Phys: An inherited resistance to the anticoagulant (blood clot prevention) action of activated protein C (a specific protein in blood) resulting in removal of a check on the clotting mechanism. The ratio of clotting time with and without activated protein C is measured.

Acute Phase Reactants
See C- Reactive Protein; Erythrocyte Sedimentation Rate

Adenosine Deaminase
NR: Varies between laboratories.
Ind: Abnormal immune system.
Int: LOW - Severe immunodeficiency due to lack of adenosine deaminase. Patients are more likely to develop infections and cancers.
Phys: Rarely used screening test in patients whose recurrent infections and cancers cannot be explained. The test is performed on the red blood cells within blood.

ADH
See Antidiuretic Hormone

Adrenal Cell Antibodies
[AdCA]
NR: Absent.
Ind: Suspected Addison's disease.
Int: PRESENT - Addison's disease.
Phys: The adrenal glands sit on top of each kidney, and produce hormones that control the level of vital elements in the body and regulate the breakdown of food. Addison's disease occurs when these glands do not produce sufficient hormone. It is rare, with symptoms of weakness, lack of appetite, diarrhoea and vomiting, skin pigmentation, mental instability, low blood pressure, loss of body hair and absence of sweating. This test measures the antibodies produced in the blood in response to the adrenal gland damage.

Adrenocorticotropic Hormone
[ACTH]
NR: 10 to 80 ng/L (0 to 0.5 mU/100 mL, 2.2 to 17.8 pmol/L). The test must be performed in the morning.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Ind:** Diseases of the pituitary gland in the brain.

**Int:** LOW - Under active pituitary gland, Cushing's disease from taking large doses of cortisone to control a wide range of diseases (including asthma and rheumatoid arthritis), or excess steroid production by other disease processes outside the pituitary gland.

HIGH - Cushing's disease coming from the pituitary gland (caused by an over production of steroids such as cortisone in the body. Headache, obesity and muscle weakness are common symptoms), adrenal gland insufficiency, a pituitary tumour, and some types of lung cancer (oat cell carcinoma).

**Phys:** ACTH is produced in the pituitary gland and stimulates production of some hormones in the adrenal glands which sits on each kidney. Blood sample should be taken between 8 and 10 am. Rapid assessment and special transportation of the specimen is required.

**AFP**
See Alpha-Fetoprotein

**AIDS**
See HIV Antibody

**Al**
See Aluminium

**Alanine Amino Transferase**

* [ALT]
  *(Alanine Transaminase, Glutamic Pyruvic Transaminase) [SGPT]*

**NR:** 3 to 40 U/L

**Ind:** Liver or heart disease.

**Int:** VERY HIGH - Severe hepatitis, severe liver damage.

HIGH - Jaundice due to gall stones or cancer blocking the exit of bile from the liver, persistent hepatitis, liver cancer, cirrhosis, heart attack (myocardial infarct), glandular fever (infectious mononucleosis), Reye syndrome, generalised severe viral infection or alcohol abuse.

LOW - Kidney failure, lack of vitamin B6.

**Phys:** Liver tissue is rich in the enzyme ALT, as are the heart, kidney and muscle. The ALT test is more liver specific.

*See also Aspartate Amino Transferase*

**Albumin**

**NR:** 35 to 55 g/L (45 to 55%)

**Ind:** Used as a guide to the severity and likely outcome of significant liver and other diseases.

**Int:** LOW - Severe liver damage (hepatic necrosis), hepatitis, liver cirrhosis, starvation, poor absorption of foods, nephrotic syndrome (a type of kidney failure), generalised infections, long term inflammation, autoimmune diseases (body inappropriately rejects

*See Disease Definitions section at back of book for explanation of unusual diseases.*
its own tissue), heart failure, excess fluid in the body, glomerulonephritis (kidney inflammation), leukaemia, Wilms tumour (kidney cancer) and severe burns. Albumin levels are also lower in pregnancy and the elderly.

HIGH - Low blood pressure from blood loss, dehydration and steroid treatment. A collection error caused by prolonged application of a tourniquet can give a false high reading.

**Alcohol**

[C$_2$H$_5$OH]

(Ethanol)

NR: Zero

Ind: Suspected alcohol intoxication.

Int: Over 0.05 g/100 mL (over 11 mmol/L) - Reflexes impaired. Legally liable in some States.

From 0.08 to 0.3g/100 mL (17 to 66 mmol/L) - Stuporous

From 0.3 to 0.5 g/100 mL (66 to 110 mmol/L) - Comatose

Over 0.5 g/100 mL (over 110 mmol/L) - Potentially fatal

Phys: Alcohol is absorbed from the stomach and broken down by the liver. In unchanged form, it is excreted from the kidneys at a fixed rate.

**Aldolase**

NR: 1 to 8 IU/L

Ind: Suspected major organ damage.

Int: HIGH - Heart attack (myocardial infarct), muscle wasting diseases (muscular dystrophies), destruction of red blood cells (haemolytic anaemia), prostate cancer that has spread to other organs, leukaemia, inflammation of the pancreas (acute pancreatitis) and hepatitis.

Phys: Destruction of tissue results in the release of aldolase, which is present in all tissues, into the blood.

**Aldosterone**

NR: 100 to 400 pmol/L (0.003 to 0.01 µg/100 mL).

Ind: Investigation of high blood pressure.

Int: HIGH - Tumour of the adrenal glands (adrenocortical adenoma), excess bodily fluid (oedema), malignant hypertension (severe high blood pressure of no known cause), treatment with fluid tablets (diuretics), heart failure and pregnancy

LOW - Under active adrenal glands (adrenocortical insufficiency), kidney disease caused by diabetes (diabetic nephropathy), kidney failure, and taking drugs such as ACE inhibitors and beta-blockers (for heart disease and blood pressure), arthritis medications (NSAIDs), cyclosporin and triamterene

Phys: Aldosterone is secreted by the adrenal glands which sit on top of each kidney, and controls the volume of fluid in the body. Blood sample must be taken in morning after rest.

*See also* Aldosterone, Urine; Renin, Blood

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See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Alkaline Phosphatase
[ALP]
NR:  Adult male 15 to 130 U/L.  
     Adult female 15 to 115 U/L.  
     Child 70 to 300 U/L .
Ind:  Bone and liver disease.  
Int:  VERY HIGH - Blockage of liver drainage ducts, spread of cancer to liver (metastatic carcinoma).  
     HIGH - Spread of cancer to bone (bone metastases), osteomalacia (bone weakness disease), rickets (lack of vitamin D), myositis ossificans (bone formation in muscle), Paget's disease of bone, over active parathyroid glands in the neck (hyperparathyroidism), hepatitis, liver cirrhosis, prostate gland cancer, pancreas gland disease, recent fracture, children with rapid bone growth, late in pregnancy and during breastfeeding.  
     LOW - Under active thyroid gland (hypothyroidism), lack of phosphate in body (hypophosphatasia), bone and body growth retardation, zinc deficiency .
Phys:  Alkaline phosphatase is present in high concentrations in growing bone and bile from the liver. Normal levels do not exclude liver disease.

Alkaline Phosphatase, Neutrophils
[ALP]
NR:  Measure of relative amount of ALP in white blood cells (neutrophils) and blood.
Ind:  Suspected Down syndrome in foetus of older mother.
Int:  VERY HIGH (in pregnant woman) - Down syndrome likely in foetus.  
     HIGH - Polycythaemia rubra vera (rare blood disease).
Phys:  Use in combination with numerous other tests to detect Down syndrome early in pregnancy.
See also Human Chorionic Gonadotrophin; Alpha-Fetoprotein, Amniotic Fluid; Alpha-Fetoprotein, Blood; Oestriol

ALP
See Alkaline Phosphatase

Alpha1-Antitrypsin
[AAT]
NR:  1.8 to 3.6 g/L
Ind:  Liver and lung disease.
Int:  HIGH - Liver cirrhosis, bile not moving out of liver (cholestasis) and many infections.  
     LOW - Liver damage (hepatic necrosis), severe protein loss from body through faeces or urine, emphysema (serious lung damage), or a congenital inability to produce the protein (birth defect).
Phys:  Alpha1-Antitrypsin is a protein produced in the liver.
See also  Alpha1-Antitrypsin, Faeces

Alpha-Fetoprotein
[AFP]
See Disease Definitions section at back of book for explanation of unusual diseases.
NR: Less than 12 µg/L.
Pregnant - rises throughout pregnancy up to 50 µg/L or more at full term.
Ind: Liver disease, monitoring pregnancy, cancer of ovary and testes.
Int: VERY HIGH and PREGNANT - Down syndrome (trisomy 21) or neural tube (spinal cord) defect foetus.
      HIGH - Liver cancer (hepatic carcinoma), bowel cancer (colon carcinoma), stomach cancer, hepatitis, liver cirrhosis, other liver diseases, ovary cancer (teratoma) or testicular cancer. A steady rise occurs throughout a normal pregnancy.
      LOW - A drop in levels late pregnancy indicates foetal distress.
Phys: Excess in non-pregnant adult indicates serious disease.
See also Alpha-Fetoprotein, Amniotic fluid

Alpha Subunit, Glycoprotein Hormones
NR: Male: Less than 0.6 IU/L.
     Female: Premenopausal: Less than 1.0 IU/L.
             Postmenopausal: less than 2.0 IU/L.
             Pregnant: less than 2.5 IU/L.
Ind: Suspected pituitary gland tumour.
Int: HIGH - Hormone secreting pituitary gland tumour (the pituitary gland lies under the brain and secretes hormones that control every other gland in the body).
Phys: Some pituitary tumours secrete excessive amounts of only part of the full hormone (alpha subunit) rather than the complete hormone, making them difficult to detect.

ALT
See Alanine Amino Transferase

Aluminium
[Al]
NR: Less than 400 nmol/L.
     Toxic over 2000 nmol/L.
Ind: Dialysis for kidney failure.
Int: HIGH - Kidney failure, brain damage from dialysis (dialysis encephalopathy), excessive use of medications containing aluminium (eg. antacids).
Phys: Great care must be taken in performing this test as contamination of the specimen may occur easily.

Amikacin
See Aminoglycosides

Aminoglycosides
NR: Amikacin - peak 25 to 30mg/L, trough less than 10 mg/L.
     Gentamicin - peak 5 to 8 mg/L, trough less than 2 mg/L.
     Tobramycin - peak 5 to 8 mg/L, trough less than 2 mg/L.
     Vancomycin - trough 5 to 10mg/L.
Ind: Monitoring of antibiotic dose.
Int: Adjust dosage as appropriate

See Disease Definitions section at back of book for explanation of unusual diseases.
**Medical Tests Explained**

**Phys:** Aminoglycosides are potent antibiotics whose dosage should be monitored if long term treatment is performed, or severe diseases are being treated. Peak measure taken 6 hours after once daily dosage, trough immediately before next dose. Toxicity if levels above exceeded, ineffective dose if peak doses too low. Vancomycin peaks not accurate for dosage management.

**Amiodarone**
**NR:** Therapeutic range 1.5 to 3.9 µmol/L (1.0 to 2.5 mg/L).
**Ind:** Amiodarone treatment.
**Phys:** Amiodarone is used to treat some heart diseases. The elimination half life is 40 days, so doctors measure drug levels only 3 months after any dosage adjustment.

**Amitriptyline**
**NR:** Therapeutic range 60 to 240 µg/L (150 to 880 nmol/L).
**Ind:** Assessment of dosage effectiveness when using amitriptyline.
**Phys:** Amitriptyline is used to treat depression and mood disorders. Several weeks may be required to reach steady state due to its long half-life.

**Ammonia**
**[NH₃]**
**NR:** Less than 50 µmol/L (less than 90 µg/100 mL).
**Ind:** Liver disease.
**Int:** HIGH - Liver disease, portacaval shunt (blood bypassing liver), high protein diet, bleeding from intestine, methicillin or spironolactone therapy, Reye syndrome, genetic hyperammonaemia, and it may be a transient finding in newborn infants.
**Phys:** Serum ammonia is derived from the putrefaction of food in the bowel by bacteria, and from protein breakdown in the liver.

**Amoeba Antibodies**
**NR:** Absent.
**Ind:** Amoeba infestation of the body outside the gut.
**Int:** POSITIVE - Amoebic infection of liver in past.
**Phys:** Gut infections do not cause antibody reaction, but the test will remain positive for many years with an infection in the liver or other organs.

**Amylase**
**NR:** 30 to 180 U/L (there are differences between races).
**Ind:** Pancreatic gland disease.
**Int:** HIGH - Acute pancreatitis (causes extreme belly pain), cancer of the pancreas, mumps, salpingitis (Fallopian tube infection), perforated duodenal ulcer, infected salivary gland in the mouth (sialectasis), liver disease, ruptured ectopic pregnancy, enlarging (dissecting) aortic aneurysm, or a small bowel obstruction.
**LOW -** Hepatitis, toxaemia of pregnancy, or failure of the pancreas.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Phys: Amylase is produced in the pancreas and salivary glands. Excess is produced in inflammation of these glands, or is forced into the blood by a blockage of the pancreatic duct.  
See also Amylase, Urine

ANA  
See Antinuclear Antibodies

Anaemia  
See Haemoglobin

ANCA  
See Anti-Neutrophil Cytoplasmic Antibodies

Androgens  
See Testosterone

Androstenedione  
NR: Males: 1.7 to 5.2 nmol/L (0.05 to 0.29 µg/100 mL).  
Females: 1.7 to 7.0 nmol/L (0.05 to 0.35 µg/100 mL).  
Before puberty: less than 2 nmol/L (less than 0.05 µg/100 mL).  
After menopause: 1.7 to 4.5 nmol/L.  
Ind: Female hirsutism (facial hair and other male characteristics).  
Int: HIGH - Hirsutism (excess body and facial hair), virilising tumours (eg. ovarian cancer), congenital adrenal hyperplasia (inherited lack of adrenal glands), polycystic ovarian syndrome (multiple cysts in the ovaries). The levels may also be raised in patients with severe acne and premature baldness. It can also be used to assess whether a person has entered puberty.  
Phys: It is necessary to collect sample mid-morning.

ANF  
See Antinuclear Autoantibodies, Fluorescent

Angiotensin Converting Enzyme [ACE]  
NR: 11 to 40 U/L with higher levels in children.  
Ind: Suspected sarcoidosis.  
Int: HIGH - Sarcoidosis (an uncommon disease of unknown cause which damages and inflames a wide range of organs within the body, most commonly the lungs. Patients may have a fever, tiredness and shortness of breath, but because almost any part of the body may be involved, the symptoms can be very varied and sometimes bizarre, and may include rashes, enlarged glands, liver or spleen enlargement, arthritis, pins and needles sensation and heart failure), tuberculosis (TB), leprosy, silicosis, asbestosis, liver cirrhosis, diabetes mellitus, alcoholism, over active thyroid gland (hyperthyroidism) and Gaucher disease.  
See Disease Definitions section at back of book for explanation of unusual diseases.
LOW - Drugs (eg. ACE inhibitors used for high blood pressure and heart disease).

Phys: This test is a good measure of sarcoid disease activity.

**Angiotensin II**

**NR:** 5 to 35 pmol/L (5 to 35 ng/L).

**Ind:** Hyperaldosteronism.

**Int:** HIGH - Hyperaldosteronism (Conn syndrome - a rare disease caused by a non-cancerous tumour in one of the adrenal glands on the kidneys. These produce excessive amounts of a substance called aldosterone. Aldosterone is a hormone that controls the amount of salt in the body, and excess causes too much salt to be retained in the body. This in turn causes high blood pressure, an excessive production of urine, muscle weakness, pins and needles sensations, headache and thirst).

**Phys:** Collect sample at mid-morning. Unstable hormone requiring immediate blood separation. The patient must rest for 12 hours before the test, and be off all drugs for one month. Angiotensin II controls aldosterone production from the adrenal glands.

**Anion Gap**

**NR:** 8 to 16 mmol/L.

**Ind:** Electrolyte imbalance. Electrolytes include sodium, potassium, chloride and bicarbonate that are dissolved in blood.

**Int:** HIGH - Body chemistry disturbances (metabolic acidosis), severe uncontrolled diabetes (diabetic ketoacidosis), kidney failure, aspirin overdose, liver failure, alcoholism, a lack of magnesium or starvation.

LOW - Lack of the protein albumin (hypoalbuminaemia), liver disease, multiple myeloma or excess calcium in the body (hypercalcaemia).

**Phys:** The anion gap is the gap between positively charged electrolytes (cations of sodium and potassium) and negatively charged electrolytes (anions of chloride and potassium) and is made up of phosphate, sulfate, protein, pyruvate, lactate and other ions. If all elements are considered, the gap is zero.

**ANS**

See Anti-Smith Antibodies

**Anti-Acetylcholine Receptor Antibody Titre**

[Anti-AChR]

**NR:** –0.5 to +0.5 nmol/L.

**Ind:** Myasthenia gravis.

**Int:** HIGH - Myasthenia gravis (causes a varying weakness of the muscles that control the eyelids, the movement of the eyes and swallowing. In severe cases, the muscles used in breathing and walking are also affected. The weakness varies in severity during the day and may disappear entirely for days or weeks before recurring, but over a period of months or years, the attacks become more severe).

See Disease Definitions section at back of book for explanation of unusual diseases.
Phys: Specific antibody for myasthenia gravis that is elevated in 80% of cases.

Antibodies
See Antimicrobial Antibodies; Immunoglobulin Antibodies, Specific

Anticardiolipin Antibodies
See Cardiolipin Autoantibodies

Anti-Centromere Antibodies
See Centromere Autoantibodies

Anti-Deoxyribonuclease-B Titre
[Anti-DNAse B]
NR: 0 to 340 (varies widely between labs).
Ind: Suspected rheumatic fever.
Int: HIGH - Streptococcal bacterial infections, rheumatic fever (a bacterial infection that is rare in developed countries due to the availability of antibiotics. Patients have two or more of a number of widely different symptoms, so every case is completely different. They may develop inflammation of the heart and its valves, irregular shaped red patches and rings on the skin, uncontrolled twitching of the arms, legs and face, a high temperature and arthritis that moves from one large joint to another), or kidney disease (nephritis).
Phys: Anti-Deoxyribonuclease-B is an antibody to an enzyme produced by group A Streptococci.
See also Anti Streptolysin O Titre

Anti-Deoxyribonucleic Acid Titre
[Anti-DNA]
NR: Less than 100 IU/mL
Ind: Suspected rheumatoid arthritis and systemic lupus erythematosus (SLE)
Int: HIGH - SLE (an uncommon, but serious disease that can affect tissues throughout the body causing arthritis, mouth ulcers, abnormal muscle movements, high blood pressure and a characteristic red rash across the cheeks and bridge of the nose in a butterfly pattern), rheumatoid arthritis
Phys: Used in association with other tests to diagnose and follow course of SLE. Levels do not rise in SLE caused by a drug reaction.
See also ANCA; Anti-Smith Antibodies; Cardiolipin Autoantibodies; Complement C3 and C4; DNA Autoantibodies; ENA; Histone Autoantibodies; HLA-DR3; LE Cells, Blood; Lupus Anticoagulant Antibody

Antidiuretic Hormone
[ADH]
(Vasopressin, Serum) [AVP]
NR: 0.4 to 2.4 pg/mL.

See Disease Definitions section at back of book for explanation of unusual diseases.
Ind: Disorders of urine production.

Int: HIGH - Syndrome of inappropriate ADH secretion, or diabetes insipidus (an uncommon disease that may be triggered by a head injury, or develop slowly over many months because of a brain infection, tumour or stroke. It is caused by a failure of the pituitary gland to produce the hormone vasopressin that controls the rate at which the kidney produces urine. Without this hormone, the kidney constantly produces large amounts of dilute urine).
LOW - Diabetes insipidus caused by kidney disease.

Phys: Varies in levels during day, with a maximum in early hours of morning, and minimum in early afternoon.

See also Osmolality, Serum

**Anti-Double Stranded DNA Antibodies**

[Anti-dsDNA]

NR: Less than 7 IU/mL.

Ind: Painful joint disease, suspected systemic lupus erythematosus (SLE).

Int: HIGH - Systemic lupus erythematosus (an uncommon, but serious disease that can affect tissues throughout the body causing arthritis, mouth ulcers, abnormal muscle movements, high blood pressure and a characteristic red rash across the cheeks and bridge of the nose in a butterfly pattern).

Phys: Highly selective for SLE, but antibodies are not present in all patients with SLE. Levels vary with disease activity and can be used to assess patient response to treatment.

**Anti-dsDNA**

See Anti-Double Stranded DNA Antibodies

**Anti-Factor Xa**

[AntiXa]

NR: Therapeutic range 0.3 to 0.5 U/mL.

Ind: Monitoring of low molecular weight heparin dosage in patients who have repeated blood clots.

Int: Adjust dosage depending on results.

Phys: Not used routinely for patients on low molecular weight heparin, only those whose management is difficult.

**Anti-Gliaden Antibodies**

See Gliaden Antibodies

**Anti-Glutamic Acid Decarboxylase Antibodies**

[Anti-GAD]

NR: Negative.

Ind: Diabetes mellitus (type one juvenile onset sugar diabetes).

Int: POSITIVE - Insulin dependent diabetes mellitus.
Medical Tests Explained

**Phys:** High incidence of positive results also occurs in association with autoimmune thyroid disease and diabetes, particularly early in course of disease. Test currently experimental, but may find use in mainstream medicine in diagnosis of some types of autoimmune disease.

**Anti-Histone Antibodies**
See Histone Autoantibodies

**Antimicrobial Antibodies**
NR: Absent.
Ind: Check for cause or type of infection.
Int: POSITIVE - Present or recent infection with specific bacteria or virus.
 Phys: Test is specific for a particular infective agent. Only a limited number of bacteria and viruses (and their diseases) can be checked. Tests available include those for brucellosis, Chlamydia, Coxiella (Q fever), Coxsackie virus, Cytomegalovirus, Echoviruses, Epstein-Barr virus (glandular fever), hepatitis A, hepatitis B, hepatitis C, *Herpes simplex*, Legionnaires disease, leptospirosis, measles, mumps, *Mycoplasma pneumoniae*, Ross River fever, rubella, salmonellosis and toxoplasmosis.

**Anti-Microsomal Antibodies**
See Thyroid Microsomal Autoantibody Titre

**Antimitochondrial Antibodies**
See Mitochondrial Autoantibodies

**Anti-Neutrophil Cytoplasmic Antibodies**
[ANCA]
NR: Negative.
Ind: Inflammation of blood vessels.
Int: POSITIVE - Systemic lupus erythematosus (SLE - an uncommon, but serious disease that can affect tissues throughout the body causing arthritis, mouth ulcers, abnormal muscle movements, high blood pressure and a characteristic red rash across the cheeks and bridge of the nose in a butterfly pattern), vasculitis, or a number of rare diseases including the Churg-Strauss syndrome and Wegener's granulomatosis.
Phys: Severity of positive result fluctuates with the severity of the disease.
See also LE Cells; Lupus Anticoagulant Antibody

**Antinuclear Autoantibodies, Fluorescent**
[ANA]
(Antinuclear Factor) [ANF]
NR: 0 to 25 IU/mL (titre 0 to 10).
Ind: Autoimmune diseases (cause the body to inappropriately reject some of its own tissue).
Int: VERY HIGH - Systemic lupus erythematosus (SLE), scleroderma.
See Disease Definitions section at back of book for explanation of unusual diseases.
HIGH - Autoimmune diseases (eg. rheumatoid arthritis, Felty syndrome, Sjögren syndrome, dermatomyositis, vasculitis, juvenile chronic polyarthritis, mixed connective tissue disease), thyroid disease (eg. Hashimoto thyroiditis, Graves disease), cancer (eg. lymphoma, leukaemia, some solid tumours), liver disease (eg. chronic active hepatitis, cirrhosis, hepatitis B, chronic liver disease), lung diseases (eg. pneumoconioses, asbestosis, idiopathic pulmonary fibrosis, fibrosing alveolitis, primary pulmonary hypertension, TB), blood disorders (eg. pernicious anaemia, idiopathic thrombocytopenic purpura), parasitic diseases (eg. malaria), subacute bacterial endocarditis, myasthenia gravis, leprosy, relatives of SLE patients, pregnancy, some elderly people or drugs (eg. hydralazine, procainamide).

Phys: Generalised test for many different types of inflammation and particularly autoimmune diseases. The specific disease present with a positive result can be determined by the pattern formed by the antibodies in a cell when examined under a microscope. Test is falsely positive in about 20% of healthy elderly women.

See also LE Cells; Lupus Anticoagulant Antibody

Anti-Skeletal Muscle Antibodies
[SKM]
NR: Negative.
Ind: Suspected myasthenia gravis.
Int: POSITIVE - Myasthenia gravis (causes a varying weakness of the muscles that control the eyelids, the movement of the eyes and swallowing. In severe cases, the muscles used in breathing and walking are also affected. The weakness varies in severity during the day and may disappear entirely for days or weeks before recurring, but over a period of months or years, the attacks become more severe. It is most common in young women and the symptoms are caused by a blocking of the nerves that supply the affected muscles).

Phys: Test detects a specific antibody in tissue.

Anti-Smith Antibodies
[ANS]
NR: Negative.
Ind: Systemic lupus erythematosus (SLE).
Int: POSITIVE - 33% of cases of systemic lupus erythematosus (an uncommon, but serious disease that can affect tissues throughout the body causing arthritis, mouth ulcers, abnormal muscle movements, high blood pressure and a characteristic red rash across the cheeks and bridge of the nose in a butterfly pattern).

Phys: More likely to be positive in cases of SLE with inflamed arteries and less likely in cases of SLE involving the kidney.

See also LE Cells; Lupus Anticoagulant Antibody

Anti-Smooth Muscle Antibodies
[SMA]
Medical Tests Explained

**Antistreptolysin O Titre**
**[ASOT]**
- **NR:** 0 to 300 IU/mL (less than 200 Todd units/mL - varies widely between laboratories).
- **Ind:** Severe bacterial infections.
- **Int:** HIGH - Severe Streptococcal bacterial infection, rheumatic fever.
- **Phys:** Patients infected with the bacteria Streptococci often develop antibodies against an enzyme (haemolysin O) produced by Streptococcus.

*See also Anti-Deoxyribonuclease-B Titre*

**Antithrombin III**
**[AT III]**
- **NR:** 80-120% (0.77-1.20 U/mL).
- **Ind:** Unusual blood clotting in veins (venous thromboses).
- **Int:** LOW (< 60%) - Congenital lack of AT III, non-functional AT III, familial thrombophilia (inherited blood clotting disease).
- **Phys:** AT III prevents clotting by preventing conversion of fibrinogen to fibrin, and also acts on the clotting factors IX, X, XI and XII. A lack allows excessive clotting of blood in veins.

**Anti-Thyroglobulin Antibody**
See Thyroglobulin Antibody

**Anti-Thyroid Peroxidase Antibodies**
- **NR:** <35 U/mL.
- **Ind:** Thyroid gland disease.
- **Int:** HIGH - Inflamed thyroid gland, Hashimoto thyroiditis, other autoimmune conditions affecting the thyroid gland.

**Anti-TSH Receptor Antibodies**
**[TRAB]**
- **NR:** Negative.
- **Ind:** Thyroid gland disease.
- **Int:** POSITIVE - Graves' disease, over active thyroid gland (thyrotoxicosis).
- **Phys:** TRAB are antibodies that bind to receptors in the thyroid gland tissue and activate the tissue, causing the excess production of thyroid hormones.

**AntiXa**
See Anti-Factor Xa

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

APC Resistance
See Activated Protein C Resistance

Apolipoproteins
[Apo]
NR: ApoA1 1.0 to 1.8g/L.
     ApoB 0.8 to 1.6g/L.
Ind: Atherosclerosis (hardening of the arteries).
Int: LOW - Increased risk of atherosclerosis.
Phys: May be measured as an alternative to high density lipoprotein cholesterol (HDL) and low density lipoprotein cholesterol (LDL).
See also High Density Lipoprotein Cholesterol; Low Density Lipoprotein Cholesterol

APTT
See Activated Partial Thromboplastin Time

Arbovirus Antibodies
See Immunoglobulin Antibodies

Ascorbic Acid
See Vitamin C

ASOT
See Antistreptolysin O Titre

Aspartate Amino Transferase
[AST]
(Glutamic Oxaloacetic Transaminase) [SGOT]
NR: 8 to 40 IU/L.
Ind: Liver disease.
Int: VERY HIGH - Blockage of bile drainage from liver (obstructive jaundice - eg. by gall stones), acute hepatitis.
     HIGH - Cirrhosis (liver disease), heart attack (myocardial infarct), liver cancer, haemolytic jaundice (excessive destruction of red blood cells), injury to liver, Reye syndrome, muscular dystrophy, alcoholism, after some anaesthetics, vigourous exercise, paracetamol overdose, poor collection or storage of blood sample.
     LOW - Kidney failure, lack of vitamin B6.
Phys: AST is widely distributed in the body with high concentrations in liver, heart, muscle and kidney. It is released from these organs when they are diseased or damaged. It rises to a peak 36 hours after a heart attack, and returns to normal after 3-4 days.
See also Alanine Amino Transferase

Aspergillus Precipitins
NR: Absent.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Ind:** Asthma triggered by the fungus aspergillosis.

**Int:** PRESENT - Allergic lung reaction to aspergillosis.

**Phys:** Does not diagnose aspergillosis infections, only a reaction to these fungal spores.

**AST**
See Aspartate Amino Transferase

**AT III**
See Antithrombin III

**Autoantibodies**
See Antinuclear Autoantibodies; Anti-Skeletal Muscle Antibodies; Anti-Smith Antibodies; Anti-Smooth Muscle Antibodies; Anti-Thyroid Peroxidase Antibodies; Basement Membrane Autoantibodies; Cardiolipin Autoantibodies; Centromere Autoantibodies; Extractable Nuclear Antigen Autoantibodies; Glomerular Basement Membrane Autoantibodies; Histone Autoantibodies; Intercellular Cement Substance Autoantibodies; Intrinsic Factor Autoantibodies; Islet Cell Autoantibodies; Mitochondrial Autoantibodies; Myocardial Autoantibodies; Ovarian Autoantibodies; Parietal Cell Autoantibodies; Reticular Cell Autoantibodies; Thyroid Microsomal Autoantibody Titre.

**AVP**
See Antidiuretic Hormone

**B Cell Lymphocytes**
**NR:** 0.06-0.60 x 10^9/L.
**Ind:** Suspected leukaemia.
**Int:** HIGH - Acute lymphoblastic leukaemia.
**Phys:** Test for the presence of a specific type of white cell (lymphocyte) in the blood that is characteristic of one of the more severe forms of leukaemia that usually affects children.

*See also T Cell Lymphocytes*

**B₂M**
See Beta-2 Microglobulin

**B₁₂**
See Cyanocobalamin

**Barbiturates**
**NR:** Zero.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Ind:** To detect an overdose using barbiturates, or control treatment using these drugs.

**Int:** HIGH - Barbiturates present.

**Phys:** Coma occurs with levels over 90 to 170 µmol/L, depending on which barbiturate is used. Half the barbiturates taken will still be present in the blood after three days.

**Barmah Forest Virus Antibodies**
See Immunoglobulin Antibodies

**Base Excess**

NR: +3 to −3 mmol/L.

**Ind:** Disorders within the body that affect metabolism (the break down of food).

**Int:** HIGH - Metabolic alkalosis, respiratory acidosis (lung diseases).

LOW - Metabolic acidosis, respiratory alkalosis (disorders such as diabetes).

**Phys:** The test is performed on blood taken from an artery and is collected in sealed syringe containing heparin to prevent clotting.

**Basement Membrane Autoantibodies**
*(Pemphigoid Autoantibodies)*

NR: Negative.

**Ind:** Blistering skin diseases.

**Int:** POSITIVE - Pemphigoid (a blistering skin disease of elderly women, although men may sometimes be affected. Patients develop red, scaling, itchy patches, which after a few days break down into large, fluid-filled blisters on widespread areas of the body. These huge, soft bubbles develop on the arms and legs initially, but soon spread to the trunk, and may involve the mouth).

**Phys:** The severity of the test results does not correlate with disease severity.

**Basophils**

NR: Less than 0.1 basophils x 10⁹/L (10 to 100/µL) (0.1-1.0%).

**Ind:** To determine nature of some infections and blood diseases.

**Int:** VERY HIGH - Chronic myeloid leukaemia, myelofibrosis, polycythaemia vera and urticaria pigmentosa.

HIGH - Chronic inflammation of any cause, underactive thyroid gland, ulcerative colitis, allergic reactions, some viral infections and after removal of the spleen.

LOW - Treatment with steroids, physical stress, pregnancy, over active thyroid gland and some infections.

**Phys:** Basophils are a type of white cell found in blood. They are normally reported as part of a full blood count.

**Beta HCG**
See Chorionic Gonadotrophin, Human, Beta

**Beta-2 Microglobulin**

[B₂M]

NR: Adults 0.8 to 2.5 mg/L; over 65 years of age 0.8 to 3.0 mg/L.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Ind: Suspected multiple myeloma, leukaemia or AIDS.
Int: HIGH - AIDS, multiple myeloma (a cancer of the cells in the bone marrow of the elderly), chronic lymphocytic leukaemia, acute monoblastic leukaemia, hepatitis B, glandular fever, cytomegalovirus infections, sarcoidosis, rheumatoid arthritis, Sjögren syndrome, Crohn's disease or kidney failure.
Phys: Results are raised in early stage of AIDS, and increases with worsening immune diseases. Useful test to measure the effectiveness of treatment of these diseases, and their speed of progression.

See also Beta-2 Microglobulin, Urine

Bicarbonate

[HCO$_3^-$]

NR: 24 to 32 mmol/L.
Ind: Suspected imbalances in the acidity (pH) of blood.
Int: HIGH - Insufficient oxygen entering lungs due to lung disease, bicarbonate treatment, a lack of potassium, vomiting, pyloric stenosis (congenital narrowing of the stomach outlet), inhaling acid regurgitated up from the stomach, late stage of aspirin poisoning, Cushing syndrome, diuretics (fluid tablets), antacids, and treatment with steroids.
LOW - Rapid over breathing (hyperventilation), hysteria, altitude sickness, excess artificial respiration, starvation, diarrhoea, liver failure, dehydration, early aspirin poisoning, diabetes mellitus, kidney failure and severe kidney disease, and surgically draining the kidneys into the bowel.

Phys: The bicarbonate level depends on the removal of carbon dioxide from the blood through the lungs, as well as the amount of acid or alkali formed in or added to the body.

Bilirubin

NR: Total 1 to 20 µmol/L. Direct (conjugated) 1 to 6 µmol/L. Indirect 2 to 13 µmol/L. New born baby 17 to 170 µmol/L.
Ind: Suspected liver diseases and anaemia.
Int: HIGH DIRECT & INDIRECT - Hepatitis, bile duct blockage, gall stones, toxic reactions, Gilbert's disease, cancer affecting the liver, cirrhosis and the Dubin-Johnson syndrome.
HIGH INDIRECT ONLY - Haemolytic (blood breakdown) disease, large resolving bruise.
HIGH IN INFANT - Physiological jaundice, haemolytic disease, spherocytosis (abnormal red blood cells), sickle cell anaemia (congenital abnormality of red blood cells in Negroes), birth injury, hepatitis, underactive thyroid gland, prematurity, abnormalities of drainage of bile from the liver, starvation, meconium ileus (blocked bowel), Crigler-Najjar syndrome and some drugs.

Phys: The break down of haemoglobin in red blood cells creates bilirubin, which is processed (conjugated) in the liver and excreted in the bile. Any overload or blockage of this system raises bilirubin levels. The ratio between direct and indirect (processed and unprocessed) bilirubin can be used to narrow down the disease process that is taking place.
Medical Tests Explained

place. Many newborn infants become yellow (jaundiced) due to high bilirubin levels associated with the destruction of a different type of red blood cell used before birth.

See also Bilirubin, Urine

Bismuth
NR: Less than 20 nmol/L.
Ind: Bismuth poisoning (eg. medications for indigestion that contain bismuth).
Int: Less than 48 nmol/L - Nontoxic level.
    48 to 240 nmol - Intermediate range, possible toxicity.
    Greater than 240 nmol - Toxic.

Blast Cells
NR: Nil
Ind: Noted on routine full blood film.
Int: PRESENT - Bone marrow infiltration by abnormal cells, cancer, leukaemia or sarcoma (bone or muscle cancer).
Phys: Most primitive form of white cell. Further investigation is essential when found in peripheral blood.

Bleeding Time
NR: 1-7 minutes.
Ind: Blood clotting disorders.
Int: HIGH - Drugs (eg. aspirin, anti-inflammatory drugs for arthritis), a lack of platelets (thrombocytopenia), abnormal platelets (thrombosthenia), and bleeding disorders such as haemophilia, Christmas disease, von Willebrand disease, Bernard-Soulier syndrome or Glanzmann syndrome.
Phys: Normal with anticoagulant therapy (eg. heparin, warfarin). Measures platelet function. Platelets are cells that form blood clots.

See also INR

Blood Gases
See Carbon Dioxide; Oxygen.

Blood Group
NR: Types : A, AB (rarest), B, O (most common). Varies between races.
    Rhesus factor : Rh+ (87%), Rh− (13%)
Ind: Blood transfusion, presurgery, medicolegal, precautionary.
Int: Blood type and factors determine which blood a patient should receive. In emergency: O− is universal donor, AB+ is universal recipient. Parentage can be determined within limits by comparing grouping and other blood factors of parents and child.

Blood Volume
NR: 60 to 80 mL/kg.
    Mean values: male 4,500 mL, female 3,600 mL.
Int: LOW - Blood loss (may be hidden internally).

See Disease Definitions section at back of book for explanation of unusual diseases.
Phys: Measured by dye or radioisotope dilution methods. Increased 40% in pregnancy.

**Brucellosis Antibodies**
See Immunoglobulin Antibodies, Specific.

**BUN**
See Urea

**Bunnell, Paul**
See Paul Bunnell Test

**C**

**C3 and C4**
See Complement

**Ca**
See Calcium; Calcium, Corrected; Calcium, Ionised

**CA 15-3**
See Cancer Associated Antigens

**CA 19-9**
See Cancer Associated Antigens

**CA 50**
See Cancer Associated Antigens

**CA 125**
See Cancer Associated Antigens

**CA 195**
See Cancer Associated Antigens

**CA 549**
See Cancer Associated Antigens

**Cadmium**

<table>
<thead>
<tr>
<th>NR:</th>
<th>Less than 0.04 µmol/L.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ind:</td>
<td>Industrial exposure in battery, electroplating, paint, plastic &amp; ceramic factories; copper, lead or zinc smelting.</td>
</tr>
<tr>
<td>Int:</td>
<td>HIGH - Excessive cadmium exposure.</td>
</tr>
</tbody>
</table>

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Phys: May accumulate in the food chain, particularly in shellfish.

Caeruloplasmin
NR: 1.5 to 3.5 mmol/L (0.2 to 0.47 g/L).
Ind: Abnormal amount of copper in diet.
Int: HIGH - Pregnancy, over active thyroid gland (hyperthyroidism), infection, aplastic anaemia (very severe form of anaemia caused by red blood cell destruction), acute leukaemia or liver cirrhosis.
       LOW - Wilson's disease (excess copper in the body).
Phys: 95% of copper in the blood is bound to the protein caeruloplasmin.
See also Copper

Calcitonin
NR: Less than 27 pmol/L (Less than 100 ng/L).
Ind: Thyroid gland and parathyroid gland disease.
Int: HIGH - Thyroid cancer, over active parathyroid gland (primary hyperparathyroidism - the parathyroid glands are imbedded in the back of the thyroid gland in the neck and control the amount of calcium in the body), phaeochromocytoma (a rare black-celled tumour of the adrenal glands that sit on top of each kidney, that releases a substance that causes very high blood pressure, severe headaches, palpitations of the heart, abnormal sweating, nausea and vomiting, abdominal pains, blurred vision, and brain damage), Cushing syndrome, multiple neuromas or a carcinoid tumour.
Phys: Collect specimen mid-morning. Calcitonin is a hormone involved in regulation of calcium and bone metabolism.

Calcium
[Ca]
NR: 2.2 to 2.7 mmol/L (9 to 10.8 mg/100 mL).
Ind: Kidney, bone and parathyroid gland disease.
Int: HIGH - Parathyroid gland overactivity (the parathyroid glands sit behind the thyroid gland in the neck and control the level of calcium in the blood), bone tumours, excess vitamin A or D, excess calcium absorption from food (eg. excess milk in diet), lymphomas (cancer of lymph nodes), sarcoidosis, other cancers, low levels of phosphate in the blood (calcium and phosphate balance each other in the body), dehydration, kidney failure, over active thyroid gland (hyperthyroidism), von Recklinghausen's disease of bone, multiple myeloma, Paget's disease of bone, adrenal gland failure, prolonged immobilisation, feeding through a drip into a vein (parenteral nutrition), infancy, postmenopause, or it may be an inherited characteristic. Prolonged application of the tourniquet during collection and drugs (eg. fluid tablets, lithium, tamoxifen) may give a falsely high reading.
LOW - Lack of vitamin D, long term illness, under active parathyroid glands (hypoparathyroidism), kidney failure (nephrotic syndrome), insensitivity to vitamin D, rickets due to kidney disease, a lack of protein in the blood (hypoalbuminaemia), acute
pancreatitis, a lack of magnesium in the blood (hypomagnesaemia), di George syndrome, pregnancy, or rapid over breathing (hyperventilation).

**Phys:** The absorption of calcium is dependent on vitamin D which is obtained by sun irradiation of cholesterol found in the skin. The amount of calcium added to or removed from bone depends on calcitonin which is secreted by the parathyroid glands. A fasting blood sample required. The prolonged use of a tourniquet during the taking of the blood may cause false high result.

*See also Calcium, Corrected; Calcium, Ionised*

### Calcium, Corrected

**NR:** 2.15 to 2.55 mmol/L.

**Ind:** As for Calcium, above.

**Int:** As for Calcium, above.

**Phys:** Calculated by an equation that corrects abnormalities due to low or high levels of protein (albumin) in the blood.

*See also Calcium*

### Calcium, Ionised

**NR:** 1.14 to 1.30 mmol/L.

**Ind:** Investigation of abnormal calcium levels in blood.

**Int:** HIGH - Over active parathyroid glands (hyperparathyroidism - the parathyroid glands sit behind the thyroid gland in the neck and control the level of calcium in the blood), early cancer, sarcoidosis, vitamin A or D excess, or the other causes of high calcium listed in the Calcium entry above.

NORMAL ionised calcium, HIGH blood calcium - Long term blood alkalinity (alkalosis) from vomiting, steroids or fluid tablets.

NORMAL ionised calcium, LOW blood calcium - Long term blood acidity, lack of protein (albumin) in blood.

LOW - Under active parathyroid glands (hypoparathyroidism), lack of vitamin D, poor diet, dietary insufficiency, other causes of low calcium listed in the Calcium entry above.

**Phys:** The ionised calcium is the only form of calcium that interacts with the membrane surrounding cells, and is responsible for clinical signs and symptoms of excess or low calcium levels in the blood. Any variation from normal range is highly significant.

*See also Calcium*

### Cancer Associated Antigens

**[CA]**

**(Carbohydrate Antigens)**

**NR:** Less than 30 U/mL; mean 12.9 U/mL; peak 6 U/mL.

**Ind:** Detection or monitoring of certain cancers.

**Int:** CA 15-3 HIGH - Metastatic breast cancer (70%+), localised breast cancer (10%+). False positive with liver failure.

CA 19-9 HIGH - Cancer of the pancreas (80%+), bile duct cancer (66%+), stomach cancer (50%+), liver cancer (hepatoma - 50%+), large bowel (colorectal) cancer (25%+). False positive with liver cirrhosis, cholangitis (inflamed bile duct) and pancreatitis.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
CA 50 HIGH - Cancer of the pancreas (75%+), large bowel (colorectal) cancer (45%+). False positive with pancreatitis.
CA 125 HIGH - Some types of ovarian cancer (85%+), cancer of the uterus (endometrial cancer). False positive with endometriosis.
CA 195 - Cancer of the pancreas (85%+), bowel (gastrointestinal) cancer.
CA 549 - Breast cancer (50%+), lung cancer, large bowel (colon) cancer, prostate gland cancer. False positive with endometriosis, liver and ovarian disease.

**Phys:** A reading above 30 U/mL is highly suspicious of cancer. Any reading above the mean should be regarded suspiciously and repeated to check for rising values. Used for following course of cancer and for screening in patients with family history of cancer.

*See also Squamous Cell Carcinoma Associated Antigen; Vasoactive Intestinal Peptide*

**Cancer Associated Serum Antigen**

[CASA]

**NR:** Negative

**Ind:** Cancer of the ovary.

**Int:** POSITIVE - High risk of cancer of the ovary (75%+), large bowel (colon) cancer, cancer of the uterus or cervix, or breast cancer. False positive possible in late pregnancy

**Carbamazepine**

(Tegretol)

**NR:** Therapeutic range 20 to 50 µmol/L (6 to 12 µg/mL).

**Ind:** Treatment with carbamazepine (Tegretol).

**Int:** Doctors adjust the dosage to keep level within the therapeutic range.

**Phys:** Carbamazepine is used for epilepsy and trigeminal neuralgia. Blood sample should be taken immediately prior to next dose.

**Carbohydrate Antigens**

See Cancer Associated Antigens.

**Carbohydrate-Deficient Transferrin**

**NR:** Varies between laboratories.

**Ind:** Alcoholism.

**Int:** HIGH - Chronic alcoholism, carbohydrate-deficient glycoprotein syndrome.

**Phys:** Very reliable test for chronic alcoholism with regular ingestion of more than 50g alcohol a day. Negative result does not exclude alcoholism as a diagnosis.

*See also Transferrin*

**Carbon Dioxide**

[pCO₂]

**NR:** Measured in several different ways.
25 to 30 mmol/L (25 to 30 mEq/L)
Combining power 45 to 65% vol.
pCO₂ 4.6 to 6.0 kPa (42 ± 4 mmHg)

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Medical Tests Explained

Ind: Lung or heart disease.
Int: Low oxygen levels in blood due to poor air entry, poor lung function, or poor circulation of blood. Higher values are far more significant than slightly raised values.
Phys: Carbon dioxide is produced in the body by the use of oxygen as a fuel, and is removed from the body through the lungs with every breath out.
See also Bicarbonate

Carboxyhaemoglobin B
NR: 0.5 to 1.5% of total haemoglobin.
Ind: Determine smoking status.
Int: HIGH - Smoker, inhalation of exhaust fumes.
Phys: Physiology.
See also Nicotine; Cotinine

Carcinoembryonic Antigen
[CEA]
NR: Less than 2.5 µg/L.
Ind: Large bowel (colorectal) cancer, monitoring cancer therapy.
Int: HIGH - Colorectal cancer, stomach cancer, thyroid gland cancer, breast cancer, lung cancer, cervix cancer, testicular cancer (seminoma), cancer of the pancreas, liver cancer (hepatoma), cirrhosis of the liver, or heavy smokers.
Phys: CEA is produced by tumours of specific types of tissue (endodermal tissue). False positive results are common. It is a useful to follow progress of cancer therapy, but not for diagnosis or screening.
See also Cancer Associated Antigens

Cardiolipin Autoantibodies
[ACLA]
(Anticardiolipin Antibodies)
NR: Absent.
Ind: Autoimmune disease (These diseases cause the body to inappropriately reject some of its own tissue. Examples include systemic lupus erythematosus, rheumatoid arthritis and scleroderma).
Int: PRESENT - Systemic lupus erythematosus, phospholipid antibody syndrome, other autoimmune diseases, blood clotting disorders, or a serious infection.
Phys: Autoantibodies are antibodies that are formed inappropriately within the body to act against normal tissue.
See also ANA; ANCA; Anti-DNA; Anti-Smith Antibodies; Complement C3 and C4; DNA Autoantibodies; ENA; Histone Autoantibodies; HLA-DR3; LE Cells; Lupus Anticoagulant Antibody

Carnitine
NR: Free: 30 to 70 µmol/L.
Total: 40 to 80 µmol/L.
Ind: Muscle diseases.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Int: LOW - Low levels of carnitine may cause muscle damage (including heart) and low blood sugar (hypoglycaemia).

Phys: Carnitine deficiency may be due to reduced intake of protein in the diet, impaired production in the body, kidney disease or acidic blood.

Carotene
NR: 0.93 to 3.7 µmol/L.
Ind: Yellow skin, poor food absorption.
Int: HIGH - Carotenaemia due to excessive intake of vitamin A in yellow coloured foods such as pawpaw, carrots, pumpkin, etc.; under active thyroid gland (hyperthyroidism), or excess fat in blood (hyperlipidaemia).
LOW - Tropical sprue or poor absorption of fat.

Phys: Skin becomes a yellow colour due to the excessive amounts of vitamin A and yellow coloured carotene.

CASA
See Cancer Associated Serum Antigen

Catecholamines
NR: Adrenaline - Less than 0.3 nmol/L.
Noradrenaline - Less than 2.5 nmol/L.
Dopamine - Less than 0.5 nmol/L.
Ind: Severe high blood pressure (hypertension).
Int: ADRENALINE & NORADRENALINE HIGH - Phaeochromocytoma (tumour of the adrenal glands on each kidney).
DOPAMINE HIGH - Neuroblastoma.

Phys: The nurse or doctor should relax the patient for 30 minutes after insertion of a needle into a vein to allow catecholamines to return to lowest possible level. There are three different types of catecholamine, all of which may increase blood pressure.

See also Catecholamines, Urine; Clonidine Suppression Test

CD Types, Lymphocytes
See T Cell Lymphocytes

CEA
See Carcinoembryonic Antigen

Centromere Autoantibodies
NR: Absent
Ind: CREST syndrome.
Int: PRESENT - CREST syndrome (name is an acronym for symptoms. Calcinosis - the formation of hard calcium containing nodules under the skin, Raynaud’s phenomenon - fingers and toes to become cold and blue, Esophageal inflammation - American spelling - causing difficulty in swallowing,

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Sclerodactyly - thickening and hardening of the skin on the fingers and toes, and Telangiectasia - multiple dilated blood vessels in the skin.

Phys: Highly accurate test for this syndrome.

Ceruloplasmin
See Caeruloplasmin

Chloride

[Cl\(^-\)]
NR: 97 to 108 mmol/L.
Ind: Body water or salt (electrolyte) imbalance, or kidney disease.
Int: LOW - Dehydration, excess salt loss through kidneys (salt losing nephropathy), excess use of fluid tablets (diuretics), chronic or severe diarrhoea, alcoholism, vomiting or cystic fibrosis.
HIGH - Salt water drowning, excess salt in diet, dehydration, kidney disease (renal tubular acidosis), diarrhoea, or excess purging of bowels.

Phys: The level of chloride is directly dependent on the level of sodium, and both are the constituents of common salt (NaCl).

Chlorpromazine
(Largactil)
NR: Therapeutic range 0.16 to 0.94 umol/L.
Toxic over 2.4 umol/L.
Ind: Chlorpromazine treatment.
Int: Doctor adjusts dosage to keep serum levels within therapeutic range.

Phys: Chlorpromazine is used in the treatment of psychoses, schizophrenia and severe agitation. The blood sample should be taken immediately prior to the next dose.

Cholesterol

NR: 2.2 to 6.5 mmol/L (less than 5.5 mmol/L recommended) (150 to 250 mg/100 mL).
Neonate 0.2 to 4 mmol/L.
Ind: Obesity, hypertension, heart disease.
Int: HIGH - Excess cholesterol in diet, inherited cholesterol excess tendency, underactive thyroid gland (hypothyroidism), diabetes mellitus, nephrotic syndrome (kidney failure), chronic hepatitis, cirrhosis of the liver, porphyria, protein deficient diet, anorexia nervosa, elderly and in pregnancy.
LOW - Acute hepatitis, Gaucher disease, over active thyroid gland (hyperthyroidism), acute infections, kidney failure (uraemia), heart attack (myocardial infarct), malnutrition or inherited tendency (familial).

Phys: Cholesterol is a type of fat that can only be obtained in the diet from foods with an animal origin (eg. meat, milk, eggs), or it can be synthesised within the liver. The level of cholesterol is determined by metabolic functions that are influenced by diet and inheritance. 70% of cholesterol occurs as low density lipoproteins. No alcohol should be consumed for 72 hours and no food for 12 hours before blood is taken.

See also Triglycerides; High Density Lipoprotein Cholesterol

See Disease Definitions section at back of book for explanation of unusual diseases.
**Cholinesterase**

**NR:** Significant variation between laboratories.

**Ind:** Used to detect the possibility of a rare form of anaesthetic complication (scoline apnoea).

**Int:** LOW - Scoline (suxamethonium) apnoea, inherited tendency to scoline apnoea, organophosphate (insecticide) poisoning or liver disease.

SLIGHTLY LOW - Pregnancy.

**Phys:** Cholinesterase essential for the breakdown of scoline, a medication used in anaesthesia to paralyse the patient. A lack causes prolongation of the scoline effect. Cholinesterase is made in the liver.

*See also Cholinesterase, Red Cells*

**Cholinesterase, Red Cells**

**NR:** Significant variation between laboratories.

**Ind:** Insecticide poisoning.

**Int:** LOW - Insecticide (organophosphate or carbamate) poisoning.

**Phys:** Levels slowly return to normal with cessation of exposure. The insecticides destroy the cholinesterase that should be in the red cells that circulate in blood.

*See also Cholinesterase*

**Chorionic Gonadotrophin, Human, Beta**

[HCG]

**NR:** Less than 10 IU/L.

**Ind:** Pregnancy, ovarian or testicular cancer.

**Int:**
- 20 to 100 IU/L - 1 to 2 weeks after pregnancy commences, or menopause
- 100 to 6000 IU/L - 3 to 4 weeks of pregnancy, or after 6 months of pregnancy, or cancers of ovary or testicle (embryonal carcinoma or choriocarcinoma).
- 6000 to 30,000 IU/L - Increases between weeks 7 and 30 of pregnancy, then slowly decreases.
- Over 30,000 IU/L - Increased risk of Down syndrome (mongolism).

**Phys:** HCG is secreted by the placenta. It rises to a peak at 10 weeks of pregnancy, then slowly declines. Reliable only 10 days after conception. Also acts as a reliable marker to certain cancers of the ovary and testes.

**CK**

See Creatine (Phospho) Kinase

**Cl**

See Chloride

**Clonazepam**

(Rivotril)

**NR:** Therapeutic range 60 to 150 nmol/L (25 to 75 µg/L).

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Medical Tests Explained

**Ind:** Treatment with the drug clonazepam (Rivotril), which is used for the treatment of epilepsy.

**Int:** Dosage is adjusted to keep serum levels within necessary range for best results.

**Phys:** Blood sample should be taken immediately before the next dose.

**Clotting Time**

**NR:** Less than ten minutes.

**Ind:** Bleeding disorders.

**Int:** HIGH - Treatment with medications that slow clotting (eg. warfarin, aspirin), an inherited or acquired lack of blood clotting factors.

**Phys:** Screening test for bleeding disorders performed under controlled conditions.  
*See also Coagulation Tests*

**CO₂**

See Carbon Dioxide

**Coagulation Tests**

See Activated Partial Thromboplastin Time; Anti-Factor Xa; Antithrombin III; Clotting Time; Factor VIII; Factor XIII Screen; Fibrin Degradation Products; Fibrinogen; International Normalised Ratio; Platelet Count; Protein C; Prothrombin Time; Thrombin Clotting Time; von Willebrand Factor.

**Cold Agglutins**

**NR:** Low

**Ind:** Detect presence of significant infections.

**Int:** HIGH - Pneumonia caused by the Mycoplasma bacteria, glandular fever (infectious mononucleosis), lymphomas and other cancers of lymphatic tissue, serious viral disease, syphilis.

**Phys:** Test for antibodies that react to cause break down of red blood cells (haemolysis) at low temperatures (ie. 4°C). The haemolysis is due to the presence of a substance called complement to the surface of red blood cells (erythrocytes).

**Collagen Binding Assay, von Willebrand Factor**

See von Willebrand Factor

**Complement**

| [C3 and C4 |  
| NR: | C3 0.83 to 1.7 g/L.  
| | C4 0.19 to 0.59 g/L.  
| Ind: | Suspected systemic lupus erythematosus (SLE).  
| Int: | LOW - SLE, rheumatoid arthritis, other diseases of joints and muscles, liver cirrhosis, hives (urticaria), after removal of spleen (splenectomy), bacterial infection with the bacteria Pneumococcus (lung and throat infection) and Neisseria (amenorrhoea).  
| | HIGH - Allergy reaction (anaphylaxis).  

*See Disease Definitions section at back of book for explanation of unusual diseases.*
**Phys:** Useful for following the progress of SLE. C4 levels are more sensitive. C3 levels drop only in severe disease.

*See also Cold Agglutins; LE Cells; Lupus Anticoagulant Antibody.*

**Complete Blood Examination**
See Full Blood Count

**Coombs' Test**
(Direct Antiglobulin Test)

NR: Negative.

Ind: Detecting the cause of anaemia due to break down of red blood cells (haemolytic anaemia), jaundice (yellow skin), or after a blood transfusion.

Int: DIRECT POSITIVE - Autoimmune haemolytic anaemia (anaemia due to the body rejecting its own red blood cells), systemic lupus erythematosus (SLE), chronic lymphatic leukaemia, cancer of lymph nodes (lymphosarcoma), Hodgkin's disease, cytomegalovirus (CMV) infection, or an incompatible blood transfusion.

DIRECT WEAK POSITIVE - Rheumatoid arthritis, ulcerative colitis, and drugs such as penicillin and methyldopa.

INDIRECT POSITIVE - Excess amounts of antibody in the blood from autoimmune haemolytic anaemia.

**Phys:** Test for clumping of red blood cells (haematological agglutination) to detect abnormal blood protein (often an immunoglobulin) attached to red blood cells. Detected by Coombs' serum, which is made from an animal anti-human immunoglobulin antibody, and added to a sample of the patient’s blood.

**Copper**

[Cu]

NR: 11 to 22 µmol/L (70 to 140 µg/100 mL).

Ind: Suspected liver disease or Wilson's disease.

Int: HIGH - Wilson's disease (early stage), anaemia, infection, liver cirrhosis, liver cancer (hepatoma).

LOW - Wilson's disease (late stage), major disorders of food absorption.

**Phys:** Wilson’s disease is a disease of abnormal copper use in the body. 95% of copper in the body is bound to the protein caeruloplasmin.

*See also Caeruloplasmin*

**Cortisol**

NR: Morning - 130 to 770 nmol/L (5 to 28 µg/100 mL).

Evening - less than 390 nmol/L (less than 14 µg/100 mL).

Midnight - less than 220 nmol/L (less than 8 µg/100 mL).

Ind: Suspected Cushing syndrome.

Int: HIGH - Cushing syndrome, oral contraceptives, obesity, stress, drugs (eg. hormones), depression, and pregnancy. Result may be used with further tests to diagnose Addison disease.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Phys: Cushing syndrome is caused by an over production of steroids such as cortisone in the body, or taking large doses of cortisone to control a wide range of diseases, including asthma and rheumatoid arthritis. Headache, obesity and muscle weakness are common symptoms of this syndrome.

See also Cortisol, Free, Urine; Dexamethasone Suppression Test; Synacthen Stimulation Test

Cotinine

NR: Zero
Ind: Determination of smoking status.
Int: HIGH - Smoker.
Phys: 5% of nicotine breaks down into cotinine.

See also Cotinine, Urine; Nicotine; Carboxyhaemoglobin B

CPK
See Creatine (Phospho) Kinase

C-Reactive Protein

[CRP]
NR: Less than 5 mg/L (less than 5 µg/mL).
Ind: Inflammation anywhere in the body.
Int: HIGH - Inflammation, tissue injury, rheumatoid arthritis, infections, pneumonia, heart attack (myocardial infarct), widespread cancer, breast cancer, acute gout, ankylosing spondylitis, rheumatic fever, SLE (systemic lupus erythematosus), blood clot in vein (thromboembolism), bacterial meningitis, polyarteritis nodosa, inflammatory bowel disease (eg. Crohn disease).
Phys: CRP is released from most tissue under stress. Nonspecific test, but usually indicates significant disease.

See also C-Reactive Protein, Ultrasensitive; Erythrocyte Sedimentation Rate.

C-Reactive Protein, Ultrasensitive

NR: Variations in C-reactive protein (CRP) as low as 0.1 mg/L measured
Ind: Unstable angina.
Int: RISING LEVELS - Poor prognosis for angina, increasing tissue damage in other organs.
Phys: Slowly increasing levels associated with increasing heart tissue damage even though total level of CRP may be quite low.

See also C-Reactive Protein; Troponin

Creatine (Phospho) Kinase

[CK or CPK]
NR: Male 60 to 280 IU/L.
    Female 30 to 190 IU/L.
Ind: Suspected heart attack (myocardial infarct).

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Int: HIGH - Heart attack (myocardial infarct), muscle wasting diseases (dystrophies), muscle inflammatory diseases (eg. polymyositis), blood clot in lung (pulmonary embolus), seizures, after major surgery, heart muscle inflammation (myocarditis), muscle injury (eg. vigourous exercise, large injection).

Phys: CK is an enzyme, the blood concentration of which rises 3-5 hours after a myocardial infarct, but returns to normal in 2 to 3 days. Heart and skeletal muscle are rich in this enzyme.

See also Creatine Kinase Isoenzymes; Troponin

Creatine Kinase Isoenzymes

NR: CK-MB ratio less than 6%.
MB factor less than 10 U/L (less than 5% total CK, less than 0.6µg/L).
MM factor 96% total CK.
BB factor rarely detected.

Ind: Heart attack (myocardial infarct).

Int: CK-MB ratio and MB factor HIGH - Heart attack (myocardial infarct), heart muscle inflammation (myocarditis).
BB factor HIGH - Brain damage.

Phys: Creatine kinase is an enzyme found in muscle. It consists in several different forms (factors). MB factor is 4% of skeletal muscle creatine kinase (CK), but 40% of CK in heart muscle. MM factor makes up rest of CK, except in brain, where significant amounts of BB factor (which is very short lived in blood) occurs.

See also Creatine (Phospho) Kinase

Creatinine

NR: 0.06 to 0.11 mmol/L (0.6 to 1.5 mg/100 mL).

Ind: Kidney disease.

Int: HIGH - Sudden onset (acute) or persistent (chronic) kidney failure, urinary tract obstruction preventing urine from leaving one or both kidneys, high blood pressure, other kidney diseases (eg. chronic glomerulonephritis, diabetic nephropathy, polycystic kidneys, reflux nephropathy), SLE (systemic lupus erythematosus), acute muscle wasting, elderly, toxins, large intake of meat or vitamin C, drugs (eg. aspirin, arthritis medications).
LOW - Pregnancy, chronic muscle wasting.

Phys: Creatinine is removed from the body by filtration through the kidney. Excess amounts in the blood is an indication of kidney failure. Abnormal results (up or down) may be caused by high blood glucose (sugar) or bilirubin, or by the drug cefoxitin.

See also Urea

Cross-Linked Fibrin Derivatives
See D-Dimer

CRP
See C-Reactive Protein

See Disease Definitions section at back of book for explanation of unusual diseases.
Cryoglobulin
NR: Absent.
Ind: Immune system disorders.
Int: PRESENT - Infection (eg. hepatitis C), myeloma, cancer of lymph tissue (lymphoma), SLE (systemic lupus erythematosus) and other immune system disorders.
Phys: Cryoglobulin is a protein that precipitates out of blood serum at 4°C and redissolves at 37°C.

Cu
See Copper

Cyanocobalamin
See Vitamin B₁₂

D-Dimer
(Cross-Linked Fibrin Derivatives)
NR: Negative or less than 0.2 mg/L.
Ind: Suspected abnormal blood clots in the body.
Int: POSITIVE - Blood clot in an artery or vein (eg. deep vein thrombosis, pulmonary embolus).
Phys: Measures the breakdown products of a protein called cross linked fibrin, which is partly responsible for the formation of a blood clot.
See also Fibrin Degradation Products

Dehydroepiandrosterone Sulfate
[DHEA-S]
NR: Male or female new born baby 4.4 to 9.2 µmol/L (1670 to 3600 ng/mL).
Male adult 5.3 to 9.0 µmol/L (2000 to 3400 ng/mL).
Female child 0.1 to 1.5 µmol/L (100 to 600 ng/mL).
Female adult 2.0 to 9.0 µmol/L (820 to 3380 ng/mL).
Female pregnant 1.0 to 3.0 µmol/L (230 to 1170 ng/mL).
Female postmenopausal 0.1 to 1.5 µmol/L (100 to 600 ng/mL).
Ind: Test of the function of the testes and ovaries.
Int: LOW - Failure of puberty, failure of the ovaries or testes.
HIGH - Ovarian or testicular tumours, polycystic ovary syndrome (Stein-Leventhal syndrome), adrenal tumour or over activity.
Phys: Dehydroepiandrosterone sulfate is a hormone from which testosterone and oestrogen are formed. Fasting blood specimen required.
Medical Tests Explained

Dengue Fever Antibodies
See Immunoglobulin Antibodies, Specific

Diazepam
(Valium)
NR: Therapeutic range 400 to 1500 µg/L (0.7 to 5.3 umol/L).
Ind: Treatment with diazepam when response is not what is expected.
Int: Doctors adjust the dosage to keep levels within therapeutic range.
Phys: The half-life (time it takes for half the dose to disappear from the blood) of diazepam is 2 to 8 hours. Sample is taken immediately before the next dose.

Digoxin
(Lanoxin)
NR: Therapeutic range 1 to 2.6 nmol/L (0.8 to 2 ng/mL)
    Toxic over 2.6 nmol/L (over 2 ng/mL).
Ind: Digoxin therapy for heart disease or irregular heart beat.
Int: Doctors adjust the dosage to keep levels within the therapeutic range.
Phys: Blood sample should be taken 8 hours after dose.

Dilantin
See Phenytoin Sodium

Direct Antiglobulin Test
See Coombs' Test

DNA Autoantibodies
NR: Less than 10 U/mL.
Ind: Systemic lupus erythematosus (SLE).
Int: VERY HIGH - SLE.
    HIGH - Rheumatoid arthritis, chronic active hepatitis, lupoid hepatitis.
Phys: Test performed on fasting blood sample.
    See also LE Cells,; Lupus Anticoagulant Antibody.

Dohle Bodies
NR: Absent from neutrophils (a type of white cell found in blood).
Int: PRESENT - Bacterial infection. Occasionally seen in viral infections, cancers, chemotherapy for cancer, death of tissue within the body (necrosis) and pregnancy.
Phys: Test is not routinely ordered, but positive finding is reported if found on blood film under a microscope.

See Disease Definitions section at back of book for explanation of unusual diseases.
Effective Thyroxine Ratio
[ETR]
NR: 0.93 to 1.06 (93 to 106%).
Ind: Thyroid gland disease.
Int: LOW - Hypothyroidism (under active thyroid gland).
       HIGH - Hyperthyroidism (over active thyroid gland).
See also Thyroxine, Free

Electrolytes
See Anion gap; Bicarbonate; Chloride; Magnesium; Potassium; Sodium.

ENA
See Extractable Nuclear Antigen Autoantibodies.

Endomysial Antibodies
NR: Absent.
Ind: Coeliac disease.
Int: PRESENT - Coeliac disease (inability to digest the protein gluten which is found in cereal grains such as wheat, rye, barley and oats, but not in rice or corn) and dermatitis herpetiformis.
Phys: 10% false positive, but more sensitive than gliaden antibodies.
See also Gliaden Antibodies

Enolase
See Neurone Specific Enolase

Eosinophils
NR: Adult : 0.05 to 0.4 x 10^9/L (50 to 400/mm³) (1 to 5%).
     Child : 0.1 to 1.4 x 10^9/L (100 to 1400/mm³).
     Newborn baby : Less than 2.0 x 10^9/L (less than 2000/mm³).
Ind: Determining nature and course of infection or inflammation.
Int: VERY HIGH - Cancer, eosinophilic leukaemia, hydatid disease (parasite of liver).
     HIGH - Allergy, hay fever, asthma, eczema, infectious mononucleosis (glandular fever), psoriasis, scabies, polyarteritis nodosa, Hodgkin's disease, intestinal or liver worms, serum sickness, rheumatoid arthritis, dermatitis herpetiformis, polyarteritis nodosa, irradiation, pemphigoid, pemphigus, Churg-Strauss syndrome, Job-Buckley syndrome, Loeffler syndrome and drugs (eg. penicillin, aspirin, sulphonamides, gold, carbamazepine, iodides).
     LOW - Severe bacterial infections, hydrocortisone treatment.
Phys: Result is part of normal full blood count.

See Disease Definitions section at back of book for explanation of unusual diseases.
Epilim
See Sodium Valproate.

Epstein-Barr Virus
See Infectious Mononucleosis.

Erythrocyte Count
(Red Blood Cell Count) [RBC] [RCC]
NR: Male 4.5 to 6.5 x 10^{12}/L.
    Female 3.9 to 5.6 x 10^{12}/L.
Ind: Blood disorders.
Int: Abnormal number
    HIGH - Polycythemia rubra vera, thalassaemia trait, kidney disease (eg. tumours, cysts, transplant), dehydration, lack of oxygen (hypoxia), high altitudes, congenital heart disease, some lung diseases, liver cancer (hepatoma), Cushing syndrome, Gaisböck syndrome, smoking, treatment with diuretics (fluid tablets) and sometimes high levels occur for no apparent reason (idiopathic).
    LOW - Haemolytic anaemia, cancer, any persistent disabling disease, aplastic anaemia, dilution by fluids from a drip into a vein and pregnancy.
Abnormal forms (shape or structure of red blood cell is not normal).
    Spherocytes - Hereditary, immune haemolytic anaemia, severe burns, Clostridium welchii septicaemia.
    Elliptocytes - Hereditary, iron deficiency anaemia.
    Sickle cells - Sickle cell disease.
    Spur cells - Severe liver disease.
    Target cells - Liver disease.
    Burr cells - Kidney disease.
    Fragmented red blood cells - Disseminated intravascular coagulation, kidney disease, Bassen-Kornzweig syndrome.
Phys: Red blood cells carry haemoglobin and thus oxygen through the blood and give it its red colour. Reticulocytes are the immature form.
See also Haemoglobin; Mean Corpuscular Volume; Reticulocytes.

Erythrocyte Sedimentation Rate
[ESR]
NR: Child 0 to 20 mm/hour.
    Male 0 to 10 mm/hour.
    Female 0 to 20 mm/hour.
    Elderly male 0 to 20 mm/hour.
    Elderly female 5 to 45 mm/hour.
Ind: May indicate hidden infection, inflammation or cancer.
Int: VERY HIGH - Collagen diseases (eg. myeloma, polymyositis), Mycoplasma infection, leukaemia, myelomatosis, heart attack (myocardial infarct).
     HIGH - Pregnancy, bacterial and viral infections, localised acute collections of pus (abscess), some cancers, TB (tuberculosis), Hodgkin's disease, SLE (systemic lupus.
See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

eythematous), polymyalgia rheumatica, temporal arteritis, subacute bacterial endocarditis (heart infection), anaemia, hyperfibrinogenaemia, excess bilirubin in blood (hyperbilirubinaemia), inflammation or infection of the thyroid gland (thyroiditis), rheumatoid or reactive arthritis, Reiter disease, Sjögren syndrome, vasculitis, dermatomyositis, rheumatic fever, Crohn disease, sarcoidosis, amyloidosis, late stage of kidney failure, drugs (eg. oral contraceptives, hydralazine, procainamide), obesity, smoking, and sometimes no cause can be found despite intensive investigation.

FALSE LOW - Polycythaemia, sickle cells, hypochromic microcytic anaemia, congenital heart disease, technical errors, drugs (eg. arthritis medication, aspirin, corticosteroids, clofibrate).

Phys: One of the most commonly used general screening tests for disease. Measures the rate at which red blood cells settle to the bottom of a narrow glass tube.

See also C-Reactive Protein; Spherocytes.

Erythropoietin

NR: 3 to 16 mIU/L.
Ind: Abnormalities in red blood cells (erythrocytes).
Int: LOW - Polycythaemia rubra vera, chronic kidney failure.
HIGH - Most anaemias, secondary erythrocytosis.

ESR
See Erythrocyte Sedimentation Rate.

Ethanol
See Alcohol

Ethosuximide
(Zarontin)

NR: Therapeutic range 280 to 700 µmol/L (40 to 100 µg/mL).
Ind: Treatment with ethosuximide.
Int: Doctors adjust dosage to keep blood levels within therapeutic range.
Phys: Ethosuximide is used to treat epilepsy. Sample should be taken just before next dose.

ETR
See Effective Thyroxine Ratio.

Extractable Nuclear Antigen Autoantibodies
[ENA]

NR: Titre less than 10.
Ind: Connective tissue disease.
Int: PRESENT - Raynaud's phenomenon, SLE (systemic lupus erythematosus), scleroderma, Sjögren syndrome, rheumatoid arthritis, other connective tissue diseases.
Phys: Several subtypes of ENA are specific to different connective tissue diseases.

See also DNA antibodies.
Factor 1
See Fibrinogen.

Factor V Leiden Mutation
See Activated Protein C Resistance.

Factor VIII
NR: Very wide variation in normal levels.
Ind: Haemophilia, von Willebrand disease (inherited diseases in which blood does not clot as rapidly as normal leading to excessive bleeding and bruising).
Int: Diagnosis of haemophilia and von Willebrand disease, and detecting those who carry the genes for these conditions, may be determined with careful analysis. Levels also increase in pregnancy.
Phys: Factor VIII is one of several proteins in blood that are responsible for blood clotting.

FANA
See Antinuclear Autoantibodies, Fluorescent.

FBC
See Full Blood Count.

FDP
See Fibrin Degradation Products.

Fe
See Iron.

Ferritin
NR: Male 20 to 320 µg/L.
    Female 15 to 300 µg/L.
    Neonate 50 to 350 µg/L.
Ind: A lack, or excess, of iron in the body.
Int: LOW - Lack of iron in diet, anaemia, chronic disease (e.g., rheumatoid arthritis, kidney failure), kidney dialysis for kidney failure.
    HIGH - Haemochromatosis (excess iron absorption), infection, over transfusion with blood, leukaemia, chronic inflammation, diseases that destroy red blood cells (haemolysis), autoimmune diseases, iron

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

overload (excess iron supplements).
VERY HIGH - Hodgkin's disease (cancer of lymph nodes), acute and chronic liver disease, cancers.
Phys: Sensitive measure of total body iron. Results usually lower in women. Normal result does not exclude iron deficiency.
See also Iron

Fetal Haemoglobin
See Haemoglobin F.

Fibrin Degradation Products
[FDP]
NR: 0 to 10 µg/mL.
Ind: Bleeding disorders.
Int: VERY HIGH - Disseminated intravascular coagulation (widespread blood clots forming within blood vessels), abruptio placentae (separation of the placenta from the wall of the uterus during pregnancy).
HIGH - Blood clot in vein (thrombophlebitis), liver disease, severe bacterial infections, cancers, hyperfibrinolytic syndrome, haemolytic-uraemic syndrome, blood clot in lungs (pulmonary embolism), pre-eclampsia (complication of pregnancy), death of foetus before birth, snake bite, extreme physical stress.
Phys: Measures substances released by the breakdown of blood clots.
See also D-Dimer, Blood

Fibrin Derivatives
See D-Dimer.

Fibrinogen
(Factor 1)
NR: 2 to 6 g/L.
Ind: Blood clotting abnormalities.
Int: LOW - Defibrination syndrome (loss of main blood clot forming protein), Waterhouse-Friderichsen syndrome, endotoxic shock (caused by poisons released by bacteria), abruptio placentae (separation of the placenta from the uterus during pregnancy), death of the baby before birth (intrauterine foetal death), amniotic fluid embolism, disseminated intravascular coagulation (widespread blood clotting within blood vessels).
HIGH - Nephrotic syndrome (serious kidney disease), Hodgkin's disease (cancer of lymph nodes), pemphigus (blistering skin disease), blood clot in lungs (pulmonary embolism), pregnancy.
Phys: Fibrinogen is involved in the first stage of the blood clotting cycle.
See also tests listed under Coagulation Tests

Fluorescent Antinuclear Antibodies
See Antinuclear Autoantibodies, Fluorescent.

See Disease Definitions section at back of book for explanation of unusual diseases.
**Fluorescent Treponemal Antibodies**

[FTA]

NR: Negative.

Ind: Sexually transmitted disease.

Int: POSITIVE - Syphilis (a serious venereal disease), yaws (a rare skin disease of poor hygiene).

Phys: Antibodies specific for the bacteria *Treponema pallidum* which is responsible for syphilis, can be detected in blood. Antibodies form in blood after infection with *T. pallidum*, and remain for many years. Thus the test may remain positive for years after successful treatment.

*See also Rapid plasma Reagin Test; Treponema Pallidum Haemagglutination*

**Foetal Haemoglobin**

See Haemoglobin F.

**Folate**

NR: 3.6 to 20 µg/L (7 to 40 nmol/L).

Ind: Anaemia.

Int: LOW - Elderly, infancy, poor diet, pregnancy and breast feeding, alcoholism, scurvy (lack of vitamin C), kwashiorkor (protein starvation), tropical sprue, coeliac disease, malabsorption syndromes, Crohn's disease, partial removal of stomach, heart failure, blood infection (septicaemia), Whipple's disease, scleroderma, chronic haemolytic anaemias, cancers, multiple myeloma, leukaemia, myelofibrosis, TB, psoriasis, haemodialysis for kidney failure, active liver disease, malaria, premature baby, drugs (eg. barbiturates, oral contraceptive, trimethoprim, tetracyclines, nitrofurantoin, primidone, methotrexate)

FALSE LOW - Severe vitamin B₁₂ deficiency.

FALSE NORMAL - Blood transfusion.

Phys: Blood folate reflects folate absorption from diet in past week only.

*See also Folate, Red Blood Cells*

**Folate, Red Blood Cells**

NR: 225 to 800 µg/L.

Ind: Anaemia.

Int: LOW - Elderly, infancy, poor diet, pregnancy and breast feeding, alcoholism, scurvy (lack of vitamin C), kwashiorkor (protein starvation), tropical sprue, coeliac disease, malabsorption syndromes, Crohn's disease, partial removal of stomach, heart failure, blood infection (septicaemia), Whipple's disease, scleroderma, chronic haemolytic anaemias, cancers, multiple myeloma, leukaemia, myelofibrosis, TB, psoriasis, haemodialysis for kidney failure, active liver disease, malaria, premature baby, drugs (eg. barbiturates, oral contraceptive, trimethoprim, tetracyclines, nitrofurantoin, primidone, methotrexate).

FALSE LOW - Severe vitamin B₁₂ deficiency.

FALSE NORMAL - Blood transfusion.

Phys: Indication of total body folate levels. This test is less affected by diet than blood folate levels. Folate is stored mainly in the liver.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Medical Tests Explained

See also Folate

**Folic Acid**

NR: 9.1 to 57 nmol/L (4 to 25 ng/mL).
Ind: Anaemia.
Int: LOW - Long term alcoholism, oral contraceptive use, anticonvulsant medications, malnutrition, sprue (poor food absorption), sickle cell anaemia, cytotoxic drugs (used to treat cancer), pregnancy, other food malabsorption syndromes.
Phys: Essential for the function of the nucleus in cells. Low levels cause megaloblastic anaemia.

See also Folic Acid, Red Blood Cells

**Folic Acid, Red Blood Cell Concentration**

NR: Greater than 318 nmol/L (greater than 140 ng/mL).
Ind: Anaemia.
Int: LOW - Long term alcoholism, oral contraceptive use, anticonvulsant medications, malnutrition, sprue (poor food absorption), sickle cell anaemia, cytotoxic drugs (used to treat cancer), pregnancy, other food malabsorption syndromes.
Phys: Folic acid is an essential substance for body function. The amount in red blood cells is measured in this test, which gives a longer term picture than the normal folic acid level in blood which may be affected by recent changes in diet.

See also Folic Acid

**Follicle Stimulating Hormone**

[FSH]

NR: Prepubertal 0 to 3 IU/L.
     Adult female 1 to 9 IU/L.
     Female at ovulation 10 to 30 IU/L.
     Postmenopausal 40 to 200 IU/L.
     Adult male 1 to 5 IU/L.
Ind: Infertility.
Int: LOW - Infertile (both sexes), Stein-Leventhal syndrome.
     VERY HIGH - Disease or failure of testes or ovaries. Levels normally rise at mid-cycle in ovulating women.
Phys: FSH is a hormone produced by the pituitary gland under the brain, that acts with LH to stimulate the production of eggs in women and sperm in men.

See also Luteinising Hormone

**Free Thyroxine Index**

[FTI]

NR: 17 to 50.
Ind: Thyroid problems.
Int: HIGH - Hyperthyroidism (over active thyroid gland).
     LOW - Hypothyroidism (under active thyroid gland).
Phys: Index is calculated from a formula that uses the results of other thyroid tests.
See also T4

See Disease Definitions section at back of book for explanation of unusual diseases.
Fructosamine
NR: Adult 200 to 290 µmol/L.
     Child 200 to 260 µmol/L.
     Pregnant 200 to 250 µmol/L.
Ind: Control of diabetes.
Int: HIGH - Poorly controlled diabetes mellitus.
Phys: Randomly timed specimens can give a good indication of control of diabetes, without
      reference to blood glucose levels or dietary intake. Measure of diabetes control over
      preceding 10-15 days.
See also Glycosylated Haemoglobin

FSH
See Follicle Stimulating Hormone.

FTA
See Fluorescent Treponemal Antibodies.

FTe
See Testosterone, Free.

FTI
See Free Thyroxine Index.

Full Blood Count
This includes the following investigations: Haemoglobin; White Cell Count; Mean Corpuscular
Volume; Mean Corpuscular Haemoglobin; Mean Corpuscular Haemoglobin
Concentration; Haematocrit.

G

G-6-PD
See Glucose 6-Phosphate Dehydrogenase.

GAD
See Glutamic Acid Decarboxylase Antibodies.

Galactokinase, Red Blood Cells
NR: 8 to 40 mU/g Hb.
Ind: Juvenile onset cataract (clouded lens in eye), galactosaemia (inherited blood sugar
      disorder).
Int: LOW - Genetic deficiency, increased risk of cataract.
Phys: Inherited condition.
See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

See also Galactose

Galactose
NR: Less than 1.0 mmol/L.
Ind: Galactosaemia.
Int: HIGH - Galactosaemia (an inherited disturbance of the breakdown of the sugar galactose in milk to cause vomiting, failure to thrive, liver disease and eye cataracts), galactose-1-phosphate deficiency (inherited lack of a liver enzyme).
See also Galactokinase, Red Blood Cells; Galactose-1-Phosphate, Red Blood Cells

Galactose-1-Phosphate, Red Blood Cells
NR: Less than 170 nmol/g Hb.
Ind: Galactosaemia.
Int: VERY HIGH (greater than 500 nmol/g Hb) - Galactosaemia (an inherited disturbance of the breakdown of the sugar galactose in milk to cause vomiting, failure to thrive, liver disease and eye cataracts).
HIGH - Galactosaemia on galactose free diet.

Phys: Used to both diagnose and monitor severity of galactosaemia.
See also Galactokinase, Red Blood Cells; Galactose

Gamma Glutamyl Transferase
[Gamma GT or GGT]
(Serum Gamma Glutamyl Transpeptidase) [SGGT]
NR: Male - less than 45 U/L.
Female - less than 30 U/L.
Ind: Liver disease.
Int: Results are interpreted by comparison with other liver function tests, the Alanine Amino Transferase (ALT), Alkaline Phosphatase (ALP) and Aspartate Amino Transferase (AST).
GGT greater than 100, ALT & ALP NORMAL - Alcoholism, obesity, diabetes mellitus, hypertriglyceridaemia (high triglyceride level in blood), obesity, idiopathic (no specific reason), drugs (eg. warfarin, tricyclic antidepressants, phenytoin, barbiturates, paracetamol overdose).
GGT greater than 100, ALP HIGH, ALT NORMAL - Obstruction to bile leaving the liver, alcohol toxicity, drug toxicity, cirrhosis (liver failure), liver cancer or liver abscess.
GGT greater than 100, ALT HIGH, ALP NORMAL - Hepatitis (all forms), glandular fever, fatty liver, alcohol toxicity, drug toxicity.
GGT greater than 100, ALT & ALP HIGH - Acute hepatitis, chronic active hepatitis, cirrhosis (liver failure), liver cancer, liver abscess, alcohol toxicity, drug toxicity.
GGT greater than 100, AST HIGH, ALP and ALT NORMAL - Alcoholic liver disease.
GGT 40 to 100 - Pancreatitis, heart attack, fatty liver, obesity, anorexia nervosa, porphyria (kidney disease), some other kidney diseases, kidney cancer, idiopathic (no specific reason found).

Phys: GGT is an enzyme in the liver and kidney that is released into the blood with damage to these organs.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

See also Alanine Amino Transferase, Alkaline Phosphatase, Aspartate Amino Transferase, Liver Function Tests

Gastric Cell Autoantibodies
See Parietal Cell Autoantibodies.

Gastrin
NR: Less than 50 pmol/L (less than 90 ng/L).
Ind: Peptic ulcer.
Int: HIGH - Stomach outlet obstruction, kidney failure, short bowel syndrome, overdevelopment of the top part of the stomach (antral hyperplasia) and stomach ulceration, pernicious anaemia, atrophic gastritis (wasting of the stomach wall), stomach cancer, postvagotomy (operation to cut nerves to stomach to treat peptic ulcer), phaeochromocytoma (rare tumour of the adrenal glands).
VERY HIGH (over 250 pmol/L) - Zollinger-Ellison syndrome (acid producing tumour).
Phys: Gastrin is an enzyme that triggers stomach acid production.

Gentamicin
See Aminoglycosides.

GFR
See Glomerular Filtration Rate.

GGT
See Gamma Glutamyl Transferase.

GHb
See Glycosylated Haemoglobin.

Glandular Fever
See Infectious Mononucleosis.

Gliaden Antibodies
(Anti-Gliaden Antibodies)
NR: Less than 25.
Ind: Coeliac disease, diet compliance.
Int: HIGH - Coeliac disease (inability to digest the protein gluten which is found in cereals such as wheat, rye, barley and oats, but not in rice or corn. Eating any foods containing gluten will cause diarrhoea, belly discomfort, weight loss, excess wind and bloating), 2% false positive rate (test is positive but patient does not have coeliac disease).
Phys: Gliaden antibodies return to normal when a strict gluten free diet followed.
See also Endomysial Antibodies

Globulin
NR: Total globulin 20 to 35 g/L (24 to 60% of blood protein).

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Alpha**
- Alpha 1 globulin 2 to 4 g/L (3 to 7%)
- Alpha 2 globulin 4 to 8 g/L (5 to 11%)
- Beta globulin 6 to 10 g/L (9 to 18%)
- Gamma globulin 6 to 15 g/L (9 to 23%)

**Ind:** Liver disease.  
**Int:** TOTAL LOW - Malnutrition, lymphatic leukaemia, immune system deficiency.  
- Alpha 1 LOW - Nephrotic syndrome (form of kidney failure).  
- Alpha 2 LOW - Nephrotic syndrome, multiple myeloma (cancer of the cells in the bone marrow of the elderly), lymphosarcoma (cancer of lymphatic tissue), leukaemia, Bruton syndrome (deficiency of the immune system in which inadequate amounts of immunoglobulin are produced), steroid drug treatment.  
- Gamma LOW - Nephrotic syndrome, multiple myeloma (cancer of the cells in the bone marrow of the elderly), lymphosarcoma (cancer of lymphatic tissue), leukaemia, Bruton syndrome (deficiency of the immune system in which inadequate amounts of immunoglobulin are produced), steroid drug treatment.  
- TOTAL HIGH - Cirrhosis (liver disease), long lasting hepatitis, hepatoma (liver cancer), malaria, SLE (systemic lupus erythematosus), bile duct obstruction, typhus, multiple myeloma, AIDS or the elderly.  
- Alpha 1 HIGH - Oestrogen hormone treatment, pregnancy.  
- Alpha 2 HIGH - Severe infections, heart attack (myocardial infarct), significant muscle injury, nephrotic syndrome, Wilms’ tumour (kidney cancer).  
- Beta HIGH - High blood cholesterol, cirrhosis, nephrotic syndrome, pregnancy, hypothyroidism (underactive thyroid gland).  
- Gamma HIGH - Infection, Sjögren syndrome, other connective tissue diseases, cirrhosis, myeloma, SLE (systemic lupus erythematosus).

**Phys:** A clotted specimen of blood is required. Globulin is a type of protein. An electric current is used to separate the various protein types. Immune globulins are used to fight infection and cancer.

**Glomerular Basement Membrane Autoantibodies**

**NR:** Absent.

**Ind:** Goodpasture syndrome.

**Int:** PRESENT - Goodpasture syndrome (a defect in the body’s immune system, that results in shortness of breath, persistent coughing up of blood, anaemia, lung and kidney damage).

**Glomerular Filtration Rate**  
**[GFR]**

**NR:** Male, 20 years 117 to 170.  
- Male, 50 years 96 to 138.  
- Male, 70 years 70 to 110.  
- Female, 20 years 104 to 158.  
- Female, 50 years 90 to 130.  
- Female, 70 years 70 to 114.  
- Pregnancy - Add 20%.  
- Units: mL/minute/1.73 m²

**Ind:** Kidney disease.

**Int:** LOW - Kidney failure.

**Phys:** Measures the rate at which the kidneys filter blood.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Glucagon
NR: 25 to 250µg/L.
Ind: Abnormal presentations of diabetes.
Int: HIGH - Glucagonoma tumour of the pancreas, diabetes mellitus, some acute illnesses.
Phys: Not a diagnostic test for glucagonoma unless clinical signs are present. Overnight fast necessary before test.

Glucose
NR: 3.5 to 6 mmol/L (60 to 100 mg/100 mL).
Ind: Suspected diabetes.
Int: HIGH - Diabetes mellitus (over 7.0 fasting diagnostic), infection, hyperthyroidism (over active thyroid gland), hyperpituitarism (over active pituitary gland in the brain), hyperadrenocorticism (over active adrenal glands on the kidneys), liver disease, acromegaly, phaeochromocytoma (tumour of adrenal glands), Leschke syndrome, Prader-Willi syndrome, Reaven syndrome, Turner syndrome, low blood potassium (hypokalaemia), burns, steroid treatment, recent meal.
LOW - Vomiting, diarrhoea, insulinoma (tumour of pancreas), excess insulin production, hypoadrenocorticism (adrenal gland underactivity), hypopituitarism (under active pituitary gland in the brain), Addison disease, hypothyroidism (under active thyroid gland), severe liver disease, hepatoma (liver cancer), alcoholism, after stomach surgery, von Gierke syndrome, Hers syndrome, Reye syndrome, unpreserved blood specimen, drugs (eg. insulin, laxatives, diabetes drugs, fluid tablets - diuretics).
Phys: Fasting for 8 hours or more before test necessary. Glucose in adequate levels is essential for normal body functions. Its level is controlled by the insulin released by the Islets of Langerhan in the pancreas.
See also Glucose Tolerance Test; Glycosylated Haemoglobin

Glucose-6-Phosphate Dehydrogenase
[G-6-PD]
NR: 6.0 to 11.0 U/gHb.
Ind: Anaemia.
Int: LOW - Normal in some Mediterranean Caucasians and some Asians, hereditary defect, drug induced haemolytic anaemia, drugs (eg. aspirin, primaquine, dapsone, nitrofurantoin).
Phys: A lack of G-6-PD or its inactivation by drugs leads to anaemia. The enzyme may be lacking genetically.

Glucose Tolerance Test
[GTT]
NR: 75 g of glucose is given by mouth as a sweet drink. Blood tests are then performed every half hour. The blood sugar level should not exceed 8 mmol/L (140 mg/100 mL) after 30 minutes, and should return to normal within 2 hours. No sugar should appear in the urine.
Ind: Suspected diabetes.
Int: VERY HIGH (greater than 11 mmol/L) - Diabetes mellitus.
See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

HIGH (8-11 mmol/L) - Potential diabetes (impaired glucose tolerance), pregnancy (additional obstetric care required), chromium deficiency.

Phys: Diabetic (and potential diabetic) patients do not produce adequate insulin to clear glucose from blood rapidly. Test may be affected by drugs such as fluid tablets (diuretics), steroids, lithium, phenytoin and phenothiazines.

See also Glucose

Glutamic Acid Decarboxylase Antibodies
[GAD]
NR: Less than 0.9 U/mL.
Ind: Differentiating types of diabetes.
Int: HIGH - Type one diabetes mellitus, potential to develop type one diabetes mellitus, autoimmune thyroid disease.

Phys: Present in 70% of type one diabetics, and frequently in first degree relatives of patients, and others at risk of developing the disease. More commonly raised in early stages of disease.

Glutamic Oxaloacetic Transaminase
See Aspartate Amino Transferase.

Glutamic Pyruvic Transaminase
See Alanine Amino Transferase.

Glutamine
NR: 450 to 750 µmol/L.
Ind: Hyperammonaemia.
Int: HIGH - Genetic hyperammonaemia (inherited tendency to excess ammonia in the blood).

Glycosylated Haemoglobin
[GHb or HbA1c]
NR: 5 to 8% of Hb as HbA1c.
Ind: Management of diabetes.
Int: HIGH - Above average normal glucose level (ie. diabetes, poorly controlled diabetic, non-compliance with treatment).
FALSE HIGH - Uraemia (kidney failure), beta thalassaemia (inherited blood disease). FALSE LOW - Haemolytic anaemia (breakdown of red blood cells), blood loss.

Phys: Glucose reacts with and attaches to haemoglobin in red blood cells. This test is an measure of compliance and efficacy of treatment as life cycle of a red blood cell is about 3 months. The test should not be used in under this time for change of therapy . Inaccurate in conditions of shortened red blood cell life span (eg. haemolytic disease, blood loss).

See also Glucose

See Disease Definitions section at back of book for explanation of unusual diseases.
Growth Hormone
NR: Adult - less than 0.3 pg/mL.
     Child - more than 1 pg/mL.
Ind: Growth abnormalities.
Int: LOW - Dwarfism.
     HIGH - Gigantism, acromegaly (causes excessive growth of the hands, feet, jaw, face, tongue and internal organs. Patients also suffer from headaches, sweating, weakness, lack of menstrual periods and loss of vision. It is caused by excess production of growth hormone in the pituitary gland because of a tumour in the gland), stress.
Phys: Growth hormone stimulates growth of nearly all the tissue in the body. It is produced by the pituitary gland in the brain. A fasting blood specimen is required.

GTT
See Glucose Tolerance Test.

H

Haematocrit
See Packed Cell Volume.

Haemoglobin
[Hb]
NR: Male 135 to 80 g/L (13.5 to 18 g/dL).
     Female 115 to 165 g/L (11.5 to 16.5 g/dL).
     Neonate 170 to 220 g/L (17 to 22 g/dL).
     Infant 110 to 125 g/L (11 to 12.5 g/dL).
     Child 120 to 140 g/L (12 to 14 g/dL).
     Pregnancy 110 to 150 g/L (11 to 15 g/dL).
Ind: Anaemia.
Int: LOW - Recent or long term blood loss, deficient red blood cell production (due to a lack of iron, copper, cobalt, vitamin B₁₂ or folic acid), bone marrow failure (aplastic or sideroblastic anaemia, myelofibrosis), excess red blood cell destruction by spleen, thalassaemia, sickle cell anaemia, chronic disease (eg. cancer, arthritis), kidney disease, liver disease, coeliac disease (abnormal food absorption from gut), many types of cancer, rheumatoid arthritis, under active thyroid gland (hypothyroidism), autoimmune diseases, pregnancy, elite athletes.
     HIGH - Haemochromatosis (excess iron in body), polycythaemia rubra vera, smoking, diuretics (fluid tablets).
     FALSE HIGH - Excess fat and protein in blood (hyperlipoproteinaemia), liver failure, very high white cell count in blood.

See Disease Definitions section at back of book for explanation of unusual diseases.
**Medical Tests Explained**

**Phys:** The haemoglobin in red blood cells is essential for the transport of oxygen to the tissues.

*See also Iron; Mean Corpuscular Haemoglobin; Mean Corpuscular Haemoglobin Concentration; Mean Corpuscular Volume; Copper; Cyanocobalamin*

**Haemoglobin, Glycosylated**

See Glycosylated Haemoglobin.

**Haemoglobin A₂**

\[ \text{[HbA₂]} \]

- **NR:** 1.5 to 4% of total haemoglobin.
- **Ind:** Suspect thalassaemia.
- **Int:** HIGH - Thalassaemia (an inherited condition that causes the red blood cells to be fragile and break down very rapidly).

*See also Haemoglobin H*

**Haemoglobin F**

\[ \text{[HbF]} \]

*(Foetal Haemoglobin)(Kleihauer Test)*

- **NR:** At birth 10.5 to 14 mmol/L (17 to 22.5 g/100 mL).
  - Adult - Less than 1% of total Hb (negative Kleihauer test).
- **Ind:** Anaemia and blood abnormalities.
- **Int:** HIGH - Bone marrow overactivity, bleeding from placenta into mother’s blood in pregnant woman.

**Phys:** Normally HbF is found in the foetus and during early childhood. Its formation may continue abnormally in infancy as a result of any type of anaemia that causes bone marrow overactivity.

**Haemoglobin H**

\[ \text{[HbH]} \]

- **NR:** Negative.
- **Ind:** Thalassaemia.
- **Int:** POSITIVE - Thalassaemia major or minor (Haemoglobin H disease) (an inherited condition that causes the red blood cells to be fragile and break down very rapidly).

**Phys:** HbH in affected patients may vary from 5 to 40% of total Hb. Care in preparing sample essential.

*See also Haemoglobin A₂*

**Haemoglobin S**

\[ \text{[HbS]} \]

- **NR:** Absent.
- **Ind:** Anaemia.
- **Int:** PRESENT - Sickle cell anaemia (abnormally shaped red blood cells found mainly in Negroes), some types of thalassaemia.

**Phys:** Sickle cell anaemia causes tiredness and weakness, but beneficially protects against malaria in tropical areas.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Ham Test
See Acidified Serum Test.

Haptoglobin
NR: 0.3 to 2.0 g/L.
Ind: Haemolysis (breakdown of red blood cells), inflammation.
Int: LOW - Severe haemolysis, megaloblastic anaemia, liver disease, inherited (congenital).
HIGH - Most severe inflammatory conditions, bile duct obstruction, pregnancy, use of steroids, oestrogen supplements.
FALSE NORMAL - Acute pancreatitis.
Phys: Haptoglobin is a protein that binds to haemoglobin in blood.

Hb
See Haemoglobin.

HbA₁c
See Glycosylated Haemoglobin.

HbF
See Haemoglobin F.

HbH
See Haemoglobin H.

HbS
See Haemoglobin S.

HCG
See Chorionic Gonadotrophin, Human.

HCO₃⁻
See Bicarbonate.

HDL
See High Density Lipoprotein Cholesterol.

Heaf Test
See Tuberculin Skin Test.

Heart Disease
See Aldolase; Aspartate Amino Transferase; Creatine (Phospho) Kinase; Lactate Dehydrogenase; Myoglobin; Troponin T.

See Disease Definitions section at back of book for explanation of unusual diseases.
Heavy Metals
See Arsenic; Cadmium; Copper; Lead; Manganese; Mercury.

Heinz Bodies
NR: Absent.
Ind: Anaemia.
Int: PRESENT - Breakdown of red blood cells (intravascular haemolysis), after removal of spleen, G-6-PD deficiency, abnormal haemoglobin (haemoglobinopathies), drug or chemical exposure.
Phys: Heinz bodies are created by oxidation of haemoglobin. They are seen under a microscope as inclusions in red blood cells.

Helicobacter pylori Antibodies
NR: Negative.
Ind: Peptic ulcer.
Int: POSITIVE - Presence of the ulcer causing bacteria *H. pylori* in stomach highly likely.
Phys: *H. pylori* is implicated in causing peptic ulcers and can be eradicated by appropriate treatment.
See also Carbon-14 Urea Breath Test; CLO Test

Hepatitis A, Antigens and Antibodies
NR: Nil
Ind: Hepatitis, jaundice.
Int: POSITIVE - Hepatitis A.
See also Immunoglobulin Antibodies, Specific

Hepatitis B, Antigens and Antibodies
NR: Nil
Ind: Suspected hepatitis B, persons engaged in an at risk lifestyle.
Int: POSITIVE - Hepatitis B infection.
Phys: Different types of antibody can determine whether the patient has active disease, is immune or is infectious.
See also Immunoglobulin Antibodies, Specific

Hepatitis C, Antigens and Antibodies
NR: Nil
Ind: Suspected hepatitis C.
Int: POSITIVE - Hepatitis C infection.
Phys: Different types of antibody can determine whether the patient has active disease, is immune or is infectious.
See also Immunoglobulin Antibodies, Specific
Hepatitis D, Antigens and Antibodies
NR: Nil
Ind: Suspected hepatitis D, persons with hepatitis B.
Int: POSITIVE - Hepatitis D infection.
Phys: Different types of antibody can determine whether the patient has active disease, is immune or is infectious. Hepatitis D can only be caught by those who already have hepatitis B.
See also Immunoglobulin Antibodies, Specific

Herpes Simplex Antibody
[HSV]
NR: Negative.
Ind: Genital herpes.
Int: POSITIVE IgG - Current or previous Herpes infection.
      POSITIVE IgM - Current Herpes infection.
Phys: *Herpes simplex* infection is responsible for the development of ulcers and sores on the affected skin, most commonly around the mouth and nose (cold sores), and the genitals. Separate antibody tests for type one and two *Herpes simplex* available.
See also Immunoglobulin Antibodies, Specific

Hexosamine
NR: 80 to 125 mg/100 mL.
Ind: Suspected tissue damage. Poor wound healing.
Int: HIGH - Presence of inflammatory reaction.
Phys: Rises to a peak 3 days after tissue injury, and returns to normal after 7-10 days. Hexosamine is essential for wound healing.

High Density Lipoprotein Cholesterol
[HDL]
NR: Male 0.9 to 2.0 mmol/L.
      Female 1.0 to 2.2 mmol/L.
Ind: Obesity, high total cholesterol.
Int: LOW - Increased risk of hardening of arteries (atherosclerosis), stroke and heart attack, pregnancy.
      HIGH - Lower risk of atherosclerosis.
Phys: HDL is the "good" cholesterol. The higher the ratio between the HDL and the total cholesterol, the better.
See also Apolipoproteins; Cholesterol; Low Density Lipoprotein Cholesterol

Histidyl-tRNA Synthetase Antibodies
See Jo-1 Antibodies.

Histocompatibility Antigen
See HLA-B27; HLA-DR2; HLA-DR3; HLA-DR4.
Histone Autoantibodies
NR: Absent.
Ind: SLE (systemic lupus erythematosus).
Int: PRESENT - SLE caused by exposure to drugs or chemicals.
See also LE Cells; Lupus Anticoagulant Antibody

HIV Antibody
(Human Immunodeficiency Virus Antibody)
NR: Negative.
Ind: High risk individuals; possible exposure to HIV.
Int: POSITIVE - AIDS, exposure to HIV.
Phys: May be positive in cases of AIDS when the patient has no symptoms. May take up to 3 months from contact to become positive.

HLA-B27
(Human Leucocyte Antigen Histocompatibility Antigen)
NR: Negative.
Ind: Rheumatic diseases.
Int: POSITIVE - Ankylosing spondylitis (stiffening of back joints), Reiter syndrome (causes conjunctivitis, inflammation of the urethra, arthritis and painful ulceration of the gums), juvenile chronic polyarthritis (arthritis of multiple joints in children), arthritis that follows infection, inflammatory bowel disease (eg. Crohn’s disease), acute anterior uveitis (eye disease), and 5% of normal people.
Phys: Large percentage of false negative results possible. Useful for matching donors in organ transplantations.

HLA-DR2
(Human Leucocyte Antigen Histocompatibility Antigen DR2)
NR: Negative
Ind: Sleep disorders.
Int: POSITIVE - Narcolepsy (99% of sufferers of this disorder which causes sleep at inappropriate times), 25% of normal population.

HLA-DR3
(Human Leucocyte Antigen Histocompatibility Antigen DR3)
NR: Negative
Ind: Autoimmune diseases.
Int: POSITIVE - SLE (systemic lupus erythematosus), Sjögren syndrome, Addison disease, chronic hepatitis, coeliac disease (some types of food poorly absorbed), myasthenia gravis (facial muscle weakness), Grave's disease (thyroid gland disease).
Phys: Expensive and performed in specialised laboratories only.
See also LE Cells; Lupus Anticoagulant Antibody

HLA-DR4
(Human Leucocyte Antigen Histocompatibility Antigen DR4)

See Disease Definitions section at back of book for explanation of unusual diseases.
**Medical Tests Explained**

NR: Negative.
Ind: Arthritis.
Int: POSITIVE - Rheumatoid arthritis.

**Homocysteine**
NR: 0.5 to 2.2 nmol/mL.
Ind: Bad family history of heart attack or stroke.
Int: HIGH - Homocysteinaemia, atherosclerosis (hardening of arteries), increased risk of heart attack or stroke.
Phys: Homocysteinaemia is an enzyme deficiency which causes inherited atherosclerosis.

**HSV Antibodies**
See *Herpes Simplex* Antibodies.

**Human Chorionic Gonadotrophin**
See Chorionic Gonadotrophin, Human, Beta.

**Human Leucocyte Antigen**
See HLA-B27; HLA-DR2; HLA-DR3; HLA-DR4.

**Human Placental Lactogen**
See Placental Lactogen, Human.

**Hydatid Antibodies**
NR: Absent.
Ind: Hydatid disease.
Int: PRESENT - Past or current hydatid infection of liver.
Phys: Test remains positive long term after infection.

**Hydrogen Ion**
See pH

**Hydroxybutyrate**
NR: Less than 1.2 mmol/L.
Ind: Blood chemistry disorders.
Int: HIGH - Ketosis (excess break down products of proteins), poorly controlled diabetes mellitus, starvation, alcoholism, hyperinsulinism (excess insulin production).
See also *Ketones*

**Hydroxyproline/Creatinine Ratio**
NR: Less than 0.02
Ind: Abnormal fractures, after menopause.
Int: HIGH - Paget’s disease of bone, hyperparathyroidism (over active parathyroid gland), osteomalacia (bone disease), hyperthyroidism (over active thyroid gland), osteoporosis after menopause, kidney failure, severe fracture.

See Disease Definitions section at back of book for explanation of unusual diseases.
Phys: Measure of bone breakdown rate and calcium loss. Calcium supplementation lowers ratio after menopause.

IA2
See Insulinoma Associated 2 Antibodies.

IBC
See Iron Binding Capacity, Total.

Ig
See Immunoglobulins.

IGF-1
(Somatomedin C)
NR: Under 5 years - 2 to 18 nmol/L.
   5 to 15 years - 5 to 60 nmol/L.
   15-25 years - 15 to 60 nmol/L.
   25 to 45 years - 10 to 50 nmol/L.
   Over 45 years - 5 to 30 nmol/L.
Ind: Acromegaly.
Int: HIGH - Acromegaly (causes excessive growth of the hands, feet, jaw, face, tongue and internal organs), gigantism.
     LOW - Laron dwarfism, protein malnutrition.
Phys: Results vary markedly with age.

Immunoglobulin Antibodies, Specific
NR: Negative.
Ind: Many bacterial, viral and fungal diseases. Examples include Barmah Forest virus, brucellosis, Chlamydia, cytomegalovirus (CMV), Dengue fever, Entamoeba histolytica, glandular fever (Epstein-Barr virus), hepatitis A, B & C, Herpes simplex, AIDS, hydatid disease, influenza, Legionnaire's disease, Leptospira, Lyme disease, measles, mumps, Mycoplasma pneumonia, Q fever, Ross Fiver fever, German measles, Salmonella, Shigella, Streptococci, syphilis, Toxoplasmosis and typhus.
Int: IgG & IgM ANTIBODY NEGATIVE - No exposure to disease or too early after exposure to be detected.
     IgG ANTIBODY POSITIVE, IgM ANTIBODY NEGATIVE - Past exposure to infection.
     IgG & IgM ANTIBODY POSITIVE - Current or recurrent infection.
     IgG ANTIBODY NEGATIVE, IgM ANTIBODY POSITIVE - Very early acute phase or false positive IgM.

See Disease Definitions section at back of book for explanation of unusual diseases.
Phys: IgG and IgM are the two main types of immunoglobulin. Specific Ig antibodies are developed after most infections. Test can be used to see if a patient has any of the above diseases, or has been exposed to them. Most infections create specific antibodies within 2 weeks of infecting an individual, but AIDS, syphilis, Q fever and Legionnaire's disease may take up to 3 months. To see if a person is immune to a disease, only IgG needs to be tested.

See also Immunoglobulins

Immunoglobulins
[Ig]

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<th>Adult</th>
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<th>5yrs</th>
<th>1yr</th>
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<td>0.5 to 2.4</td>
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<td>4.6 to 12</td>
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<td>Less than 100</td>
<td>Less than 200</td>
<td>Less than 60</td>
<td>Less than 15</td>
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</table>

Units for IgA, IgG, IgM are g/L
Units for IgE are IU/mL

Ind: Liver disease, protein abnormalities.

Int: ALL HIGH - Acute viral hepatitis.
IgA and IgG HIGH - Laennec's cirrhosis (liver disease).
IgG HIGH - Chronic acute hepatitis, viral infection, multiple myeloma, systemic lupus erythematosus (SLE), Lassa fever (rare African infection).
IgM HIGH - Primary biliary cirrhosis (blocked bile duct), viral infection, trypanosomiasis (infestation with a parasite), nephrotic syndrome (kidney failure), Waldenström's macroglobulinaemia (blood disorder).
IgA HIGH - Buerger's disease (damage to the small arteries in the feet and hands caused by smoking).
IgE HIGH - Asthma, allergies, atopic eczema (rash), allergic rhinitis (hay fever), allergic conjunctivitis (eye inflammation), aspergillosis (fungal infection), parasitic diseases, multiple myeloma, bullous pemphigoid (blistering skin), Job-Buckley syndrome.
IgA LOW - Gut disease, lung infections, drugs (eg. phenytoin, penicillamine).
IgM LOW - Septicaemia (serious blood infection).
IgG LOW - Nephrotic syndrome (kidney failure), hypogammaglobulinaemia (lack of some proteins in blood), infancy.
IgE LOW - Hypogammaglobulinaemia (lack of some proteins in blood).
ALL LOW - Bruton syndrome.

Phys: Immunoglobulins form antibodies as a reaction to many infections and diseases. They occur in many different forms including A, E, G and M. Significant number of false high and low results with IgE.

See also Bilirubin; Alanine Amino Transferase; Aspartate Amino Transferase; Radioallergosorbent Test

Infectious Mononucleosis Screen
(Epstein-Barr Virus; Glandular Fever)

NR: Negative.

Ind: Suspect infectious mononucleosis (glandular fever).

Int: POSITIVE - Infectious mononucleosis.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Phys: Specific antibody test to confirm the diagnosis. Takes up to ten days from symptoms appearing for test to become positive.  
See also Paul Bunnell Test; Immunoglobulin Antibodies, Specific

Influenza Antibodies  
See Immunoglobulin Antibodies, Specific.

INR  
See International Normalised Ratio - Prothrombin.

Insulin  
NR: Less than 19 mIU/L (less than 0.9 µg/L) fasting.  
50 to 130 mIU/L 1 hour after 75 g glucose.  
Less than 100 mIU/L 2 hours after 75 g glucose.  
Ind: Diabetes mellitus, insulinoma (insulin producing tumour).  
Int: LOW after glucose - Diabetes due to lack of insulin (type one diabetes), malnutrition.  
HIGH - Diabetes due to lack of tissue response to insulin (type two diabetes), insulinoma, Reaven syndrome, pregnancy.  
Phys: Insulin is a hormone produced in the pancreas that is essential for the movement of glucose from blood and into cells. Blood specimen is collected after 15 hour fast and during a Glucose Tolerance Test.  
See also Glucose; Glucose Tolerance Test

Insulinoma Associated 2 Antibodies  
[IA2]  
NR: Less than 0.75 U/mL.  
Ind: Diabetes.  
Int: HIGH - Type one diabetes mellitus, potential to develop type one diabetes mellitus.  
Phys: Present in up to 60% of type one diabetics, and frequently in first degree relatives of patients and others at risk of developing the disease.

Intercellular Cement Substance Autoantibodies  
(Pemphigus Autoantibodies)  
NR: Absent  
Ind: Blistering rash.  
Int: PRESENT - Pemphigus (blistering skin disease), extensive burns, skin drug reactions.  
Phys: Regular measurement can be used to follow disease activity.

International Normalised Ratio - Prothrombin  
[INR]  
NR: 0.9 to 1.1  
Ind: Control of warfarin treatment.  
Int: Doctors modify dose of warfarin to maintain ratio within desired range for best treatment.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

1.5 to 2.5 - Transient ischaemic attacks (TIA - temporary stroke), stroke, atrial fibrillation (rapid beating of upper chambers of heart).
2.0 to 3.0 - Deep venous thromboses (DVT - clot in leg vein), pulmonary embolism (clot in lung), heart valve disease, transplanted animal heart valves, cardiomyopathy (heart failure), heart attack (myocardial infarct), after major surgery (eg. after hip replacement).
2.5 to 3.5 - Mechanical heart valves.

Phys: Measures ratio between normal rate of blood clotting and the actual rate. A person with an INR of 2 takes twice as long to clot blood as a person with an INR of 1.

Intrinsic Factor Autoantibodies

NR: Absent.
Ind: Anaemia.
Int: PRESENT - Pernicious anaemia (anaemia due to a lack of vitamin B₁₂).

Phys: Intrinsic factor is necessary for vitamin B₁₂ to be absorbed from the stomach. Negative result does not exclude diagnosis of pernicious anaemia.

See also Cyanocobalamin

Iron

[Fe]
NR: Male 12 to 35 µmol/L.
    Female 10 to 28 µmol/L.
Ind: Anaemia.
Int: LOW - Iron deficiency anaemia, lack of iron in diet, chronic inflammation, malabsorption of iron from gut, persistent bleeding, infections, Hodgkin's disease, cancer, elderly, bleeding peptic ulcer, bleeding piles, bowel cancer, coeliac disease, heavy periods, gastrectomy (stomach surgery), pregnancy, scurvy (lack of vitamin C), serious injury, elite athletes.
HIGH - Other anaemias, intestinal bleeding, liver damage, haemochromatosis (inherited iron storage disease), haemosiderosis, beta-thalassaemia, alcoholism, iron treatment.

Phys: Iron is essential for the formation of haemoglobin. Iron is actively absorbed in the duodenum (first part of small intestine). Collect specimen in morning to avoid false low reading.

See also Ferritin; Haemoglobin; Iron Binding Capacity, Total

Iron Binding Capacity, Total

[IBC, TIBC]
NR: Male 45 to 70 µmol/L (250 to 380 µg/100 mL).
    Female 44 to 74 µmol/L (245 to 400 µg/100 mL).
Ind: Anaemia.
Int: HIGH - Late pregnancy, iron deficiency anaemia.
    LOW - Chronic infection, rheumatoid arthritis, cancer, liver cirrhosis, nephrotic syndrome (kidney failure), haemochromatosis (iron storage disease).

Phys: Measures the amount of iron that may potentially be stored in the body.
See also Transferrin

See Disease Definitions section at back of book for explanation of unusual diseases.
Islet Cell Autoantibodies
NR:  Absent.
Ind:  Diabetes mellitus.
Int:  PRESENT - Type I (insulin dependent) diabetes mellitus, close relatives of diabetic patients, other autoimmune diseases (false positive).
Phys:  Levels decrease slowly after initial onset of disease. May predict potential to develop diabetes mellitus.

Isoenzymes
See Lactate Dehydrogenase Isoenzymes; Creatine Kinase Isoenzymes.

J

Jo-1 Antibodies
(Histidyl-tRNA Synthetase Antibodies)
NR:  Negative.
Ind:  Polymyositis.
Int:  POSITIVE - Polymyositis (muscle destruction disease) with lung disease and thrombocytopenia (lack of platelets in blood which aid clotting).
Phys:  Defines a specific type of polymyositis.

K

K
See Potassium

Ketones
NR:  0.02 to 0.5 mmol/L (0.1 to 3 mg/100 mL).
Ind:  Diabetes mellitus.
Int:  HIGH - Diabetic ketoacidosis (severe form of diabetes), urinary tract infection, starvation, vomiting, dehydration, general anaesthesia, strenuous exercise, cold exposure.
Phys:  Ketones are waste products formed in the liver and are normally completely destroyed and removed from the body. Altered sugar metabolism causes accumulation of ketones and they appear in the blood and urine.
See also Hydroxybutyrate

See Disease Definitions section at back of book for explanation of unusual diseases.
Kidney Function Tests
See Urea; Creatinine; Glomerular Filtration Rate; Urate.

Kleihauer Test
See Haemoglobin F.

Lactate
(L-Lactate)
NR: Vein blood 0.3 to 1.3 mmol/L.
Artery blood 0.3 to 0.8 mmol/L.
Ind: Body chemistry disorders.
Int: HIGH - Lactic acidosis (excess acid in blood), diabetes mellitus, heart failure, lack of oxygen (hypoxia), shock (low blood pressure or blood loss), other body chemistry (metabolic) disturbances.
Phys: Patient must fast overnight before blood sample taken.

Lactate Dehydrogenase
[LD or LDH]
NR: 120 to 230 U/L.
Ind: Heart attack.
Int: HIGH - Myocardial infarct (heart attack), tissue damage, muscle damage, red blood cell destruction, kidney damage, cancer, pulmonary infarct (death of lung tissue), hepatitis, other liver diseases, polycythaemia rubra vera, pernicious anaemia, seminoma (tumour of epididymis around testicle), muscular dystrophy (muscle wasting disease), paracetamol overdose, blood specimen damaged during collection.
Phys: LDH is present in all cells, and is released from them when they are damaged. Blood level rises over 3 to 4 days after damage, and declines to normal over following 5 to 7 days.

See also Creatine Kinase

Lactate Dehydrogenase Isoenzymes
NR: LDH₁ - less than 65 IU/L.
LDH₂ - less than 120 IU/L.
LDH₃ - less than 785 IU/L.
LDH₄ - less than 20 IU/L.
LDH₅ - less than 20 IU/L.
Ind: Raised total lactate dehydrogenase result, myocardial infarct (heart attack), liver disease.
Int: LDH₁ & LDH₂ HIGH - Heart, kidney, brain or red blood cell damage or disease.

See Disease Definitions section at back of book for explanation of unusual diseases.
LDH3 HIGH - Lung, pancreas, adrenal gland, spleen, thymus gland, lymph node or white blood cell damage or disease.
LDH4 & LDH5 HIGH - Skeletal muscle or liver damage or disease.

**Phys:** Human blood contains 5 distinct forms of lactate dehydrogenase which come from different organs and tissues within the body.

*See also Lactate Dehydrogenase*

**Lactogen, Human Placental**
See Placental Lactogen, Human.

**Lactose Tolerance Test**
**NR:** Rise in blood glucose of less than 1.0 mmol/L after lactose challenge.
**Ind:** Food intolerance, diarrhoea.
**Int:** BLOOD GLUCOSE RISES more than 1.0 mmol/L - Lactose intolerance, false positive result.

**Phys:** 50 g of lactose (a type of sugar) is given to patient who has fasted overnight. Blood glucose measured at 30 minute intervals for 3 hours. Rise in blood glucose indicates low or absent lactase (enzyme that breaks down lactose) activity. False positive rate about 25%.

**Lanoxin**
See Digoxin.

**Largactil**
See Chlorpromazine.

**Latex Agglutination**
**NR:** 0 to 60 IU/mL.
**Ind:** Connective tissue disease.
**Int:** VERY HIGH - Rheumatoid arthritis, Sjögren syndrome.
HIGH - SLE (systemic lupus erythematosus), polyarteritis (inflammation of arteries), polymyositis (inflammation of muscles), liver disease, viral infection, 5% of normal people.

**Phys:** More sensitive test for rheumatoid arthritis than rheumatoid factor, but more false positives. Normal levels do not exclude rheumatoid arthritis.

*See also Antinuclear Autoantibodies, Fluorescent; Rheumatoid Factor*

**LATS**
See Long Acting Thyroid Stimulator Antibody.

**LD or LDH**
See Lactate Dehydrogenase.

**LDL**
See Low Density Lipoprotein Cholesterol.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Lead
[Pb]
NR: Less than 1.2 µmol/L.
Ind: Lead exposure (eg. working with batteries).
Int: 1.3 to 1.9 µmol/L - Retest adults three monthly, risk of mental damage in children
1.9 to 2.4 µmol/L - Retest adults monthly, check sources of exposure.
Greater than 2.4 µmol/L - Remove adults from exposure, treat children with aggressive
elimination.
Phys: 95% of whole population should have levels less than 0.8 µmol/L.
See also Lead, Urine

LE Cells
(Lupus Erythematosus Cells)
NR: Absent
Ind: Autoimmune disease.
Int: PRESENT - SLE (systemic lupus erythematosus), scleroderma (thickening and
inflammation of skin), rheumatoid arthritis, chronic active hepatitis.
Phys: Normal leucocytes (white cells) incubated with the blood of a patient with SLE gain an
additional clump of protein (that stains purple and can be seen under a microscope) to
form an LE cell. May be found in other diseases of disordered immunity.
See also ANA; ANCA; Anti-DNA; Anti-Smith Antibodies; Cardiolipin Autoantibodies;
Complement C3 and C4; DNA Autoantibodies; ENA; Histone Autoantibodies; HLA-
DR3; Lupus Anticoagulant Antibody.

Legionella Antibodies
See Immunoglobulin Antibodies, Specific.

Leptospira Antibodies
See Immunoglobulin Antibodies, Specific.

Leucocytes
See White Cell Count.

LFT
See Liver Function Tests.

LH
See Luteinising Hormone.

Lipase
NR: 0.2 to 1.5 IU/L.
Ind: Diseases of the pancreas.
Int: HIGH - Acute pancreatitis (inflammation of the pancreas gland), pancreatic duct
obstruction.

See Disease Definitions section at back of book for explanation of unusual diseases.
Phys: Pancreatic lipase is released into the blood with damage to the pancreas. Remains elevated for longer than amylase in pancreatitis.
See also Amylase

Lipids, Total
NR: After fasting 12 hours, 400 to 600 mmol/L.
Ind: Obesity, hypertension (high blood pressure).
Int: HIGH - Hyperlipidaemia (high blood fat level), atherosclerosis (hardening of arteries), diabetes, hypothyroidism (underactive thyroid gland).
Phys: Lipid is a collective term for all types of fats, so this test is a measure of all types of fats within blood.
See also Cholesterol; Triglyceride

Lipoproteins
See Apolipoproteins; High Density Lipoprotein Cholesterol; Low Density Lipoprotein Cholesterol; Very Low Density Lipoprotein Cholesterol.

Lithium
NR: Correct range while on treatment 0.5 to 1 mmol/L.
Ind: Lithium treatment.
Int: Doctors adjust dosage to keep blood levels within correct range.
Phys: Blood sample taken 12 hours after last dose.

Liver Function Tests
[ LFT ]
Summary of Liver Function Test Abnormalities

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>ALT</th>
<th>AST</th>
<th>GGT</th>
<th>ALP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral hepatitis A, B, C, D</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>N/+</td>
</tr>
<tr>
<td>Drug induced hepatitis</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>N/+</td>
</tr>
<tr>
<td>Active hepatitis</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Glandular fever hepatitis</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>N</td>
</tr>
<tr>
<td>Liver cirrhosis</td>
<td>+</td>
<td>+</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Alcoholic liver damage</td>
<td>N</td>
<td>+</td>
<td>+++</td>
<td>N/+</td>
</tr>
<tr>
<td>Bile blocked in liver</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Bile blocked outside liver</td>
<td>+</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Hepatoma (liver cancer)</td>
<td>N/+</td>
<td>+</td>
<td>++</td>
<td>+</td>
</tr>
</tbody>
</table>

N = normal  + = raised level  ++ = significantly raised level  +++ = very high level
ALT = alanine amino transferase  AST = aspartate amino transferase
GGT = gamma glutamyl transferase  ALP = alkaline phosphatase

See also Albumin; Alkaline Phosphatase; Alanine Amino Transferase; Aspartate Amino Transferase; Gamma Glutamyl Transferase; Bilirubin; Immunoglobulins; Protein, Total

L-Lactate
See Lactate.

Long Acting Thyroid Stimulator Antibody
[ LATS ]

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

NR: Negative.
Ind: Thyroid gland disease.
Int: POSITIVE - Hyperthyroidism (over active thyroid gland).
Phys: May be normal in up to 40% of cases of hyperthyroidism.
See also other Thyroid Function Tests

Low Density Lipoprotein Cholesterol
[LDL]
NR: Less than 3.0 mmol/L.
Ind: High total blood cholesterol.
Int: HIGH - Increased risk of arteriosclerosis (hardening of arteries), heart disease and cerebrovascular disease (stroke).
Phys: LDL is the “bad” form of cholesterol, while HDL (high density lipoprotein) is the “good” form. The lower the proportion of LDL to HDL the better.
See also Apolipoproteins; Cholesterol; High Density Lipoprotein Cholesterol

Lupus Anticoagulant Antibody
(Lupus Inhibitor)
NR: Negative.
Ind: Suspected systemic lupus erythematosus (SLE), recurrent miscarriages.
Int: POSITIVE - SLE, recurrent thromboembolism (blood clots in veins), other autoimmune diseases, many different types of cancer, recurrent miscarriages due to antiphospholipid syndrome.
Phys: Detects an antibody that stops the reactions that prevent blood from clotting (ie. blood can clot more easily).
See also ANA; Anti-DNA; Anti-Smith Antibodies; Complement C3 and C4; ENA; LE Cells.

Lupus Erythematosus Cells
See LE Cells

Luteinising Hormone
[LH]
NR: Before puberty 1 to 3.4 IU/L.
Male 2 to 9 IU/L.
Fertile female 2 to 20 IU/L.
At time of ovulation in females 10 to 50 IU/L.
After menopause 30 to 200 IU/L.
Results and units vary between laboratories.
Ind: Menstrual cycle disorders, infertility.
Int: LOW - Infertile, hypogonadism (ovary or testicle not functioning properly to produce sex hormones).
HIGH - Test taken at time of ovulation, premature puberty, Stein-Leventhal syndrome.
Phys: LH is released from the pituitary gland in the brain. It is responsible for controlling ovulation, oestrogen production and and maintenance of a pregnancy in the female, and stimulates sperm production and production of testosterone in the male testes.
See also Follicle Stimulating Hormone; Oestrogen; Testosterone.

See Disease Definitions section at back of book for explanation of unusual diseases.
Lyme Disease Antibodies
See Immunoglobulin Antibodies, Specific.

Lymphocytes
NR: 1.5 to 3.5 x 10^9 lymphocytes in every Litre of blood (1,500 to 3,500 lymphocytes per cubic millimetre) (20 to 40% of all white blood cells).
Ind: Infection, blood disorders.
Int: HIGH (normal cell forms) - Chronic infection, TB, syphilis, pertussis (whooping cough), infectious lymphocytosis (glandular fever), chronic lymphocytic leukaemia (usually occurs in the elderly).
HIGH (abnormal cell forms) - Infectious mononucleosis (glandular fever), measles, acute lymphatic leukaemia (usually occurs in children), cytomegalovirus (CMV) infection, toxoplasmosis (usually caught from cats), rubella (German measles), hepatitis, brucellosis (usually caught from cattle), typhoid fever, bacterial endocarditis (heart infection), serum sickness, other viral infections.
LOW - Stress, injury, haemorrhage (excess bleeding), severe infection, Hodgkin's disease, AIDS, irradiation, TB, cytotoxic drugs (usually used to treat cancer), elderly.
Phys: Lymphocytes make up a large part of the infection fighting white cells in the blood. They move freely between lymph nodes in the neck, armpits, groin etc. and the blood. Infection or other stresses on the body produce an increase in the number of lymphocytes.
See also Neutrophils

Lymphocyte CD Types
See T Cell Lymphocytes.

Lyssavirus Antibody Enzyme Immunoassay
NR: Negative.
Ind: Rabies exposure.
Int: POSITIVE - Rabies, other lyssavirus infections, after vaccination for rabies.
Phys: Numerous lyssaviruses exist that cause rabies and similar diseases (eg: Australian bat lyssavirus infection).

Macrocytosis
See Mean Corpuscular Volume.

Magnesium [Mg]
NR: Adult 0.7 to 1.0 mmol/L (1.7 to 2.3 mg/100 mL).

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Newborn infant 0.6 to 0.9 mmol/L.

Ind: Kidney disease.
Int: HIGH - Chronic kidney failure.
LOW - Renal tubular defects (damage to the urine collecting ducts in the kidney), long term alcoholism, hyperaldosteronism (Conn syndrome), liver cirrhosis, poor absorption of food, diarrhoea, parathyroidectomy (surgical removal of the parathyroid glands in the neck), diabetic ketoacidosis (severe uncontrolled diabetes), malnutrition, vomiting, prolonged intravenous therapy (drip into vein), drugs (eg. diuretics, amphotericin, gentamicin, laxatives, cisplatin, cytotoxics - last two used for cancer treatment).

Phys: Magnesium is an important for the electrical function of cells. Its level in the body is controlled by the kidneys. Low levels can cause an irregular heart rhythm. It is required for the functioning to at least 300 enzymes in the body.
See also Magnesium, Faeces; Magnesium, Urine

Manganese
NR: 140 to 220 nmol/L.
Ind: Suspected manganese poisoning.
Int: HIGH - Manganese poisoning.
Phys: Beware of sample contamination during collection and transportation.
See also Manganese, Urine

MCH
See Mean Corpuscular Haemoglobin.

MCHC
See Mean Corpuscular Haemoglobin Concentration.

MCV
See Mean Corpuscular Volume.

Mean Corpuscular Haemoglobin
[MC]H
NR: Adult: 27 to 31 pg.
Child: 24 to 30 pg.
Infant: 24 to 34 pg.
Ind: Anaemia.
Int: LOW - Lack of iron in the body, long term blood loss, sprue, achlorhydria (lack of acid in the stomach), pregnancy, thalassaemia, some uncommon anaemias (eg. megaloblastic and sideroblastic anaemia).
HIGH - Pernicious anaemia (a lack of vitamin B₁₂), lack of folic acid, starvation, reticulocytosis (abnormality of red blood cell formation), hypothyroidism (under active thyroid gland), aplastic anaemia.
Phys: Useful to determine type of anaemia. The MCH is determined by dividing the haemoglobin by the red blood cell count (Hb/RBC).
See also Mean Corpuscular Haemoglobin Concentration.
Mean Corpuscular Haemoglobin Concentration

\[ \text{MCHC} \]

NR: 300 to 340 g/L (30 to 34%) (18.6 to 21.2 mmol/L).

Ind: Indications.

Int: LOW - Iron deficiency anaemia, blood loss, pregnancy, thalassaemia, anaemias of chronic disease, some rare anaemias.
NORMAL - Other forms of anaemia.

Phys: Measure of the average amount of haemoglobin in each red blood cell (RBC). In iron deficiency, there is less haemoglobin in each RBC. The MCHC is measured by dividing the haemoglobin by the packed cell volume (MCHC = Hb/PCV).

See also Mean Corpuscular Haemoglobin; Mean Corpuscular Volume; Packed Cell Volume

Mean Corpuscular Volume

\[ \text{MCV} \]

NR: Adult 80 to 96 fL (80 to 96 cubic microns).
Child 73 to 89 fL (73 to 89 cubic microns).
Newborn infant 85 to 106 fL (85 to 106 cubic microns).

Ind: Anaemia.

Int: VERY LOW - Lack of iron in body, chronic blood loss, pregnancy, chronic disease (eg. rheumatoid arthritis).
LOW (called microcytosis in medical terminology) - Recent sudden blood loss, haemolytic anaemia (red cells destroyed prematurely), bone marrow cancer, some rare anaemias (eg. sideroblastic anaemia), thalassaemia trait, elderly.
HIGH (called macrocytosis in medical terminology) - Pernicious anaemia (lack of vitamin B₁₂), alcoholism, folic acid deficiency, sprue, starvation, reticulocytosis (excessive number of a type of white cell in blood), aplastic anaemia, hypothyroidism (under active thyroid gland), liver disease, hyperlipidaemia (excess fats such as cholesterol in blood), scurvy (lack of vitamin C), leukaemia, megaloblastic anaemia, lung failure, myelomatosis (form of white cell cancer), cytotoxic drugs (used to treat cancers).

Phys: Useful test to determine type of anaemia present. The MCV is calculated by dividing the packed cell volume by the red blood cell count (MCV = PCV/RBC).

See also Mean Corpuscular Haemoglobin Concentration; Packed Cell Volume; Red Cell Count.

Measles Antibodies

See Immunoglobulin Antibodies, Specific.

Methaemoglobin

NR: Less than 0.1% of total haemoglobin.
Infants: Less than 1.5% of total haemoglobin.

Ind: Cyanosis (blue tinge to skin colour).

Int: HIGH - Poisoning by oxidant drugs (eg. sulfonamides, nitrates, nitrites, aniline dye).

Phys: Poison causes haemolysis (destruction of red blood cells) and cyanosis.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Mg
See Magnesium.

Microcytosis
See Mean Corpuscular Volume.

Microglobulin, Beta-2
See Beta-2 Microglobulin.

Mitochondrial Autoantibodies
[AMA]
NR: Negative.
Ind: Liver disease.
Int: HIGH - Primary biliary cirrhosis (scarring of liver), chronic active hepatitis.

Monocytes
NR: 0.2 to 0.8 x 10^9/L (200 to 800/mm^3) (4 to 8%).
Ind: Infection.
Int: LOW - Chronic infection, brucellosis (caught from cattle), subacute bacterial endocarditis (heart infection), malaria, Rickettsial infection (eg. Q fever, typhus), cytotoxic drugs (used to treat cancer).
HIGH - TB, some acute and chronic bacterial infections, many forms of cancer, acute monocytic leukaemia, infectious mononucleosis (glandular fever), malaria, Hodgkin's disease, splenectomy (removal of the spleen, usually after a severe injury).
Phys: This test helps to determine the nature and course of infection. Monocytes are a type of white blood cell that increases during most bacterial infections.
See also Lymphocytes; Neutrophils; White Cell Count.

Myocardial Autoantibodies
NR: Absent.
Ind: Myocarditis (inflammation of heart muscle).
Int: PRESENT - Dressler syndrome, after heart surgery, autoimmune myocarditis, myocardial infarct (heart attack), heart injury.
Phys: Nonspecific test of heart damage.

Myoglobin
NR: Male : Less than 70 µg/L.
Female : Less than 50 µg/L.
Ind: Myocardial infarct (heart attack).
Int: HIGH - Myocardial infarct.
Phys: Myoglobin levels rise within 2 to 4 hours of a heart attack. Should not be used as a late indicator of an attack, as it is rapidly cleared from the blood stream.
See also Myoglobin, Urine; Troponin.

See Disease Definitions section at back of book for explanation of unusual diseases.
Mysoline
See Primidone.

N

Na
See Sodium.

NAP
See Neutrophil Alkaline Phosphatase.

Neonatal Screen
Phys: Screening tests (shown in brackets) performed on infants shortly after birth to detect serious diseases include those for galactosaemia (galactose), phenylketonuria (phenylalanine), cretinism (thyroid stimulating hormone) and cystic fibrosis (trypsin).

Neurone Specific Enolase
NR: Less than 12µg/L.
Ind: Monitoring the progress of some specific cancers.
Int: RISING LEVEL - Progress of small cell lung carcinoma of lung or neural crest tumour of spine or brain.
Phys: Cannot be used as a screening or diagnostic test.

Neutrophil Alkaline Phosphatase
[NAP]
NR: 30 - 180. See Phys. below.
Ind: Abnormal blood film seen under a microscope.
Int: HIGH WCC, HIGH NAP - Bacterial infection.
     HIGH WCC, LOW NAP - Chronic leukaemia.
     HIGH RCC, HIGH NAP - Polycythaemia rubra vera.
     HIGH RCC, LOW NAP - Other causes of erythrocytosis (excess red blood cells).
     Haemoglobin in urine, HIGH NAP - Haemolytic anaemia, hypoplastic anaemia.
     Haemoglobin in urine, LOW NAP - Paroxysmal nocturnal haemoglobinuria.
Phys: 100 neutrophils (a type of white cell) in capillary blood film examined by microscopy.
     Dye intensity of cells compared, and scored on a basis of 0 for no dye, 1 for light dye, 2 for medium dye, 3 for heavily dyed, and 4 for very heavily dyed. Score added, to give a NAP value between 0 and 400. Test useful for differentiating cause of high white cell count (WCC) or high red cell count (erythrocyte count - RCC).

See also Erythrocyte Count.
Neutrophils
NR: Adult: 2.1 to 7.5 x 10^9/L (2,100 to 7,500/mm³) (40 to 60%).
    Child : 1.6 to 9.0 x 10^9/L (1,600 to 9,000/mm³).
    Newborn infant : 4.5 to 12 x 10^9/L (4,500 to 12,000/mm³).
Ind: Infection.
Int: VERY HIGH - Pneumococcal pneumonia, lung abscess, widespread cancer.
    HIGH (known in medical terminology as neutrophilia) - Bacterial infections, rabies, actinomycosis, some viral infections (eg. Herpes zoster), severe inflammation anywhere in body (eg. heart attack, arthritis, dermatitis), haemorrhage (abnormal bleeding), haemolysis (rapid destruction of red blood cells), many types of cancer, myeloproliferative disease (cancers of lymph nodes and tissue), splenectomy (surgical removal of spleen), pregnancy, burns, severe injury, physical stress, drugs (eg. lithium, corticosteroids).
    LOW (known in medical terminology as neutropenia) - Viral infection (eg. glandular fever, AIDS), severe bacterial infection (eg. pneumonia, cellulitis, septicaemia), typhoid, hepatitis, TB, brucellosis (caught from cattle), aspergillosis (widespread fungal infection), starvation, vitamin B₁₂ and folic acid deficiencies, acute leukaemia, lymphosarcoma (severe form of cancer), aplastic anaemia, Gaucher disease, SLE (systemic lupus erythematosus), rheumatoid arthritis, haemodialysis (treatment for kidney failure), myelodysplasia, hypersplenism (over active spleen), Chediak-Higashi syndrome, Diamond-Blackfan syndrome, Felty syndrome, irradiation, drugs (eg. cytotoxics, arthritis drugs - NSAID, sulphonamides, captopril, penicillin).
    Hypersegmentation (increased number of segments in nucleus of neutrophil)
Phys: Neutrophils are the most common form of white blood cell. Rate of entry of neutrophils to circulation can be increased by certain stimuli (listed under HIGH above). Once reserve supplies of neutrophils in bone marrow are depleted, blood levels may drop markedly.
See also Basophils; Eosinophils; Monocytes.

Neutrophil Cytoplasmic Antibodies
See Anti-Neutrophil Cytoplasmic Antibodies.

Nicotine
NR: Less than 0.006 mg/L.
Ind: Can be used to see if someone is a smoker.
Int: HIGH - Smoker, passive smoker.
Phys: Nicotine is the most common chemical found in tobacco. Blood half-life of nicotine averages 40 minutes (half the nicotine present disappears every 40 minutes).
See also Carboxyhaemoglobin B; Cotinine

Nicotinic Acid
See Vitamin B₃.
Nortriptyline
NR: Therapeutic range 60 to 240 µg/L (150 to 880 nmol/L).
Int: Doctor adjusts dosage to keep serum levels within therapeutic range.
Phys: Several weeks may be required to reach steady state due to long half-life. Nortriptyline is a medication used to treat depression.

Oestradiol, 17beta
NR: Male: Less than 300 pmol/L (less than 82 ng/L).
    Female before ovulation: 180 to 1500 pmol/L (50 to 400 ng/L).
    Female after ovulation: 400 to 800 pmol/L (120 to 200 ng/L).
    After menopause: Less than 200 pmol/L (less than 55 ng/L).
Ind: Test for fertility in female.
Int: LOW - Not ovulating, before puberty, or after menopause.

Oestriol
NR: 32 weeks pregnant 145 to 800 nmol/L.
    34 weeks pregnant 170 to 1040 nmol/L.
    36 weeks pregnant 230 to 1400 nmol/L.
    38 weeks pregnant 300 to 1560 nmol/L.
    40 weeks pregnant 350 to 1600 nmol/L.
Ind: Check of health of foetus.
Int: Repeated tests necessary, single test of little value. The oestriol level should rise steadily as the pregnancy progresses. If no rise noted, or levels drop, foetal distress is likely. Low level may be due to Down syndrome.
Phys: Oestriols are produced by a chain of processes starting in the foetal adrenal gland, and progressing through the foetal liver and the placenta before entering in the maternal circulation. Steroids and ampicillin treatment of mother may depress values.
See also Lecithin-Sphingomyelin Ratio, Amniotic Fluid.

Osmolality
NR: 280 to 300 mmol/kg water.
Ind: Water imbalance in body.
Int: HIGH - Hyperglycaemia (high blood sugar), uraemia (kidney failure), salicylate (eg. aspirin) overdose, excess alcohol, hypernatraemia (excess salt in body), diabetes insipidus, dehydration.
    LOW - Hyponatraemia (lack of salt in body), excess water in body, pregnancy.
Phys: Blood osmolality is controlled by the kidneys and their retention or rejection of electrolytes (eg. salt), proteins and other small molecules.
See also Osmolality, Urine.
Medical Tests Explained

Osmotic Fragility of Red Blood Cells
NR: 0.40 to 0.45% saline before incubation.
     0.47 to 0.60% saline after 24 hour incubation.
Ind: Suspected spherocytosis.
Int: HIGH - Hereditary spherocytosis (enlarged and fragile red blood cells), autoimmune haemolytic anaemia.

Ovarian Autoantibodies
NR: Absent.
Ind: Diseases of the ovaries.
Int: PRESENT - Autoimmune ovarian disease, Addison's disease.

Oxygen
[pO₂]
NR: Blood from artery : 97% pO₂, 10 to 13 kPa (75 to 100 mmHg).
     Blood from vein : 60 to 85% pO₂, 5 to 9.5 kPa (40 to 70 mmHg).
Ind: Lung disease.
Int: LOW - Hypoxia (low arterial blood oxygen) due to poor air entry into lungs, poor lung function or poor circulation (eg. high altitude, pulmonary fibrosis, pulmonary oedema, emphysema, abnormal connection between artery and vein, brain stem damage, emphysema).
Phys: Measures the amount of oxygen in blood. Great care must be taken to collect blood in a vacuum tube with no air (and therefore oxygen) present.
See also Carbon Dioxide, Blood; Forced Expiratory Volume in 1 Second; Vital Capacity, Lungs.

Oxygen Saturation, Arterial Blood
NR: Greater than 95%.

P
See Phosphorus, Inorganic.

Packed Cell Volume
[PCV]
(Haematocrit)
NR: Adult male 40 to 54%.
    Adult female 36 to 47%.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Child 32 to 42% .

**Ind:** Blood disorders.

**Int:** HIGH - Polycythaemia rubra vera, dehydration.  
LOW - Anaemia, pregnancy .

**Phys:** A blood specimen is centrifuged (spun around extremely quickly in a machine) and the percentage of packed cells to plasma (fluid) in the tube is measured.

**Paracetamol**  
(**Acetaminophen**)

**NR:** Nil or minimal amounts.

**Ind:** Assessment of paracetamol overdose.

**Int:** Toxic if level of over 1300 µmol/L (195 mg/L) found four hours after swallowing tablets or mixture.

**Phys:** Liver damage and death can result from paracetamol overdose. Blood levels can rise for four or more hours after swallowing paracetamol.

**Parathormone**  
([**PTH**])  
(Parathyroid Hormone)

**NR:** 1.0 to 7.0 pmol/L whole molecule PTH.  
Less than 100 pmol/L (less than 100 ng/L) mid-molecule PTH.  
10 to 65 ng/L P-intact parathyroid hormone.

**Ind:** Parathyroid disease.

**Int:** HIGH - Hyperparathyroidism (overactive parathyroid glands), osteomalacia (bone disease caused by a lack of calcium), kidney failure, lack of vitamin D, pregnancy, anticonvulsant therapy (used for epilepsy).

**Phys:** The parathormone hormone released by the four parathyroid glands in the neck (imbedded in the back of the thyroid gland) control calcium levels in the body.  
*See also Calcium*

**Parathyroid Hormone**

See Parathormone.

**Parietal Cell Autoantibodies**  
(Gastric Cell Autoantibodies)

**NR:** Negative.

**Ind:** Pernicious anaemia.

**Int:** POSITIVE - Pernicious anaemia, chronic atrophic gastritis (stomach disease), autoimmune endocrinopathies (generalised damage to glands in body), thyroid gland disease.

**Phys:** Detects specific antibodies against the parietal cells in the stomach (responsible for producing hydrochloric acid in the stomach), that are present in blood.

**Paul Bunnell Test**

**NR:** Titre up to 1:128.

**Ind:** Infectious mononucleosis (glandular fever).

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Medical Tests Explained

**Int:** HIGH - Infectious mononucleosis.

**Phys:** When the diluted blood of patients with IM are mixed with sensitised sheep red blood cells, the cells stick together if IM is present and the patient’s blood has been diluted more than 128 times. This is now an obsolete test.

*See also Infectious Mononucleosis Screen; Immunoglobulin Antibodies, Specific.*

**Pb**
See Lead

**pCO₂**
See Carbon Dioxide.

**PCR**
See Polymerase Chain Reaction.

**PCV**
See Packed Cell Volume.

**Pemphigoid Autoantibodies**
See Basement Membrane Autoantibodies.

**Pemphigus Autoantibodies**
See Intercellular Cement Substance Autoantibodies.

**pH**

**NR:** 7.36 to 7.44
Outside range 6.8 to 8 causes death.

**Ind:** Imbalance in blood chemistry.

**Int:** LOW - Acidic - Poor air entry into lungs, shock (heart failure), severe diarrhoea, starvation, diabetes mellitus, kidney failure and disease, ureterocolic anastomosis (ureter from kidney surgically drains into colon of bowel).
HIGH - Alkaline - Hyperventilation (rapid over breathing), hysteria, altitude sickness, vomiting, salicylate (aspirin) overdose, Cushing syndrome.

**Phys:** pH (acidity or alkalinity) of blood is determined by the level of bicarbonate (indirectly carbon dioxide - CO₂) and other electrolytes.

*See also Carbon Dioxide.*

**Phenobarbitone**
(Phenobarbital)

**NR:** Therapeutic range 65 to 170 µmol/L (15 to 40 µg/mL).

**Ind:** Control of therapy.

**Int:** Doctors adjust dosage to keep levels within therapeutic range.

**Phys:** Phenobarbitone is used to control epilepsy. Half-life (time taken for half medication present to be removed from body) is 50-140 hours. Blood sample should be taken immediately before next dose.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Medical Tests Explained

**Phenylalanine**

**NR:** 40 to 120 µmol/L.

**Ind:** Screening and monitoring of phenylketonuria (PKU).

**Int:** HIGH - Phenylketonuria (an error in the body’s metabolic processes that is present from birth).

**Phys:** Routine screening test performed on all new born infants using blood obtained by a heel prick.

**Phenytoin**

(Dilantin)

**NR:** Therapeutic range 40 to 80 µmol/L (10 to 20 mg/L).

**Ind:** Treatment with phenytoin.

**Int:** Doctors adjust dosage to keep levels within therapeutic range.

**Phys:** Phenytoin is used to treat epilepsy. Blood sample should be taken before next dose. Peak blood level occurs 8 hours after administration.

**Phosphate**

**NR:** 0.79 to 1.40 mmol/L (2.4 to 4.5 mg/100 mL).

**Ind:** Bone disease.

**Int:** LOW - Elderly male, primary hyperparathyroidism (over active parathyroid glands in the neck), renal tubular acidosis (kidney disease), osteomalacia (bone weakening condition), poor diet, alcoholism, severe burns, starvation, gout, pregnancy, prolonged intravenous fluid treatment, drugs (eg. diuretics, insulin).

HIGH - Elderly female, severe illness, kidney disease, acidosis, blood sample damage after collection (haemolysis).

VERY HIGH - Hypoparathyroidism (under active parathyroid glands in the neck), rickets (bone weakness due to kidney disease).

**Phys:** The parathyroid glands in the neck control the level of calcium and phosphate in the body and bones. Results should be compared with blood calcium level to make accurate diagnosis.

*See also Calcium*

**Phosphorus, Inorganic**

[P]

**NR:** 0.9 to 1.5 mmol/L (3 to 4.5 mg/100 mL)

**Ind:** Bone and kidney disease.

**Int:** HIGH - Kidney failure, hypoparathyroidism (under active parathyroid glands in the neck, which control body calcium), excess vitamin D present.

LOW - Hyperparathyroidism (over active parathyroid glands in the neck), lack of vitamin D, rickets (bone softening disease in children), osteomalacia (bone weakness in adults), steatorrhoea (fatty faeces), renal tubular insufficiency (form of kidney failure), insulin therapy, after eating large meal.

**Phys:** The concentration of inorganic phosphorus in the blood is influenced by parathyroid gland function, absorption of phosphorus from the gut, kidney function, bone metabolism, and nutrition of patient. Levels vary between day and night.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
**Placental Lactogen**

**NR:** Variable

**Ind:** Pregnancy monitoring.

**Int:** STEADY RISE - Normal pregnancy

VERY HIGH - Choriocarcinoma (cancer of placenta), small cell cancer of lung

**Phys:** Test may be used to check health of the placenta, and therefore the foetus, in pregnancy.

**Plasma Cells**

**NR:** Absent

**Ind:** Reported if found on routine blood cell count.

**Int:** FEW - Infection, serum sickness

MANY - Multiple myeloma

**Plasminogen**

**NR:** 50 to 150%

**Ind:** Blood clots in veins.

**Int:** LOW - Infants, liver disease

HIGH - Pregnancy, contraceptive pill use, elderly, Negroes

**Phys:** High levels associated with increased risk of thromboembolism (blood clots).

**Platelet Count**

**NR:** 150 to 450 x 10^9/L (150,000 to 450,000/mm³)

**Ind:** Bleeding disorders.

**Int:** HIGH NUMBER (THROMBOCYTOSIS) - Myelofibrosis (bone marrow disease), chronic leukaemia, polycythaemia rubra vera, essential thrombocythaemia (excessive number of platelets for no known reason).

LOW NUMBER, NORMAL TYPE (THROMBOCYTOPENIA) - Bone marrow damage, cancer, myeloma, cytotoxic drugs (used to treat cancer), infections, megaloblastic anaemia, systemic lupus erythematosus (SLE), acute leukaemia, disseminated intravascular coagulation (widespread clotting of blood in veins), haemolytic-uraemic syndrome, massive transfusion, autoimmune diseases, hypersplenism (over active spleen), rheumatoid arthritis, Fanconi syndrome, HELLP syndrome, sticky platelet syndrome, Wiskott-Aldrich syndrome, alcoholism, viral or bacterial infections (eg. german measles, glandular fever), idiopathic thrombocytopenia (low number of platelets for no known reason), congenital (present since birth), after blood transfusion, drugs (eg. quinidine, quinine, heparin, aurothiomalate, arthritis medications)

LOW NUMBER, ABNORMAL TYPE - May-Hegglin anomaly

NORMAL NUMBER, ABNORMAL TYPE (THROMBOASTHENIA) - Glanzmann disease.

**Phys:** Platelets are cells in the blood that are essential for blood clotting. They are made in the bone marrow and spleen.

See also Fibrinogen; Clotting Time
Platelet Survival

NR: 8 to 10 days
Ind: Thrombocytopenia (low level of platelets).
Int: LOW - Immune thrombocytopenia, hypersplenism (over active spleen), other causes of platelet destruction

Phys: Platelets are cells in the blood that are essential for blood clotting. Radioactive platelets injected, and sampled after 30 minutes and 2 hours, then at daily intervals.

See also Platelets

Polycythaemia

Phys: Polycythaemia is a term that means an excessive number of red cells are present in blood.

See Erythrocyte Count; Packed Cell Volume

Polymerase Chain Reaction
[PCR]

NR: Negative
Ind: Some infections and other diseases.
Int: POSITIVE - Specific results for selected diseases. Range of diseases increasing regularly. Examples include Charcot-Marie-Tooth disease, cystic fibrosis, Duchenne muscular dystrophy, fragile X syndrome, haemophilia, hepatitis C, haemochromatosis, Huntington’s chorea, sickle cell disease, thalassaemia trait, tuberculosis (TB) and Chlamydia trachomatis

Phys: Very specific and sensitive tests for these diseases.

Porphyrians, Red Blood Cells

NR: Less than 900 nmol/L
Ind: Porphyria.
Int: HIGH - Some types of porphyria, lead poisoning, iron deficiency

Phys: Differentiates different forms of porphyria. Blood sample must be protected from light.

Potassium

[K]

NR: 3.5 to 5.2 mmol/L
Ind: Kidney or gut disease, body chemistry (electrolyte imbalance), diuretic (fluid tablet) therapy.
Int: HIGH - Acute kidney failure, Addison’s disease, damaged (haemolysed) blood sample, acidosis (acidic blood), hypoaldosteronism (underactive adrenal gland), massive injury, severe infection, vigourous exercise, excess intake of potassium, drugs (eg. digoxin, ACE inhibitors, arthritis medications, triamterene, amiloride, spironolactone).
LOW - Vomiting, diarrhoea, ulcerative colitis, malabsorption syndrome, tumours of colon, excessive purgatives, kidney disease, diabetes mellitus, Conn syndrome, Cushing syndrome, oat cell cancer of lung, ureterocolic anastomosis (ureter from kidney drains into colon of gut), familial periodic paralysis, lack of potassium in diet,
renal tubular acidosis (kidney disease), alkalosis (alkaline blood), Liddle syndrome, aldosteronism, drugs (eg. diuretics, steroids, laxatives, insulin)

Phys: Potassium is lost from the body through the kidneys and bowels. It is easily absorbed from food in the gut. 95% is inside cells and not free in blood.

See also Anion Gap

Prealbumin
(Transthyretin)
NR: 185 to 320 mg/L.
Ind: Lack of protein in diet.
Int: NORMAL - Good protein nutrition.
LOW - Poor nutrition, septicaemia (infection of blood), adult respiratory distress syndrome (lung disease), abscesses.
HIGH - Kidney failure, steroid treatment.

Phys: Prealbumin has a half life of one to two days, making it a good marker of adequate nutrition. Acts as a transporter of thyroxine (which controls rate at which cells function), so hypothyroidism (under active thyroid gland) may interfere with results.

Primidone
(Mysoline)
NR: Therapeutic range 22 to 50 µmol/L (5 to 12 µg/mL)
Ind: Treatment with primidone, a medication used to treat epilepsy.
Int: Doctors adjust dosage to keep serum levels within therapeutic range.

Phys: Sample should be taken immediately prior to next dose. Very variable half-life (time taken for half of medication present to disappear). Primidone breaks down to the active medication phenobarbitone.

Procainamide
NR: Therapeutic range 17 to 40 µmol/L (4 to 11 µg/mL)
Ind: Treatment with procainamide, a medication used to regulate heart rhythm.
Int: Doctors adjust dosage to keep serum levels within therapeutic range

Phys: Half-life (time taken for half medication present to disappear) is 3 to 5 hours. Sample should be taken immediately before next dose.

Prolactin
NR: Female 3 to 25 µg/L (less than 600 mU/L)
Male 2 to 15 µg/L (less than 450 mU/L)
Ind: Female infertility, galactorrhoea (abnormal production of breast milk).
Int: HIGH - Tumours or enlargement of the pituitary gland under the brain, tumours of brain that put pressure on the pituitary gland, brain injury, hypothyroidism (under active thyroid gland), kidney failure, sarcoidosis, pregnancy, Stein-Leventhal syndrome, severe premenstrual tension, stress, drugs (eg. phenothiazines, antidepressants, antihistamines), excess caffeine.

Phys: Prolactin is a hormone produced in the anterior lobe of the pituitary that helps control the menstrual cycle and lactation (breast feeding). High levels cause sterility.
amenorrhoea (no menstrual periods) and galactorrhoea (abnormal breast milk production).

**Prostate Specific Antigen**

[PSA]

**NR:** Less than 4 µg/L

**Ind:** Prostate gland disease.

**Int:** HIGH - Prostate gland cancer, benign enlargement of the prostate gland, prostatitis (infection of prostate gland), injury to prostate.

**Phys:** Significant false positive and false negative results occur, and so this is not a good screening test for prostate cancer. Used for assessing progress of disease rather than diagnosis.

*See also Prostate Specific Antigen Free/Total Ratio*

**Prostate Specific Antigen Free/Total Ratio**

**NR:** More than 25%

**Ind:** Prostate gland disease.

**Int:** LOW - Prostate gland cancer.

**Phys:** Only appropriate to use when prostate specific antigen (PSA) is greater than 4 µg/L. The ratio between the amount of PSA free in the blood and the amount bound to proteins is measured.

*See also Prostate Specific Antigen*

**Prostatic Acid Phosphatase**

See Acid Phosphatase, Total

**Protein C**

**NR:** 50 to 150%

**Ind:** Thrombosis (blood clot in veins).

**Int:** LOW - Recurrent thromboses (blood clots), skin damage with warfarin treatment, familial thrombophilia (inherited clotting disease).

**Phys:** Protein C breaks down blood clotting factors V and VII, so a low level allows excessive clotting to occur. An inherited lack of protein C causes recurrent severe blood clots, that may commence as an infant.

*See also Protein S*

**Protein S**

**Ind:** Excessive thromboses (blood clots).

**Int:** LOW - Recurrent thromboses, familial thrombophilia (inherited clotting tendency).

**Phys:** Protein S works with protein C to break down clotting factors in the blood. A lack is an inherited trait.

*See also Protein C*

**Protein, Total**

**NR:** 60 to 80 g/L

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Newborn infant 45 to 75 g/L

**Int:** LOW - Nephrotic syndrome (form of kidney failure), chronic kidney failure, malnutrition, child under 5 years, severe liver disease, overhydration (excess fluid in body), protein losing enteropathy (bowel disease in which excess protein is lost).
HIGH - Alcoholism, dehydration, multiple myeloma, lymphoma (lymph tissue cancer), autoimmune diseases, chronic liver disease, chronic infection, prolonged tourniquet while taking blood sample.

**Phys:** Blood contains many different types of protein, including albumin, globulin and fibrinogen.

*See also Albumin; Globulin; Fibrinogen*

### Prothrombin Index

**[PI]**

**NR:** Normal range 90 to 110. Therapeutic range 40 to 60

**Ind:** Bleeding disorders, and treatment with anticoagulants (prevent blood clotting).

**Int:** LOW - Bleeding disorders, anticoagulant treatment (dosage is adjusted by doctor to keep levels within therapeutic range).

**Phys:** This test is now obsolete and has been replaced by the International Normalised Ratio (INR).

*See also International Normalised Ratio - Prothrombin*

### Prothrombin Ratio

See International Normalised Ratio - Prothrombin

### Prothrombin Time

**[PT]**

**NR:** Normal range 12 to 16 seconds
Therapeutic range 20 to 30 seconds

**Ind:** Bleeding disorders.

**Int:** LONG - Lack of proteins essential for clotting such as fibrinogen, prothrombin, factors V, X, or VII. Liver disease, anticoagulant therapy, or a lack of vitamin K.

*See also tests listed under Coagulation Tests*

### PSA

See Prostate Specific Antigen

### PTH

See Parathormone

### Pyruvate

**NR:** 0.03 to 0.10 mmol/L

**Ind:** Liver disease.

**Int:** HIGH - Lack of thiamine (vitamin B), cirrhosis of liver, other severe liver diseases, hypoxia (lack of oxygen).

*See also Lactate*

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Medical Tests Explained

See Disease Definitions section at back of book for explanation of unusual diseases.
**Q**

**Q Fever Antibodies**  
See Immunoglobulin Antibodies, Specific

**Quinidine**  
**NR:** Therapeutic range 6 to 15 µmol/L (2 to 5 µg/mL)  
**Ind:** Treatment with quinidine.  
**Int:** Doctors adjust dosage to keep serum levels within therapeutic range.  
**Phys:** Quinidine is used in heart disease. Half-life (time taken for half medication present in blood to disappear) is 4 to 7 hours. Sample should be taken immediately before next dose.

**R**

**Rabies Antibodies**  
See Lyssavirus Antibody Enzyme Immunoassay

**Rivotril**  
See Clonazepam

**Radio allergosorbent Test**  
[RAST]  
**NR:** Negative OR less than 0.69 kU/L  
**Ind:** Allergies.  
**Int:** POSITIVE or HIGH - Allergy to test substance.  
**Phys:** Substance suspected to be cause of allergy is given to patient and blood samples are tested at intervals thereafter. Both false negative and positive results possible.

**Rapid Plasma Reagin Test**  
[RPR]  
Venereal Disease Research Laboratory Test [VDRL]  
**NR:** Negative  
**Ind:** Sexually transmitted disease.  
**Int:** POSITIVE - Syphilis, yaws.

See Disease Definitions section at back of book for explanation of unusual diseases.
Phys: Old fashioned nonspecific blood test for syphilis. Becomes negative some years after successful treatment.
See also Fluorescent Treponemal Antibodies; Syphilis Enzyme Immunoassay; Treponema pallidum Haemagglutination

RAST
See Radioallergosorbent Test

RBC
See Erythrocyte Count

RCC
See Erythrocyte Count

Red Blood Cell Count
See Erythrocyte Count

Red Blood Cell Fragility, Osmotic
NR: Saline concentration causing 50% lysis (cell breakdown) in fresh blood 4.0 to 4.5 g/L (68 to 82 mmol/L)
     Saline concentration causing 50% lysis in stored blood 4.6 to 5.9 g/L (84 to 100 mmol/L)
Ind: Haemolytic anaemia.
Int: HIGH FRAGILITY - Spherocytosis (inherited abnormality of red blood cells that are over round), inherited haemolytic anaemia.
     LOW FRAGILITY - Thalassaemia, liver disease, iron deficiency.
Phys: Results not diagnostic. Not a commonly used test.

Red Blood Cell Mass
NR: Males 25 to 35 mL/kg of body weight.
     Females 20 to 30 mL/kg of body weight.
Ind: Polycythaemia (excessive number of red blood cells).
Int: HIGH - Polycythaemia
Phys: Measured using radioisotope labelled red cells. Inaccurate with splenomegaly (enlarged spleen).

Red Blood Cell Survival
NR: Red cell half-life (time taken for half cells present to die) 25 to 33 days.
Ind: Haemolysis (excessive break down of red blood cells).
Int: LOW - Indication of severity of haemolysis. Cause must then be sought.
Phys: Measured by measuring survival of red cells labelled with radioactive chromium (51Cr).

Renal Function Tests
See Creatinine; Glomerular Filtration Rate; Urate; Urea

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Renin
NR: Varies markedly between labs, patient preparation, posture, etc.
Ind: Secondary hypertension (high blood pressure due to other disease).
Int: LOW RENIN, HIGH ALDOSTERONE - Steroid abnormality, Conn syndrome
     HIGH RENIN, HIGH ALDOSTERONE - Kidney abnormality
Phys: Must be performed in conjunction with aldosterone studies.
      See also Aldosterone

Resin Uptake of T₃
See T₃ Uptake of Resin

Reticulocytes
NR: 0.5 to 1.5% of red blood cells (10 to 10⁹/L)
     Infants 2 to 6%
Ind: Anaemia.
Int: HIGH - Increased rate of red blood cell formation due to haemorrhage (excessive
     bleeding), haemolysis (rapid break down of red blood cells), treatment of pernicious
     anaemia, iron therapy in iron deficiency anaemia.
Phys: Reticulocytes are immature red blood cells (erythrocytes).
      See also Erythrocyte Count

Reticulum Cell Autoantibodies
[RCA]
NR: Absent
Ind: Autoimmune disease.
Int: POSITIVE - Coeliac disease, Crohn's disease, gluten sensitive enteropathies (bowel
     disease resulting in malabsorption), dermatitis herpetiformis, IgA deficiency (inherited
     lack of a type of immunoglobulin), other generalised autoimmune diseases

Rheumatoid Factor
[RF]
(Rose-Waaler Test; Rheumaton Titre)
NR: Titre less than 16 (less than 40 IU/mL)
Ind: Arthritis.
Int: HIGH - 75% of adults with rheumatoid arthritis have rheumatoid factor (RF). RF is also
     present in many adults without rheumatoid arthritis. Higher titres are more significant.
     Other causes include systemic lupus erythematosus (SLE), scleroderma, other
     connective tissue disease, chronic active hepatitis, sarcoidosis, multiple myeloma,
     chronic infection, cancers, infectious mononucleosis (glandular fever), tuberculosis
     (TB), fibrosing alveolitis (degenerative lung disease), brucellosis, parasites, leprosy,
     subacute bacterial endocarditis (heart infection), syphilis, malaria.
     VERY HIGH - Sjögren syndrome.
Phys: Rheumatoid factor is a macroglobulin (large protein) that circulates in blood in
     combination with gamma globulins. Agglutination (clumping together) of sensitised
     latex particles or sheep red blood cells indicates the presence of RF.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

See also Anti-Deoxyribonucleic Acid Titre; Antinuclear Antibodies; Beta-2 Microglobulin; Complement; C-Reactive Protein; DNA Autoantibodies; Erythrocyte Sedimentation Rate; Extractable Nuclear Antigen Autoantibodies; HLA-DR4; Latex Agglutination

Riboflavine
See Vitamin B₂

Rickettsial Serology
See Weil-Felix Reaction

Ristocetin Cofactor
See von Willebrand Factor

Rivotril
See Clonazepam

Rose-Waaler Test
See Rheumatoid Factor

Ross River Fever Antibodies
See Immunoglobulin Antibodies, Specific

RPR
See Rapid Plasma Reagin Test

Rubella Antibodies
NR: See Interpretation below.
Ind: To determine immunity to rubella (German measles), particularly in early pregnancy.
Int: TITRE less than 10 - Not immune (no previous infection or vaccination)
     TITRE 10 to 20 - Previous infection or vaccination.
     TITRE over 20 - Immune to rubella.
Phys: Once infected with, or vaccinated against rubella (German measles), antibody levels rise permanently and reinfection is not possible. Infection in early pregnancy may lead to foetal abnormalities, particularly deafness.
See also Immunoglobulin Antibodies, Specific

Salicylates
NR: Therapeutic range 1.0 to 2.5 mmol/L (15 to 35 mg/100 mL)
    Toxic over 2.5 mmol/L (over 35 mg/100 mL)
Ind: Overdose, or control of salicylate therapy.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Int:** Doctors adjust dosage to keep levels within therapeutic range, severity of any overdose can be assessed.

**Phys:** Salicylates are a group of inflammation and pain reducing medications. Aspirin is the most common one. Sample should be taken immediately before the next dose.

**SCC Associated Antigen**
See Squamous Cell Carcinoma Associated Antigen

**Schilling Test**

**NR:** See Interpretation below.
**Ind:** Vitamin B₁₂ deficiency.
**Int:** ABNORMAL 1st. STAGE - Regional enteritis (Crohn’s disease), lymphomas (cancer of lymph nodes).
ABNORMAL 2nd. STAGE - Lack of intrinsic factor (essential for the absorption of vitamin B₁₂ from the stomach), terminal ileal disease (small gut disease), pernicious anaemia, total gastrectomy (removal of stomach).
ABNORMAL 1st AND 2nd STAGE, NORMAL 3rd STAGE - Blind loop syndrome (after gut surgery), scleroderma, multiple small bowel diverticulae, bacterial overgrowth in the small intestine.
**Phys:** Test is carried out in three stages: 1. without intrinsic factor; 2. with intrinsic factor; 3. after antibiotics. Vitamin B₁₂ is absorbed in the ileum (last part of small intestine). This may be prevented by damaged ileal receptor sites, a lack of intrinsic factor (produced in stomach and essential for vitamin B₁₂ absorption) or conditions that allow bacteria to take up vitamin B₁₂ before it reaches the ileum. This test now superseded by other tests.

*See also Vitamin B₁₂*

**Selenium**

**NR:** Whole blood : 1.21 to 2.5 umol/L
Plasma (liquid part of blood without cells) : 0.7 to 1.3 µmol/L
**Ind:** Lack of selenium in diet.
**Int:** LOW - Dietary selenium deficiency, Keshan disease (form of heart failure), Kaschin-Beck disease (joint and muscle disease).
**Phys:** Common problem with seriously ill patients who are fed by a drip into a vein.

**SG**
See Specific Gravity

**SGGT**
See Gamma Glutamyl Transpeptidase

**SGOT**
See Aspartate Amino Transferase

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

SGPT
See Alanine Amino Transferase

Sickle Cells
NR: Absent
Ind: Anaemia.
Int: PRESENT - Sickle cell anaemia (red cells are crescent or sickle shaped instead of being round), sickle cell trait (inherited tendency to develop sickle cell anaemia).
Phys: Sickle cell anaemia almost invariably occurs in Negroes. Abnormal cells seen on routine blood film. These abnormal cells protect against developing malaria, but cause anaemia and tiredness.

Skeletal Muscle Autoantibodies
See Anti-Skeletal Muscle Antibodies

SKM
See Anti-Skeletal Muscle Antibodies

SMA
See Anti-Smooth Muscle Antibodies

Smith Antibodies
See Anti-Smith Antibodies

Smooth Muscle Autoantibodies
See Anti-Smooth Muscle Antibodies

Sodium
[Na]
NR: 135 to 145 mmol/L
Ind: Imbalance between fluids and electrolytes (salts) in blood.
Int: LOW (hyponatraemia) - Over hydration (excess fluid in body), acute or chronic diarrhoea, salt losing nephropathy (kidney disease), hypothyroidism (under active thyroid gland), fresh water drowning, hyperglycaemia (excess blood sugar - may lead to diabetes), Addison's disease, hypopituitarism (under active pituitary gland under the brain), acute kidney failure, syndrome of inappropriate ADH secretion, infection, cancer, cirrhosis of liver, ascites (fluid in belly cavity), congestive heart failure, cystic fibrosis, severe burns, excess sweating, prolonged storage of blood sample, drugs (eg. diuretics, tricyclic antidepressants, carbamazepine, phenothiazines, clofibrate).
HIGH (hypernatraemia) - Dehydration, salt water drowning, uraemia (kidney failure), diabetes insipidus, hyperaldosteronism, excess salt intake, artificial mechanical ventilation.
Phys: The level of blood sodium regulates the amount of water in the body. Dehydration may be due to lack of water or lack of salt (sodium chloride).
See also Anion Gap

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Sodium Valproate
See Valproate

Somatomedin C
See IGF-1

Specific Gravity, Serum
[SG]
NR: 1.025 to 1.029
Ind: Determine amount of water in body.
Int: HIGH - Dehydration.
        LOW - Excess water intake, Addison's disease, heat stroke, lack of salt in body.
Phys: Plasma is blood without all the cells. Its volume rises or falls with water excess or loss, while amount of protein in blood remains relatively stable, thus altering the specific gravity. Specific gravity is the density of a fluid compared to distilled water, which has an SG of 1.
See also Specific Gravity, Urine

Sperm Antibodies
NR: Absent
Ind: Infertility, vasectomy reversal.
Int: POSITIVE - Sperm survival unlikely
Phys: Test performed on female partner. Positive result would indicate cause for infertility.
        Vasectomy reversal unlikely to be successful if result positive.
See also Sperm Antibodies, Seminal Fluid

Spherocytes
NR: Absent
Ind: May be found on routine blood smear.
Int: PRESENT - Hereditary spherocytosis (inherited condition), autoimmune haemolytic anaemia, alcoholism, HbC disease (congenital abnormality of haemoglobin), drug induced (eg. methyldopa) haemolytic anaemia, severe viral infection, significant cancer.
Phys: Red blood cells that swell up with excess fluid form spherocytes. They have a defective cell membrane that allows excess sodium to enter, and fluid follows. The cells become swollen and fragile.

Squamous Cell Carcinoma Associated Antigen
[SCC Antigen]
NR: Negative
Ind: Monitoring the progress of SCCs that spread inside the body, detecting internal SCC in patients with a significant family history.
Int: POSITIVE - More than 60% of SCC involving lung, cervix, head and neck; less than 20% of other types of lung cancers; false positive result common.

See Disease Definitions section at back of book for explanation of unusual diseases.
Phys: SCC (squamous cell carcinomas) are a common form of skin cancer that may spread into internal tissues and organs. 

*See also Cancer Associated Antigens*

**Steroids, 17-Hydroxy**

NR: Male 7 to 19 µg/100 mL  
Female 9 to 21 µg/100 mL  
Ind: Measured in adrenal gland function tests.  
Int: HIGH - Adrenal gland overactivity  
LOW - Adrenal gland underactivity (Addison's disease).

Phys: 17-Hydroxy steroids are produced in the adrenal glands that sit on top of each kidney.  
*See also Dehydroepiandrosterone Sulfate*

**Sugar**

See Glucose

**Sulfate**

NR: 50 to 150 µmol/L  
Ind: Kidney disease.  
Int: HIGH - Kidney failure.

**Sulphaemoglobin**

NR: Absent  
Ind: Cyanosis (blue tinge to skin colour).  
Int: PRESENT - Haemolysis (red blood cell destruction) from exposure to sulpha drugs, dyes, and other oxidants.

**Synacthen Stimulation Test**

NR: Greater than 100% rise in cortisol level in blood after injection with ACTH (adrenocorticotropic hormone - a pituitary gland hormone that stimulates the adrenal glands that sit on top of each kidney).  
Ind: Addison's disease.  
Int: LOW - Addison's disease (under active outer part of the adrenal gland).  
Phys: An initial blood cortisol reading is taken. A short acting ACTH preparation is then given by injection and a further specimen for blood cortisol is taken 30 minutes later.  
*See also Cortisol*

**Syphilis IgG Enzyme Immunoassay**  
*[Syphilis EIA]*

NR: Negative  
Ind: Sexually transmitted disease.  
Int: POSITIVE - Syphilis  
Phys: Very sensitive for the presence of antibodies against *Treponema pallidum*, the bacteria which causes syphilis, but does not show if disease is active or dormant.  
*See also Fluorescent Treponemal Antibodies; Rapid Plasma Reagin Test*

See Disease Definitions section at back of book for explanation of unusual diseases.
**T**

**T Cell Lymphocytes**

**NR:** CD3 Mature T Cells - 0.8 to $2.4 \times 10^9$/L  
CD4 T Helper Cells - 0.5 to $1.6 \times 10^9$/L  
CD8 T Suppressor Cells - 0.2 to $1.0 \times 10^9$/L  
CD16 Natural Killer Cells - 0.07 to $0.6 \times 10^9$/L

**Ind:** Damage to the immune system (eg. AIDS).

**Int:** LOW - Immune deficiency, AIDS, cancers, leukaemia, chemotherapy (drug treatment of cancers).  
CD16 LOW - Poorly functioning immune system, cancers, Chediak-Higashi syndrome

**Phys:** T lymphocytes are a type of white blood cell that are responsible for a significant proportion of the body's immunological defence. CD = Cluster Differentiation antibodies, specific types of disease fighting antibody proteins.

**T₃ Uptake of Resin**  
[T₃ RU] (T₃ Uptake of Monoagglutinated Albumin)

**NR:** 22 to 35%

**Ind:** Thyroid gland disease.

**Int:** HIGH - Hyperthyroid (over active thyroid gland), nephrotic syndrome (kidney failure), Graves' disease, drugs (eg. phenytoin, aspirin).  
LOW - Hypothyroid (under active thyroid gland), pregnancy, oral contraceptives, chronic liver disease, drugs (eg. propranolol, phenytoin)

**Phys:** Indirect measure of the hormone thyroxine in the body. This test has now been superseded by other thyroid function tests.

*See also Triiodothyronine, Free; Triiodothyronine, Total; Thyroxine, Free*

**T₄**  
(Total Thyroxine)

**NR:** 64 to 160 nmol/L (5 to 13 µg/100 mL)

**Ind:** Thyroid gland disease.

**Int:** LOW - Hypothyroidism (under active thyroid gland), nephrotic syndrome (kidney failure), chronic disease, drugs (eg. aspirin, steroids, frusemide, diazepam, lithium, sulfamethoxazole/trimethoprim).  
HIGH - Hyperthyroidism (over active thyroid gland), pregnancy, Graves' disease (form of hyperthyroidism), severe infections, excessive vomiting, high altitudes, inherited trait, acute psychiatric conditions, stress, drugs (eg. oral contraceptives, amiodarone, amphetamines).

**Phys:** This is a direct measure of total circulating thyroxine (T₄).  
*See also Thyroxine, Free*

See Disease Definitions section at back of book for explanation of unusual diseases.
Tegretol
See Carbamazepine

Testosterone
NR: Male 12 to 34 nmol/L
    Female 0.4 to 3.6 nmol/L
    Before puberty 0.4 to 0.7 nmol/L
Ind: Sexual dysfunction.
Int: LOW - Male hypogonadism (under active testes), panhypopituitarism (under active pituitary gland under the brain), male menopause, delayed puberty, Addison’s disease, sterility.
    HIGH - Virilising adrenal tumour (tumour of adrenal glands on kidneys that produces testosterone), Stein-Leventhal syndrome, pregnancy, oestrogen therapy.
Phys: Testosterone is the sex hormone produced by the testes that is responsible for the development of male characteristics (eg. facial hair, penis enlargement at puberty) in a person. It is produced in response to hormonal signals from the pituitary gland which lies under the brain.
See also Dehydroepiandosterone Sulfate

Testosterone, Free
[FTe]
NR: Female 16 to 40 years - 3 to 12 pmol/L
    Female 40+ years - 2 to 10 pmol/L
    Male 16 to 40 years - 60 to 130 pmol/L
    Male 41 to 70 years - 40 to 100 pmol/L
    Male 70+ years - 30 to 90 pmol/L
Ind: Female hirsutism (signs of excess facial hair and other male characteristics), sexual dysfunction.
Int: LOW - Male hypogonadism (under active testes), panhypopituitarism (under active pituitary gland under the brain), male menopause, delayed puberty, Addison’s disease, sterility.
    HIGH - Virilising adrenal tumour (tumour of adrenal glands on kidneys that produces testosterone), Stein-Leventhal syndrome, pregnancy.
Phys: Less accurate test than testosterone.
See also Testosterone

Theophylline
NR: Therapeutic range 55 to 110 µmol/L (10 to 20 mg/L)
Ind: Theophylline treatment.
Int: Doctors adjust dosage to keep levels within therapeutic range
Phys: Theophylline is an old fashioned medication used for relief of asthma. Half-life (time taken for half the medication present to be removed from the body) is 3 to 9 hours. Blood sample should be taken 4 hours after last dose. Beneficial clinical effects of the medication may be observed at levels below the therapeutic range.

See Disease Definitions section at back of book for explanation of unusual diseases.
Thiamine
See Vitamin B₁

Thrombin Clotting Time
NR: 10 to 15 seconds
Ind: Blood clotting disorders.
Int: HIGH - Low fibrinogen levels, heparin treatment.
Phys: Fibrinogen is essential in the clotting process. Heparin is used to treat blood clots. See also tests listed under Coagulation Screen

Thrombocytes
See Platelet Count

Thromboplastin Time
See Activated Partial Thromboplastin Time

Thyroglobulin Antibody (Anti-Thyroglobulin Antibody)
NR: Less than 40 U/mL
Ind: Thyroid gland disease.
Int: HIGH - Hyperthyroidism over active thyroid gland), autoimmune thyroiditis (inflammation of the thyroid gland), thyroid cancer.
See also other Thyroid Function Tests

Thyroglobulin
NR: Less than 38 µg/L
Ind: Thyroid gland inflammation or cancer.
Int: HIGH - Thyroiditis (inflammation of thyroid gland), thyroid cancer, thyrotoxicosis (severely over active thyroid gland).
Phys: Test normally used to check for recurrence of thyroid cancer after total thyroidectomy (removal of the thyroid gland).

Thyroid Antibodies
See Anti-Thyroid Peroxidase Antibodies; Thyroglobulin Antibody; Thyroid Microsomal Autoantibody Titre

Thyroid Function Tests
See Anti-TSH Receptor Antibodies; Effective Thyroxine Ratio; Free Thyroxine Index; Long Acting Thyroid Stimulator Antibody; T₃ Uptake of Resin; T4; Thyroglobin Antibody; Thyroid Microsomal Autoantibodies; Thyrotropin Receptor Antibody; Thyroxine, Free; Triiodothyronine, Free; Triiodothyronine, Total.

Thyroid Microsomal Autoantibody Titre (Anti-Microsomal Antibody Titre)
NR: Less than 100

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Thyroid Stimulating Hormone**

**[TSH]**

*NR:* 0.2 to 4.0 mU/mL

*Ind:* Thyroid gland disorders.

*Int:* HIGH - Hypothyroidism (under active thyroid gland), autoimmune thyroid disease, iodine deficiency goitre.

LOW - Excess thyroid hormone replacement

**Phys:** This is the most commonly used screening test for thyroid gland disease. TSH is produced in the pituitary gland, which lies under the brain, and circulates through the blood to the thyroid gland where it stimulates the production of the hormone thyroxine by the thyroid gland.

*See also other Thyroid Function Tests*

**Thyrotropin Receptor Antibody**

*NR:* Negative

*Ind:* Thyroid gland disease.

*Int:* POSITIVE - Some cases of hyperthyroidism (over active thyroid gland).

*See also other Thyroid Function Tests*

**Thyroxine, Free**

*(Free T₄)*

*NR:* 10 to 25 pmol/L (0.8 to 2.0 ng/100 mL)

*Ind:* Thyroid gland disease.

*Int:* HIGH - Hyperthyroidism (over active thyroid gland), thyroiditis (inflamed thyroid gland), stress, drugs (eg. frusemide, amiodarone, amphetamines).

LOW - Hypothyroidism (under active thyroid gland), pregnancy, elderly, drugs (eg. phenytoin).

**Phys:** Thyroxine is the hormone produced by the thyroid gland, which lies in the front of the neck. Thyroxine controls the rate at which every cell in the body functions - high levels increase the rate, low levels decrease it. This test measures the amount of thyroxine directly affecting the cell. The result can be varied by steroid therapy.

*See also T₄*

**Thyroxine, Total**

*See T₄*

**Thyroxine Index**

*See Free Thyroxine Index*

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Medical Tests Explained

**TIBC**
See Iron Binding Capacity, Total

**Tobramycin, Blood**
See Aminoglycosides

**Toxoplasma Antibodies, Serum**
See Immunoglobulin Antibodies, Specific

**TPHA**
See *Treponema pallidum* Haemagglutination

**TRAB**
See Anti-TSH Receptor Antibodies

**Transaminases and Transferases**
See Aspartate Amino Transferase; Alanine Amino Transferase

**Transferrin**

NR: 1.7 to 3.5 g/L

Ind: Anaemia.

Int: LOW - Haemochromatosis (excess iron in body), iron supplements
     HIGH - Iron deficiency anaemia.

Phys: Transferrin is a protein that transfers iron between cells in the body, and carries iron in the blood stream.

*See also Carbohydrate-Deficient Transferrin; Transferrin Saturation*

**Transferrin Saturation**

NR: 25 to 50%

Ind: Anaemia, haemochromatosis (excess iron in body).

Int: LOW - Iron deficiency anaemia, lack of iron in body
     HIGH - Excess iron in body, haemochromatosis.

Phys: Substantial seasonal and daily variation.

*See also Iron; Iron Binding Capacity; Transferrin*

**Transthyretin**
See Prealbumin

**Treponema pallidum Haemagglutination**

[TPHA]

NR: Negative

Ind: Sexually transmitted disease.

Int: POSITIVE - Syphilis (active, latent or treated), yaws (rare skin infection).

Phys: This test is less sensitive than fluorescent treponemal antibodies (FTA), and a positive result does not disappear with treatment.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Triglycerides
NR: Less than 2.3 mmol/L (less than 200 µg/100 mL) after 12 hour fast
Ind: Obesity, heart disease.
Int: LOW - malnutrition
HIGH - Increased risk of heart disease and atherosclerosis (hardening of arteries), familial, nephrotic syndrome (kidney disease), chronic kidney failure, diabetes mellitus, hypothyroidism (under active thyroid gland), Cushing syndrome, pancreatitis, hypopituitarism (under active pituitary gland under the brain), acromegaly (enlargement of bones), glycogen storage diseases, alcohol, pregnancy, drugs (eg. oral contraceptives, steroids).
Phys: Triglycerides are a type of fat also known as VLDL (very low density lipoproteins). Hypertriglyceridaemia (excess levels of triglycerides) may be inherited or associated with obesity, diabetes and other body chemistry disorders. No alcohol should be drunk for 72 hours and no food eaten for 12 hours before the test.
See also Cholesterol

Triiodothyronine, Free
(Free T₃)
NR: 4 to 8 pmol/L
Ind: Thyroid gland disease.
Int: LOW - Hypothyroidism (under active thyroid gland).
HIGH - Thyroiditis (inflamed thyroid gland).
Phys: Test results only positive late in hypothyroidism.
See also other Thyroid Function Tests

Triiodothyronine, Total
(Total T₃)
NR: 0 to 5 years: 1.6 to 3.3 nmol/L
5 to 10 years: 1.5 to 3.0 nmol/L
Over 10 years: 1.5 to 2.7 nmol/L
Ind: Thyroid gland disease.
Int: HIGH - Thyrotoxicosis (toxic levels of thyroxine), hyperthyroidism (over active thyroid gland).
Phys: More sensitive test for hyperthyroidism than free thyroxine (free T₄).
See also Thyroxine, Free

‘Triple Test’ Antenatal Investigation for Down Syndrome
Phys: Results of Alpha-fetoprotein, chorionic gonadotrophin human (HCG) and oestriol tests are compared to give an indication of risk for Down syndrome in foetus. See individual tests for further information.

Troponin I
NR: Less than 0.6 ug/L
Ind: Heart disease.
See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Int:** HIGH - Myocardial infarct (heart attack), myocarditis (heart inflammation), heart injury. VERY HIGH (>2 ug/L) - High risk of death from existing heart attack within 30 days.

**Phys:** Positive within 4 hours of pain onset in myocardial infarct. Remains high for at least 7 days. Very specific test. Risk of death from heart attack increases rapidly with higher troponin I levels.

*See also Troponin T*

**Troponin T**

**NR:** Negative (less than 0.2 µg/L)

**Ind:** Heart damage.

**Int:** POSITIVE - Myocardial infarct (heart attack), unstable angina, myocarditis (heart inflammation), heart injury, kidney failure.

**Phys:** More sensitive than creatine kinase test for heart attack. 80% positive within 4 hours, and 99% within 6 hours, of pain onset in myocardial infarct. Remains high for at least 7 days. Very specific and commonly used test.

*See also Creatine kinase; Troponin I*

**Trypanosome Antibodies**

**NR:** Negative

**Ind:** Sleeping sickness.

**Int:** POSITIVE - Trypanosomiasis (sleeping sickness), Chaga’s disease.

**Phys:** False positive results common.

**Trypsin, Immunoreactive**

**NR:** Nil.

**Ind:** Screening test on infants for cystic fibrosis.

**Int:** HIGH - Cystic fibrosis (severe lung disease), acute pancreatitis (inflamed pancreas).

**Phys:** Cystic fibrosis levels appear to drop after one month of age as trypsin inhibitors increase in blood.

**Tryptase**

**NR:** Less than 2u/L

**Ind:** Anaphylaxis (severe allergy reaction).

**Int:** HIGH - Anaphylaxis, mastocytosis (skin allergy reaction).

**Phys:** Tryptase released by degeneration of mast cells, which are responsible for allergy reactions. False negative result possible.

**TSH**

See Thyroid Stimulating Hormone

**Tumour Markers**

See Cancer Associated Antigens

**Typhoid Antibodies**

See Widal Test

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Urate (Uric Acid)
NR: Male 0.24 to 0.42 mmol/L (3.2 to 8.1 mg/100 mL)
    Female 0.17 to 0.36 mmol/L (2.2 to 7.1 mg/100 mL)
Ind: Acute arthritis.
Int: HIGH - Gout, high protein diet, leukaemia, hypertension (high blood pressure), kidney failure, myeloma, lymphoma, other cancers, polycythaemia, prolonged fever, hypothyroidism (under active thyroid gland), hyperlipidaemia (high blood fat levels), starvation, dehydration, psoriasis, generalised viral infection, infectious mononucleosis (glandular fever), alcoholism, fasting, haemolytic anaemia, rhabdomyolysis (muscle breakdown), acidosis (excessively acidic blood), lead poisoning, Lesch-Nyhan syndrome, toxoaemia of pregnancy, obesity, drugs (eg. thiazide diuretics, other diuretics, aspirin and similar, nicotinic acid, cytotoxics, lead).
LOW - Acute hepatitis, probenecid or allopurinol treatment, Fanconi syndrome, renal tubular disease (form of kidney failure), syndrome of inappropriate ADH secretion, diuresis (excess production of urine), pregnancy.
Phys: Uric acid is an end product of protein breakdown (metabolism), and is excreted by the kidneys. Gout is a metabolic disease characterised by increased levels of uric acid, and crystals of this are deposited in joints. Results are raised by thiazide diuretics, lowered by salicylates, methyldopa and phenylbutazone.

Urea (Blood Urea Nitrogen) [BUN]
NR: 3.2 to 8.0 mmol/L (20 to 45 mg/100 mL)
    Newborn infant 1.7 to 5.3 mmol/L
Ind: Kidney disease.
Int: HIGH - Kidney failure, nephritis (kidney inflammation), urinary tract obstruction by stone or tumour, dehydration, intestinal bleeding, shock (blood loss), heart failure, excess protein breakdown in body, diabetic kidney disease, polycystic kidney disease, reflux of urine into kidney, adrenal gland failure, dehydration, elderly, drugs (eg. analgesics, NSAIDs).
LOW - Liver failure, nephrosis (kidney disease), cachexia (severe weight loss), diabetes insipidus, pregnancy, overhydration (excess water in body), diuresis (excess urine production), kwashiorkor (no protein in diet), low protein diet.
Phys: Kidney damage prevents urea excretion, and levels increase in blood. Excretion of urea is a good test of kidney function. Results are affected by drugs such as methyldopa, indomethacin, propranolol, etc. Urea level varies directly with protein intake. Creatinine is a more reliable estimate of renal function.
See also Creatinine

See Disease Definitions section at back of book for explanation of unusual diseases.
Urea Nitrogen, Blood [BUN]
See Urea

Uric Acid
See Urate

Valium
See Diazepam

Valproate
(Epilim; Sodium Valproate)
NR: Therapeutic range 300 to 600 μmol/L (40 to 85 μg/mL)
Ind: Valproate therapy.
Int: Doctors adjust dosage to keep serum levels within therapeutic range
Phys: Valproate is used to treat epilepsy. Blood sample should be taken immediately before next dose.

Vancomycin
See Aminoglycosides

Varicella Zoster Antibody
NR: Negative
Ind: Detection of past exposure to Varicella zoster.
Int: PRESENT - Past infection with chickenpox or shingles
Phys: Used in immunocompromised patients to detect previous infection. Not for diagnosis of current infection. Varicella (or Herpes) zoster is a virus that causes chickenpox and shingles.

Vasoactive Intestinal Peptide
NR: Negative.
Ind: Following progress of certain cancers.
Int: POSITIVE - Some cases of bronchogenic lung cancer, pancreatic islet cell cancer (cancer of the pancreas), neuroblastoma (brain tumour), thyroid medullary cancer
Medical Tests Explained

(cancer of thyroid gland in neck), phaeochromocytoma (adrenal gland tumour causing very high blood pressure); occasionally positive in shock (blood loss) and liver failure.

See also Cancer Associated Antigens

Vasopressin
See Antidiuretic Hormone

VDRL
[Venereal Disease Research Laboratory Test]
See Rapid Plasma Reagin Test

Very Low Density Lipoprotein Cholesterol
[VLDL]
NR: Less than 1 mmol/L
Ind: High cholesterol levels.
Int: HIGH - Reaven syndrome.
See also Cholesterol

Viral Serology
See Immunoglobulin, Specific

Viscosity
NR: 1.6 to 1.9 mPa.s (1.52 to 1.72 centipoise)
Ind: Blood clots.
Int: HIGH - Hyperviscosity syndrome (blood flows slowly), multiple myeloma, Waldenström macroglobulinaemia, polycythaemia rubra vera, acute leukaemia, chronic myeloid leukaemia, rheumatoid arthritis, acute inflammation, dehydration, hypothermia (body temperature very low).
LOW - Overhydration, excess fluids through drip into a vein.
Phys: Viscosity is a measure of the ability of a fluid to flow freely. A high viscosity (flow is thicker) may be a cause of venous thrombosis (blood clots in veins).

Vitamin A
NR: 0.7 to 2.8 µmol/L
Ind: Malnutrition, eye disease.
Int: HIGH - Excess ingestion of vitamin A, carotenaemia (yellow skin).
LOW - Xerophthalmia (dry eye), keratomalacia (eye disease), photophobia, night blindness, malnutrition.
Phys: Vitamin A is vital for the formation of the pigment in the retina at the back of the eye. It is found in fish oil, milk and eggs, vegetables.

Vitamin B₁
(Thiamine)
NR: Average values:
Male 8.9 µg/100 mL

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Female 7.6 µg/100 mL

**Ind:** Malnutrition.

**Int:** LOW - Beriberi, Wernicke syndrome.

**Phys:** Thiamine is present in cereals, green vegetables, liver and peanuts. Lack causes nerve damage and loss of appetite. Alcoholics are often lacking in vitamin B1.

**Vitamin B₂ (Riboflavin)**

**NR:** 2.6 to 3.7 µg/100 mL

**Ind:** Poor nutrition, stunted growth.

**Int:** LOW - Malnutrition or malabsorption with dry mouth, inflamed mouth and photophobia (unable to stand bright light).

**Phys:** Vitamin B₂ is found in milk, liver and green vegetables.

**Vitamin B₃ (Nicotinic Acid)**

**NR:** Average 0.6 mg/100 mL

**Ind:** Malnutrition.

**Int:** LOW - Pellagra.

**Phys:** Nicotinic acid is present in whole grain, lean pork and beef, and peanuts. Lack causes disease called pellagra and the symptoms of tiredness, dermatitis, diarrhoea and sore mouth.

**Vitamin B₁₂ (Cyanocobalamin)**

**NR:** 150 to 660 pmol/L (200 to 900 ng/mL)

**Ind:** Anaemia.

**Int:** LOW - Pernicious anaemia, gastrectomy (surgical removal of stomach), intestinal blind loops (after intestinal surgery), Crohn's disease, sprue, chronic pancreatitis (inflammation of pancreas gland), subacute combined degeneration of the cord, congenital, vegan diet. False low due to folate deficiency, late pregnancy, oral contraceptives, multiple myeloma, megadose vitamin C therapy.

**HIGH - Liver disease. False high due to chronic leukaemia, polycythaemia rubra vera, widespread cancer.**

**Phys:** Vitamin B₁₂ is required for the formation of red blood cells. Intrinsic factor produced in stomach required for absorption of vitamin B₁₂ from the gut.

*See also Schilling Test*

**Vitamin C (Ascorbic Acid)**

**NR:** 23 to 86 µmol/L (0.4 to 1.5 mg/100 mL)

**Ind:** Poor diet.

**Int:** LOW - Scurvy, rickets (bone disease of infants).

**Phys:** A severe lack of vitamin C leads to the disease scurvy, which has the symptoms of impaired wound healing, loss of teeth, mouth ulcers and poor resistance to infections.
and stress. Scurvy is almost unknown in developed countries. The vitamin is plentiful in citrus and berry fruits.

**Vitamin D**
See 25-Hydroxyvitamin D

**Vitamin E**

**NR:** Adult: 11 to 46 µmol/L  
Child: 7 to 35 µmol/L

**Ind:** Haemolytic anaemia (red blood cells break down excessively), poor absorption of fat.

**Int:** LOW - Deficiency of vitamin E due to break down of red blood cells or poor absorption of vitamin from gut.  
FALSE NORMAL - High cholesterol or blood fats levels, gall bladder disease.

**Phys:** Vitamin E dissolves in fat, not water.

**Vitamin K**

*(Phytomenadione)*

**NR:** Varies between laboratories.

**Ind:** Undiagnosed bleeding disorders.

**Int:** LOW - Poor absorption of vitamin k from gut, cholestasis (gall bladder disease), small bowel diseases, bleeding disease of newborn, lack of vitamin in diet, long term antibiotic use.

**Phys:** Lack of vitamin K causes excessive bleeding and bruising. Test not yet routinely available.

**VLDL**
See Very Low Density Lipoprotein Cholesterol

**VMA**
See 4-Hydroxy-3-Methoxy Mandelic Acid

**Volume**
See Blood Volume

**von Willebrand Factor**

*[vWf]*

*(Ristocetin Cofactor; Collagen Binding Assay, von Willebrand Factor)*

**NR:** Variable

**Ind:** von Willebrand disease (inherited bleeding disorder).

**Int:** LOW - von Willebrand disease.

**Phys:** Test can measure severity of von Willebrand disease. Subtypes of disease can be identified by variables within test.

**vWf**
See von Willebrand Factor

See Disease Definitions section at back of book for explanation of unusual diseases.
Waaler-Rose Test
See Rheumatoid Factor

**Wasserman Complement Fixation Test**

**[WR]**

NR: Negative
Ind: Sexually transmitted disease.
Int: POSITIVE - Syphilis, yaws (rare skin disease caused by same bacteria).

**Phys:** Used only as a screening test for syphilis.

*See also* Rapid Plasma Reagin Test

**WCC**

See White Cell Count

**Weil-Felix Reaction**

**(Rickettsial Serology)**

NR: Negative (titre less than 1:160)
Ind: Typhus.
Int: POSITIVE - Epidemic typhus, murine typhus, scrub typhus, rocky mountain spotted fever, tick typhus
NEGATIVE - Q fever, other rickettsiae, normal persons.

**Phys:** Typhus is caused by Rickettsiae, a bacteria like organism, and transmitted from person to person by insects such as tics.

**White Cell Count [WCC]**

**(Leucocyte count)**

NR: Neonate 10 to 30 x 10⁹/L (10,000 to 30,000/mm³)
Infant 6 to 20 x 10⁹/L (6,000 to 20,000/mm³)
Child 5 to 15 x 10⁹/L (5,000 to 15,000/mm³)
Adult 4 to 10 x 10⁹/L (4,000 to 10,000/mm³)

Ind: Infection, blood disease.
Int: HIGH (Leucocytosis) - Bacterial infection, leukaemias, alcoholic hepatitis, cholecystitis (gall bladder infection), pregnancy
LOW (Leucopenia) - Leukaemia, viraemia (generalised viral infection), autoimmune disease, after removal of spleen, elderly.

ABNORMAL FORMS - Bloch-Sulzberger syndrome, Bloom syndrome, eosinophilia-myalgia syndrome, May-Hegglin anomaly, myelodysplastic syndrome, Sézary syndrome, leukaemia

**Phys:** White blood cells are also known as leucocytes. They are the infection fighting cells of the body and come in many different forms. This is one of the most commonly performed blood tests.

*See also* Basophils; Eosinophils; Lymphocytes; Monocytes; Neutrophils

See Disease Definitions section at back of book for explanation of unusual diseases.
Widal Test  
(Typhoid Antibodies)  
NR: Negative  
Ind: Typhoid fever.  
Int: RISING TITRE - Typhoid fever  
      POSITIVE - Typhoid vaccination, carrier of typhoid.  
Phys: False positives and negatives common. Rising titre (test positive at increasing dilutions of blood sample) more significant. Typhoid is a disease caused by a bacteria that is transmitted from one person to another by poor hygiene.  

WR  
See Wasserman Complement Fixation Test

Z

Zarontin  
See Ethosuximide

Zinc  
[Zn]  
NR: 12 to 20 µmol/L (80 to 140 µg/100 mL)  
Int: LOW - Cirrhosis of liver, diarrhoea, malabsorption of zinc, alcoholism, drugs (eg. steroids, diuretics - fluid tablets)  
      HIGH - May be due to taking zinc tablets.

Zn  
See Zinc
Bone and Bone Marrow

The spongy interior of most bones is filled with marrow, a soft gelatinous substance that produces white blood cells (to fight infection), red blood cells (to carry oxygen) and platelets (which help stop bleeding). Bone marrow is crucial to the maintenance of life. Blood vessels and nerves pass into the spongy interior of a bone through small channels in the hard outer layer.

A bone marrow biopsy is most commonly carried out in cases of suspected leukaemia and certain anaemias. The bone marrow is responsible for the production of new blood cells, and an analysis of bone marrow can give vital information if this production seems to have been disrupted and caused disease.

Marrow is obtained through a needle inserted into the cavity of either the breastbone or the pelvic bone. A local anaesthetic is given, but there will usually be some pain as the needle reaches the interior. A smear of the bone marrow extracted is examined to assess such things as the number of cells, the internal chemistry and the maturity of the cells, and the presence of abnormal cells.
Tests on Bone and Bone Marrow

Bone Mineral Density
[BMD]
NR: T score above –1
Ind: Osteoporosis.
Int: Less than –2.5: Osteoporosis requiring treatment
From –1 to –2.5: Borderline, retest in 2 years, institute prevention with medication, exercise, hormone replacement or calcium.
Phys: Dual photon densitometry measures bone density at wrist and interpreted as a T score variation from young normal mean.

Iron, Marrow Transit Time
NR: Mean 3.5 days
Ind: Anaemia due to a lack of iron
Int: LOW - Iron deficiency anaemia
Phys: Iron is used in the marrow to make haemoglobin for red blood cells.

Marrow Cells
NR: Sideroblasts 40 to 60%
      Neutrophils 7 to 30%
      Eosinophils 0.5 to 4%
      Basophils 0 to 0.7%
      Lymphocytes 3 to 17%
      Myeloblasts 0.5 to 5%
      Metamyelocytes 13 to 30%
      Megakaryocytes 0 to 3%
      Plasma cells 3 to 5%
      Monocytes 0.5 to 5%
      Normoblasts 7 to 32%
      Myelocytes 5 to 22%
      Promyelocytes 1 to 8%
      Pronormoblasts 1 to 8%
      Reticular cells 0.1 to 2%
These are the different types of cells normally found in bone marrow.

Ind: Abnormal cells found on a blood test
Int: ABNORMAL - Various blood diseases including agranulocytosis, aplastic anaemia, haemolytic anaemia and leukaemias; bone diseases such as osteogenic sarcoma (bone cancer); the use of cytotoxic and immunosuppressive (cancer treating) drugs; other diseases affecting white blood cells such as myelomatosis and Hodgkin’s disease; and the tropical disease visceral leischmaniasis
LOW Sideroblasts - A lack of iron
Phys: All white and red blood cells are initially formed in the spleen or bone marrow.

See Disease Definitions section at back of book for explanation of unusual diseases.
Cerebrospinal Fluid (CSF)

Cerebrospinal fluid (CSF) surrounds the brain and spinal cord, and there is a slow circulation from the ventricles inside the brain, where the CSF is made, to the outside of the brain and down the spine to the lower back.

A sample of CSF is obtained by putting the patient on their side, curled up in the foetal position, and putting a needle between two vertebrae in the lower back and pushing it into the CSF filled space surrounding the spinal cord. About two to five mLs. of fluid is removed, and sometimes a similar amount of sterile saline is injected back into the space to replace the removed fluid.
Tests on Cerebrospinal Fluid

Antimicrobial Antibodies
NR: Absent
Ind: Check for cause or type of infection.
Int: POSITIVE - Present or recent infection with specific bacteria or virus.
Phys: Test is specific for a particular infective agent. Only a limited number of bacteria and viruses (and their diseases) can be checked. Tests available include those for brucellosis, Chlamydia, Coxiella (Q fever), Coxsackie virus, Cytomegalovirus, Echoviruses, Epstein-Barr virus (glandular fever), hepatitis A, hepatitis B, hepatitis C, Herpes simplex, Legionnaires disease, leptospirosis, measles, mumps, Mycoplasma pneumoniae, Ross River fever, rubella, salmonellosis and toxoplasmosis.

Cerebrospinal Fluid Cells
NR: Neutrophils - nil
Lymphocytes - less than 5/µL
Erythrocytes - less than 5/mL
Ind: Most forms of brain disease.
Int: HIGH [25 to 2000 cells/µL] - Viral encephalitis, TB (tuberculosis), syphilis, brain abscess, polio, brain injury, toxoplasmosis, bleed into or around the brain (subdural or cerebral haemorrhage), brain tumour, multiple sclerosis, alcoholism or kidney failure (uraemia).
Phys: Neutrophils and lymphocytes are different types of white blood cells, and erythrocytes are red blood cells. They are not normally found in the cerebrospinal fluid that surrounds the brain and spinal cord.

Cerebrospinal Fluid Pressure
NR: Horizontal adult : 70 to 200 mm water
Horizontal child : Less than 100 mm water
Horizontal infant : Less than 80 mm water
Ind: Brain disease.
Int: HIGH - Viral meningitis or encephalitis, bleeding around the brain (subdural or subarachnoid haemorrhage) or alcoholism
VERY HIGH - Bacterial meningitis, syphilis, tuberculosis (TB), bleeding into the brain (cerebral haemorrhage) or toxoplasmosis

Chloride
[Cl⁻]
NR: 120 to 30 mmol/L (700 to 750 mg/100 mL)
Ind: Meningitis.
Int: LOW - Acute meningitis or tuberculosis of brain (TB).

See Disease Definitions section at back of book for explanation of unusual diseases.
Glucose
NR: 2.1 to 4 mmol/L (40 to 100 mg/100 mL)
Ind: Brain disease.
Int: LOW - Bacterial meningitis, tuberculosis of the brain, syphilis, insulin use.
       HIGH - After bacterial encephalitis (brain infection), tumours, kidney failure, severe diabetes.
See also Glucose, Blood

Immunoglobulin G
[IgG]
NR: Adult 5 to 45 mg/L
    Child 8 to 64 mg/L
Ind: Meningitis.
Int: HIGH - Viral meningitis.

Lactate
NR: 1.2 to 2.8 mmol/L
Ind: Meningitis.
Int: HIGH - Bacterial meningitis, severe lack of oxygen to brain (cerebral hypoxia).
Phys: Levels do not rise with viral meningitis. Very early sign in bacterial meningitis.

Protein
NR: Adult 0.1 to 0.4 g/L
    Child Less than 0.2 g/L
    Infant Less than 0.3 g/L
Ind: Suspected brain infection, tumour or injury.
Int: VERY HIGH - Bacterial meningitis, TB meningitis, toxoplasmosis, premature infant
       HIGH - Syphilitic meningitis, polio, cerebral haemorrhage (bleeding into brain), brain
tumour, new born infant, blood contaminated sample during procedure.

Sugar
See Glucose
Faeces

The body disposes of solid wastes as faeces through the anus. It consists mainly of fibre (cellulose), fats, protein and small amounts of inorganic substances such as iron and phosphorus. At least two thirds of the total weight of faeces is made up of water, but more commonly it is three-quarters water, and if the person has diarrhoea, water may make up over 95% of the faeces. Bacterial debris also makes up a very large part of faeces.

Faeces is usually passed once or twice a day, but some people are comfortable passing faeces only two or three times a week. The amount passed varies markedly from one person to another, and depends greatly upon the diet. The more fibre in the diet, the greater the volume of faeces.
Tests on Faeces

AAT
See Alpha1-Antitrypsin

Alpha1-Antitrypsin
[AAT]
NR: Less than 1.5 mg/g dry weight of faeces
Ind: Bowel inflammation
Int: HIGH - Protein losing enteropathy (inflammatory bowel disease)
Phys: Alpha1-Antitrypsin is a protein that may leak into the bowel when it is inflamed. Blood loss into intestine may give a false high reading
See also Alpha1-Antitrypsin, Blood

Blood, Occult
See Occult Blood

Chymotrypsin
NR: More than 75 µg/g
Ind: Pancreas gland diseases.
Int: LOW - Impaired pancreatic function
Phys: Screening test only, not diagnostic.

Fat
NR: Less than 21 g/3 days (less than 60 mmol/3 days)
Ind: Weight loss.
Int: HIGH - Malabsorption syndrome (unable to absorb fat), tropical sprue (caused by a long term intestinal infection contracted in equatorial countries), afferent loop syndrome (complication of major surgery to the stomach), coeliac disease (inability to digest the protein gluten which is found in cereal grains such as wheat, rye, barley and oats), chronic pancreatitis, cystic fibrosis, lactose (milk) intolerance, short bowel syndrome, and inadequate bile from the gall bladder and liver.
Phys: Faeces collected over three days tested.

Magnesium
[Mg]
NR: Less than 45 mmol/L (less than 15 mmol/day)
Ind: Unexplained diarrhoea.
Int: HIGH - Abuse of laxatives containing magnesium, hypomagnesaemia (lack of magnesium in blood) due to loss of magnesium into gut

See Disease Definitions section at back of book for explanation of unusual diseases.
Melaena
See Occult Blood, Faeces

Occult Blood
NR: Negative
Ind: Suspected bleeding in gut.
Int: See table below

<table>
<thead>
<tr>
<th>CHEMICAL TEST</th>
<th>IMMUNO CHEMICAL</th>
<th>INTERPRETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>Negative</td>
<td>Upper gastrointestinal bleed (e.g. oesophageal varices, gastric or duodenal ulcer etc.)</td>
</tr>
<tr>
<td>Positive</td>
<td>Positive</td>
<td>Lower intestinal bleed (e.g. rectal cancer, polyps, ulcerative colitis)</td>
</tr>
<tr>
<td>False positive</td>
<td>Negative</td>
<td>Certain foods (see Physiology below)</td>
</tr>
</tbody>
</table>

Phys: Occult merely means hidden, so it is a test for blood that is not visible in the faeces. The chemical test detects the haem molecule (part of haemoglobin in blood), while immunochemical test detects only the whole intact haemoglobin molecule, allowing differentiation between bleeding coming from the upper and lower parts of the intestine as the haemoglobin molecule is broken down as it moves through the gut. No red meat, cauliflower, broccoli, turnips, bananas or radishes should be eaten for 3 days before test as these may interfere with chemical test. Three tests on consecutive days are necessary.

pH
NR: Meconium (faeces of foetus before birth) 5.7-6.4
Breastfed infant 4.0-7.0
Cows' milk fed child 5.0-7.5
Adult 6.0-8.0
Ind: Poor food absorption.
Int: LOW - Lactose (milk sugar) malabsorption syndrome, disaccharide (type of sugar) deficiency, some bacterial gut infections
Phys: The acidity (pH) of a faeces sample is measured.

Porphyrins
NR: Absent
Ind: Porphyria.
Int: PRESENT - Some types of porphyria, some gut disorders.
See also Porphyrins Red Blood Cells, Blood

Reducing Substances
NR: Negative
Ind: Malabsorption of food, diarrhoea.
Int: POSITIVE - High dose vitamin C, Crohn's enteritis (inflammation of intestine), short bowel syndrome (after surgery), gastroenteritis, poor digestion of sugars, drugs (e.g. levodopa used for Parkinson’s disease)

See Disease Definitions section at back of book for explanation of unusual diseases.
Screening test, not diagnostic of these diseases. Keep faeces refrigerated at 4°C or test promptly. Reducing substances are substances such as glucose.

**Sodium**

[Na]

**NR:** Less than 45 mmol/L  
**Ind:** Diarrhoea.  
**Int:** HIGH - Secretory diarrhoea (eg. cholera)  
**Phys:** Sodium, and other vital salts, are secreted into the gut from the blood in severe forms of diarrhoea that may be life threatening.

**Urobilinogen**

**NR:** 68 to 474 µmol/day (40-280 mg/day)  
**Ind:** Liver disease.  
**Int:** HIGH - Excess bilirubin production (liver disease), haemolytic anaemia.  
LOW - Antibiotics, hepatobiliary disease (gall bladder disease), bile duct obstruction, infant.  
**Phys:** Averaged over 4 day collection of faeces.

See Disease Definitions section at back of book for explanation of unusual diseases.
Joint (Synovial) Fluid

Synovial fluid is the lubricating fluid that can be found in every moving joint. The amount varies dramatically between joints, with the knee having quite a large amount to absorb the stresses of this major weight bearing joint, while smaller joints have only a film of fluid present.

The synovial fluid is formed in small sacs (bursae) near the joint, and moves into the joint space through tiny ducts. Here the fluid is very slowly absorbed through the bone ends and eventually enters the blood stream to be processed. Thus there is a slow and steady circulation of synovial fluid through every joint.

If excess fluid is present due to infection, inflammation or disease, the joint will be swollen and usually painful and stiff.

A sample of synovial fluid can be taken by inserting a needle into the joint and drawing out the fluid with a syringe. Large joints are obviously easier to access than smaller ones, but fluid can be taken even from finger and jaw joints if necessary.

See Disease Definitions section at back of book for explanation of unusual diseases.
Tests on Joint (Synovial) Fluid

Clarity
NR: Transparent
Ind: Arthritis.
Int: TRANSLUCENT - Inflammatory arthritis (eg. rheumatoid arthritis).
     OPAQUE - Septic arthritis (joint infection).
Phys: Clarity decreases with presence of white cells in synovial fluid.

Colour
NR: Colourless to straw
Ind: Arthritis.
Int: PALE YELLOW - Noninflammatory arthritis (eg. some forms of osteoarthritis).
     YELLOW - Inflammatory arthritis (eg. rheumatoid arthritis).
     YELLOW/BROWN - Septic arthritis (joint infection).

Crystals
NR: Nil
Ind: Arthritis.
Int: URATE CRYSTALS - Gout
     CALCIUM PYROPHOSPHATE CRYSTALS - Pseudogout
Phys: Crystals deposit in cartilage and structures around the joint when in high levels present in blood.

Mucin
Ind: Joint disease.
Int: LOW - Gout, pseudogout, rheumatoid arthritis
     VERY LOW - Acute bacterial arthritis (joint infection).
Phys: Mucin is a sticky protein.

Viscosity
NR: High
Ind: Joint disease.
Int: LOW - Osteoarthritis, systemic lupus erythematosus (SLE), joint injury.
     VERY LOW - Rheumatoid arthritis, gout, infection in joint.
Phys: Viscosity is the thickness of the fluid.

White Cell Count
NR: Less than 200/mL
Ind: Arthritis.
Int: HIGH (over 1500) - Osteoarthritis, systemic lupus erythematosus (SLE), injury to joint.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

VERY HIGH (over 15,000) - Gout, pseudogout, rheumatoid arthritis
EXTREMELY HIGH (over 50,000) - Septic arthritis (joint infection), severe gout, rheumatoid arthritis.

See Disease Definitions section at back of book for explanation of unusual diseases.
Urine

The body produces three waste products - urine from the kidneys, faeces from the bowels, and bile, which passes from the liver via the gall bladder to the small intestine and mixes with the faeces.

Urine is produced by the nephrons in the kidney by filtration of blood. From the kidney urine moves down the ureters to the bladder where it is stored before being expelled when convenient through the urethra to the outside of the body.

Urine consists mainly of water, with a very large number of dissolved waste products (e.g. urea), salts (e.g. urate), ammonia, enzymes, vitamins (e.g. vitamins B and C), minerals, proteins (e.g. creatinine), fats and carbohydrates. Many toxic substances and medications are removed from the body in the urine. The concentration of urine will depend on the amount of water in the body (hydration). If the person is well hydrated, dilute urine will be passed. If the person is dehydrated, the urine will be far more concentrated. The colour of the urine varies depending on its concentration from almost completely clear (dilute) to a dark yellow. The yellow colour comes from the pigment (haemoglobin) that gives blood its red colour, and is removed from the body as red blood cells are broken down and recycled.

Urine is collected by passing it into a sterile container. Sometimes an entire day’s output of urine is required, while at others, when an infection is suspected, a small amount of urine should be passed to clear out debris from the urethra, then a small sample is passed into the container, and the rest of the bladder contents can then be passed into a toilet.
Tests on Urine Numbers

4-Hydroxy-3-Methoxy Mandelic Acid
[HMMA]
(Vanillylmandelic Acid) [VMA]
NR:  10 to 5 µmol/day (1.8 to 7.1 mg/day) (less than 2.5 µg/mg creatinine)
Ind:  Very high blood pressure and a suspected phaeochromocytoma.
Int:  VERY HIGH - Phaeochromocytoma - a black-celled tumour of the adrenal glands that sit on top of each kidney. This rare tumour releases a substance into the blood stream that causes very high blood pressure, severe headaches, palpitations of the heart, abnormal sweating, nausea and vomiting, abdominal pains, blurred vision, and brain damage that may result in loss of speech, blindness or unconsciousness. Other associated symptoms may include increased appetite, nervousness and irritability, shortness of breath, weight loss, light-headedness and chest pain (angina). In some cases, there is an hereditary tendency, and it may be associated with cancer.
HIGH - Neuroblastoma (brain tumour), some foods (eg. caffeine, bananas), drugs (eg. aspirin, arthritis drugs)
Phys: HMMA is a break down product of catecholamines (a substance similar to adrenaline) and its level in urine is increased 10 to 100 times in the presence of phaeochromocytoma. Catecholamines increase blood pressure markedly. For 3 days before the test the patient must avoid meat, fish, poultry and gelatin.
See also Metanephrine

5-Aminolaevulinate
NR:  Less than 40 µmol/L
      Less than 3.8 mmol/mol creatinine
Ind:  Suspected porphyria.
Int:  HIGH - Acute attack of acute intermittent porphyria (an inherited liver disease), lead poisoning or type 1 tyrosinaemia

5 HIAA
See 5-Hydroxyindole Acetic Acid

5-Hydroxyindole Acetic Acid
[5 HIAA]
NR:  10 to 80 µmol/24 hours (2 to 10 mg/24 hours)
Ind:  Food malabsorption

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Int:** HIGH - Tropical sprue (caused by a long term intestinal infection caught in equatorial countries. The lining of the gut is damaged to prevent adequate food absorption, and symptoms are foul diarrhoea, abdominal cramps, excess wind, mouth ulcers, dry skin and muscle cramps. It is treated with vitamin and folic acid supplements, and antibiotics), gluten intolerance or carcinoid syndrome.

**Phys:** Patients with malabsorption often have abnormalities in tryptophan metabolism. 5 HIAA is a breakdown product of tryptophan, and its level in urine is increased with excessive tryptophan breakdown. For 3 days before test the patient must avoid alcohol, avocado, banana, eggplant, coffee, tea, pineapple, plum, tomatoes, walnuts and drugs (eg. imipramine, paracetamol, MAOIs, phenothiazines).

*See also Vitamin D, Blood*

**Addis Count**
See White Cell Count

**Adrenaline**
See Catecholamines

**Albumin**
- **NR:** Less than 15mg a day
- **Ind:** Kidney disease.
- **Int:** HIGH - Kidney or bladder infection, kidney damage due to diabetes (diabetic nephropathy), glomerulonephritis (kidney inflammation), kidney failure (eg. nephrotic syndrome) and pregnancy-induced high blood pressure.

**Phys:** Sensitive test for early kidney damage in diabetes

**Aldosterone**
- **NR:** 8 to 33 nmol/24 hours (6 to 16 µg/24 hours).
- **Ind:** Investigation of the adrenal glands and high blood pressure.
- **Int:** HIGH - Adrenal gland tumour (adrenocortical adenoma), cirrhosis of the liver, kidney disease (nephrosis), excess fluid in the abdomen (ascites), heart failure, toxaemia of pregnancy and malignant hypertension (severe high blood pressure of no known cause).

**Phys:** Excess secretion of aldosterone by the adrenal gland causes high blood pressure and a low levels of potassium in the blood.

*See also Aldosterone, Blood*

**Alpha1-Microglobulin**
- **NR:** Less than 15mg/L
- Less than 1.5g/mol creatinine.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Medical Tests Explained

Ind: Kidney disease.
Int: HIGH - Fanconi syndrome (rare defect of kidney function that may be present from birth or follow a serious disease), nephrotic syndrome (kidney failure) and other kidney disorders

Amino Acids

<table>
<thead>
<tr>
<th>NR</th>
<th>Amino Acids</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alanine</td>
<td>Less than 100 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>3-Amino-butyric acid</td>
<td>Less than 25 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Arginine</td>
<td>Less than 20 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Citrulline</td>
<td>Less than 5 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Glutamine</td>
<td>Less than 150 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Glycine</td>
<td>Less than 350 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Histidine</td>
<td>Less than 400 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Isoleucine</td>
<td>Less than 10 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Leucine</td>
<td>Less than 10 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Lysine</td>
<td>Less than 100 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Methionine</td>
<td>Less than 10 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Ornithine</td>
<td>Less than 10 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Phenylalanine</td>
<td>Less than 20 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Serine</td>
<td>Less than 100 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Taurine</td>
<td>Less than 300 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Tyrosine</td>
<td>Less than 20 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Threonine</td>
<td>Less than 30 mmol/mol creatinine</td>
</tr>
<tr>
<td></td>
<td>Valine</td>
<td>Less than 10 mmol/mol creatinine</td>
</tr>
</tbody>
</table>

Ind: Suspected metabolic disease.
Int: ALL HIGH - Premature infant, Hartnup disease
Arginine HIGH - Arginase deficiency syndrome
Citrulline HIGH - Hyperornithinaemia-hyperammonaemia-hypercitrullinuria syndrome
Glycine HIGH - Nonketotic hyperglycinaemia, familial iminoglycinuria
Histidine HIGH - Histidinaemia
Leucine and isoleucine HIGH - Maple syrup urine disease, other rare conditions of organic acid metabolism
Methionine HIGH - Homocystinuria
Ornithine HIGH - Gyrate atrophy of the choroid and retina, hyperornithinaemia-hyperammonaemia-hypercitrullinuria syndrome
Phenylalanine HIGH - Phenylketonuria (PKU)
Tyrosine HIGH - Richner-Hanhart syndrome, tyrosinosis
MIXED PATTERN - Fasting, infection
Others HIGH - Usually rare inherited errors of metabolism

Phys: Amino acids are the building blocks of proteins and are essential for the functioning of the body. Changes in urinary concentration of certain amino acids (most of which are listed above) can be used to detect diseases affecting the body’s metabolism (chemical processes).

See also Cystine
Amylase
NR: 170 to 2000 U/L (differs between races).
(0.8 to 80 u/mmol creatinine)(Less than 17IU/L).
Ind: Pancreatitis.
Int: HIGH - Pancreatitis (inflammation or infection of the pancreas gland in the abdomen).
Phys: Urinary amylase is also raised with the same conditions as blood amylase. This is a useful test in late a presentation of pancreatitis, as levels remain high for 7 days after blood amylase drops.
See also Amylase, Blood

Anabolic Steroids
NR: Absent.
Ind: Detection of steroid use, particularly in elite athletes.
Int: POSITIVE - Use of anabolic steroids in previous days or weeks.
Phys: Rate of break down and clearance from urine depends on individual characteristics, type of steroid and dose.

Arsenic
[As2O₃]
NR: 0 to 0.1 mg/L (less than 3 µmol/day).
Ind: Suspected arsenic poisoning.
Int: HIGH - Arsenic poisoning.

Bence-Jones Proteins
NR: Absent
Ind: Suspected multiple myeloma.
Int: PRESENT - Multiple myeloma (a cancer of the cells in the bone marrow of the elderly. Patients experience bone pain, tiredness from anaemia, and recurrent infections. Other complications include fractures of the weakened bones, and kidney and heart failure caused by the toxic by-products of the marrow and bone destruction. Another complication may cause the blood to become excessively thick and viscous, and this leads to a wide range of other symptoms including dizziness, vomiting, bleeding gums, mental changes and partial blindness), kidney damage, macroglobulinaemia, plasmacytoma or other autoimmune diseases.
Phys: These light chain proteins formed from abnormal immunoglobulins in multiple myeloma are easily filtered through kidney into the urine.

See Disease Definitions section at back of book for explanation of unusual diseases.
**Beta-2 Microglobulin**

**NR:** < 0.5 mg/L (< 40 µg/mmol creatinine).

**Ind:** Kidney disease.

**Int:** HIGH - AIDS, multiple myeloma, chronic lymphocytic leukaemia, acute monoblastic leukaemia, hepatitis B, glandular fever, cytomegalovirus infections, sarcoidosis, rheumatoid arthritis, Sjögren syndrome, Crohn disease, kidney failure, kidney damage (eg. from cancer treating drugs, heavy metal poisoning, aspirin overdose, aminoglycoside antibiotics) or glomerulonephritis (kidney disease).

**Phys:** This small protein (microglobulin) is excreted in the urine in certain kidney disorders. See also Beta-2 Microglobulin, Blood

---

**Bilirubin**

**NR:** Absent.

**Ind:** Liver disease.

**Int:** PRESENT - Liver disease or damage.

**Phys:** Bilirubin is a dark yellow waste product produced by the liver. This test is unable to determine the type of liver disease. See also Bilirubin, Blood

---

**Blood**

**(Haematuria)**

**NR:** Less than 1000 RBC/mL (less than 1 RBC/HPF)

RBC = red blood cell. HPF = high powered field of microscope.

**Ind:** Urinary tract and kidney disease.

**Int:** HIGH - Glomerulonephritis (kidney disease), cystitis (bladder infection), prostatitis (prostate gland infection), kidney stone, urinary tract cancer, injury to kidney or bladder, foreign body in urethra, blood clotting abnormalities, tuberculosis, schistosomiasis (bilharzia), very high blood pressure (hypertension), polycystic kidney disease (multiple cysts in kidney), nephrotic syndrome (form of kidney failure), systemic lupus erythematosus (SLE), other kidney diseases, congenital (inherited kidney weakness), leukaemia, exercise stress, and drugs (eg. cyclophosphamide, warfarin, heparin, aspirin, carbidopa, phenytoin, metronidazole, phenothiazines).

FALSE POSITIVE on dipstick test - Iodine contamination, oxidising agents in container, haemoglobinuria, sample not fresh.

FALSE NEGATIVE on dipstick test - High urinary nitrate, high urinary vitamin C.

**Phys:** May be tested by examination of urine under a microscope or chemical reaction on a strip that is dipped into urine. Causes of red urine that may be confused with haematuria include beetroot, urates, pyridium, phenindione, porphyria, phenolphthalein, vegetable dyes and the disease haemoglobinuria.
Medical Tests Explained

C

Calcium
[Ca]
NR: 2.5 to 7.5 mmol/day
Ind: Parathyroid gland or bone disease.
Int: HIGH - Over active parathyroid glands - (hyperparathyroidism - the parathyroid glands sit behind the thyroid gland in the neck and control the level of calcium in the blood), high blood calcium levels, osteoporosis.
LOW - Kidney failure (eg. nephrotic syndrome).
Phys: This result is strongly affected by the amount of calcium in the diet (eg. dairy products).
See also Calcium, Blood

Casts
See White Cell Count

Catecholamines
NR: Adrenaline : Less than 80 nmol/day (0.11 to 0.52 nmol/L)
Noradrenaline : Less than 780 nmol/day (1.27 to 2.81 nmol/L)
Dopamine : Less than 3500 nmol/day
Ind: Extremely high blood pressure.
Int: ALL HIGH - Phaeochromocytoma (a tumour of the adrenal glands on the kidneys) or drugs (eg. methyldopa).
DOPAMINE HIGH - Ganglioneuroma or a neuroblastoma (both are rare tumours).
LOW - Failure of, or damage to, the adrenal glands on the kidneys.
Phys: Adrenaline and noradrenaline are the catecholamines produced in the adrenal gland, and normally stimulate the “flight or fight” response. Excesses are produced if a phaeochromocytoma tumour is present, raising blood pressure markedly.
See also Catecholamines, Blood; Clonidine Suppression Test, Blood

Chloride
[Cl-]
NR: 100 to 200 mmol/L/day as common salt (NaCl)
Ind: Little clinical value.
Int: Varies with diet, water and salt intake.
See also Chloride, Blood

Chorionic Gonadotrophin, Human
[HCG]
NR: Less than 30 IU/day
Ind: Pregnancy.
Int: HIGH - Pregnant, cancers of ovary or testes (seminomas, choriocarcinoma) or placental tumour (hydatidiform mole).
Phys: Peak level reached at 10 weeks pregnancy.
See Disease Definitions section at back of book for explanation of unusual diseases.
See also Chorionic Gonadotrophin, Human, Beta, Blood

Cl⁻
See Chloride

Collagen Crosslink Fragments
See Deoxypyridinoline

Colour
NR: Light yellow and clear (“straw”).
Int: RED - Blood, myoglobin (break down product of muscles), drugs (eg. rifampicin, phenindione), foods (eg. beetroot, berries).
      DARK YELLOW - Dehydration.
      BROWN - Bilirubin or urobilinogen (due to liver disease), porphyria (changes colour when left to stand).
      BLUE GREEN - Drugs (eg. amitriptyline)
      CLOUDY - White cells (eg. infection), salts (eg. urates, phosphates), refrigeration of urine and prolonged time after collection (precipitation of salts).

Copper
[Cu]
NR: Less than 1.2 µmol/day
Ind: Suspected liver disease or Wilson's disease.
Int: HIGH - Wilson's disease (early stage), liver cirrhosis, liver cancer (hepatoma).
      LOW - Wilson's disease (late stage), major disorders of food absorption.
Phys: Wilson’s disease is a disease of abnormal copper use in the body. 95% of copper in the body is bound to the protein caeruloplasmin.
See also Caeruloplasmin, Blood; Copper, Blood

Coproporphyrins
NR: 0 to 240 nmol/day (0 to 161 µg/24 hours)
Int: HIGH - Porphyria, hereditary coproporphyria, drugs (eg. barbiturates, salicylates such as aspirin).
Phys: Porphyria is a group of liver diseases that are usually inherited, but may be triggered by some poisons, and occurs in all races but is more common amongst the Bantu tribes of Africa. Patients have skin that is very sensitive to sunlight, with skin thickening and pigmentation occurring in sun exposed areas such as the face and forearms. The urine has a strange characteristic in that it turns a dark purple colour, then brown, if left standing.

Cortisol, Free
NR: 97 to 330 nmol/day
Ind: Suspected Cushing syndrome.
Int: HIGH - Cushing syndrome, hormone therapy

See Disease Definitions section at back of book for explanation of unusual diseases.
Phys: 24 hour urine collection essential. Unlike blood cortisol, no fluctuation occurs with short-term stress. Cushing syndrome is caused by an over production of steroids such as cortisone in the body, or taking large doses of cortisone to control a wide range of diseases, including asthma and rheumatoid arthritis. Headache, obesity and muscle weakness are common symptoms of this syndrome.

See also Cortisol, Blood

Cotinine
NR: Zero
Ind: Determination of smoking status.
Int: HIGH - Smoker.
Phys: 5% of nicotine breaks down into cotinine.
See also Cotinine, Blood; Nicotine, Blood; Carboxyhaemoglobin B, Blood

Creatinine
NR: Male: 8 to 18 mmol/day
Female: 5 to 16 mmol/day
Child: 0.07 to 0.19 mmol/day/Kg
Ind: Kidney function test.
Int: HIGH - Muscle wasting diseases (dystrophies), muscle inflammation (myositis), myasthenia gravis, starvation, hyperthyroidism (over active thyroid gland).
LOW - Kidney failure, hypothyroidism (under active thyroid gland).
Phys: Creatinine is removed from the body only by the kidney. Excess is produced with increased body metabolic rate and activity. Values decrease with age
See also Creatinine, Blood

Crystals
NR: Phosphate crystals are common in alkaline urine.
Oxalate crystals are common in acid urine.
Uric acid crystals occur in people with high uric acid levels (eg. gout) and some normal people.
Phys: The test has little clinical significance.

Cu
See Copper

Cystine
NR: 0.04 to 0.8 mmol/day.
Ind: A number of rare kidney diseases.
Int: HIGH - Fanconi syndrome, cystinuria, other kidney diseases.
Phys: 24 hour collection of urine necessary. The Fanconi syndrome is a rare defect of kidney function that may be present from birth or follow diseases such as cystinosis, glycogen storage diseases, Wilson disease and others. There is a failure of the kidney to adequately deal with numerous chemicals and elements.

See Disease Definitions section at back of book for explanation of unusual diseases.
Deoxypyridinoline
[DPyd]
NR: Male 2.5 to 5.0 nmol DPyd/mmol creatinine.
Female 3.0 to 5.5 nmol DPyd/mmol creatinine.
Ind: Suspected bone weakness or damage.
Int: HIGH - Persistently under active ovaries or testes (chronic hypogonadism), osteoporosis, Paget disease, over active thyroid gland (hyperthyroidism), over active parathyroid glands (primary hyperparathyroidism), long lasting liver disease, long lasting kidney disease, vitamin D deficiency, rheumatoid arthritis, long term steroid treatment.
Phys: When bone is broken down and absorbed into the bloodstream, collagen breakdown products are released into the blood and passed out in the urine. Deoxypyridinoline is one of these products.

Dexamethasone Suppression Test
NR: Urinary 17-hydroxycorticosteroids less than 3.5 mg/day on second day of test.
Ind: Suspected Cushing syndrome.
Int: HIGH - Cushing syndrome (caused by an over production of steroids such as cortisone in the body, or taking large doses of cortisone to control a wide range of diseases), and some patients with a particular type of depression.
Phys: Dexamethasone 0.5 mg is given every 6 hours for 2 days, and 17-hydroxysteroids in the urine are measured on the second day.

Dopamine
See Catecholamines

DPyd
See Deoxypyridinoline

Erythrocyte Count
See Haematuria

See Disease Definitions section at back of book for explanation of unusual diseases.
**Fibrin Degradation Products**

[FDP]

**NR:** Mean value of 0.25 µg/mL.

**Ind:** Kidney disease.

**Int:** HIGH - Disseminated intravascular coagulation (widespread blood clots forming within blood vessels), polycystic kidney disease (multiple cysts within the kidneys), hydronephrosis (kidneys swollen with urine), lupus nephritis (autoimmune kidney disease), proliferative glomerulonephritis (form of kidney failure), kidney transplant, haemolytic-uraemic syndrome.

**Phys:** This test is useful for following the progress of kidney disease or transplant rejection. 

*See also D-Dimer, Blood*

**Glucose**

**NR:** Absent

**Ind:** Diabetes.

**Int:** POSITIVE - Diabetes mellitus, pregnancy, physical stress, Fanconi syndrome, galactosaemia.

**Phys:** The glucose levels in urine are only proportional to that of blood provided no kidney disease is present.

*See also Glucose, Blood*

---

**H-K**

**Haematuria**

See Blood in urine

**Haemoglobin**

See Blood in Urine

**Haemosiderin**

**NR:** Absent

**Ind:** Persistent anaemia.

**Int:** PRESENT - Excessive break down of red blood cells (intravascular haemolysis) and the release of the haemoglobin they contain.

**Phys:** Haemoglobin breaks down to haemosiderin in the kidneys.

**HMMA**

See 4-Hydroxy-3-Methoxy Mandelic Acid

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Medical Tests Explained

Homovanillate
[HVA]
NR: Adult - less than 5.5 µmol/nmol creatinine.
    Considerable variation between labs.
Ind: Brain tumours.
Int: HIGH - Neuroblastoma, ganglioneuroma (both are specific types of brain tumour).
Phys: Serial tests are useful in monitoring the progress of a tumour.

HVA
See Homovanillate, Urine

Hydroxyproline
NR: Less than 35 mmol/mol creatinine/2 hours.
Ind: Assessment of bone diseases.
Phys: Timed two hour urine collection after overnight fast. No gelatin (eg. meat, jelly, ice cream) for 24 hours before test.

K
See Potassium

Ketones
NR: Nil
Ind: Diabetes mellitus.
Int: HIGH - Diabetic ketoacidosis (severe form of diabetes), urinary tract infection, starvation, vomiting, dehydration, general anaesthesia, strenuous exercise, cold exposure.
Phys: Ketones are formed in the liver and are normally completely destroyed and removed from the body. Altered sugar metabolism causes accumulation of ketones and they appear in the blood and urine.

L

LCR
See Ligase Chain Reaction.

Lead
[Pb]
NR: 5 to 105 µg/24 hours (less than 0.5 µmol/L) (less than 0.25 µmol/day).
Ind: Lead poisoning.
Int: HIGH - Lead poisoning.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Phys:** May be caused by swallowing (e.g. old paint, battery workers) or inhalation (e.g. exhaust fumes from leaded petrol) of lead. Pregnant and breast feeding women should not work with lead.

*See also Lead, Blood*

**Leucocytes**

See White Cells.

**Ligase Chain Reaction**

[LCR]

**NR:** Negative.

**Ind:** Sexually transmitted or pelvic inflammatory disease, inflamed cervix, conjunctivitis.

**Int:** POSITIVE - *Chlamydia* infection.

**Phys:** May also be applied to a swab from affected area.

---

**M**

**Magnesium**

[Mg]

**NR:** 2.5 to 8.0 µmol/day (20 to 180 mg/day).

**Int:** LOW - Malabsorption syndrome (inability to absorb magnesium from gut), severe body fluid loss, alcoholism, diabetic ketoacidosis (severe form of uncontrolled diabetes), liver cirrhosis, primary aldosteronism (Conn syndrome), long term kidney failure.

*See also Magnesium, Blood*

**Manganese**

NR: Less than 3 µmol/L

Ind: Suspected manganese poisoning.

Int: HIGH - Manganese poisoning

*See also Manganese, Blood*

**Mercury**

[Hg]

NR: Less than 0.2 µmol/day

Ind: Suspected mercury poisoning.

Int: HIGH - Mercury poisoning (Minamata disease).

**Metadrenalines**

See Metanephrine

*See Disease Definitions section at back of book for explanation of unusual diseases.*

146
Medical Tests Explained

Metanephrine
(Metadrenalines)
NR: Less than 5 µmol/day (depends on age).
Ind: To detect uncommon causes of hypertension (high blood pressure) resistant to treatment.
Int: HIGH - Phaeochromocytoma, neuroblastoma, ganglioneuroma, drug interference.
Phys: Metanephrine is a breakdown product of catecholamines (which increase blood pressure) excreted in urine.

Mg
See Magnesium

Microalbumin
See Albumin

Myoglobin
NR: Absent
Ind: Muscle damage, haemoglobinuria (haemoglobin present in urine).
Int: PRESENT - Any significant muscle injury, rhabdomyolysis (severe breakdown of muscle tissue), electric shock, snake bite, myopathies (diseases affecting muscles), hypokalaemia (low blood potassium level).
Phys: Not a sensitive test, as it is not able to detect most myocardial infarcts (heart attacks). May be used to differentiate confusion with haemoglobin in urine, in which case the test remains negative.
See also Myoglobin, Blood

N

Na
See Sodium

Nitrite
NR: Negative
Ind: Suspected cystitis (bladder infection) or pyelonephritis (kidney infection).
Int: POSITIVE - Urinary tract infection (bladder or kidneys), chronic kidney failure.
Phys: Certain bacteria, when in high concentration in urine, break down nitrates in urine to nitrates, thus indicating their presence.

Noradrenaline
See Catecholamines

See Disease Definitions section at back of book for explanation of unusual diseases.
N-Telopeptides, Cross-Linked
[Ntx]
NR: Negative
Ind: Osteoporosis.
Phys: Ntx is a compound within bone which is released with bone breakdown, and can be detected in the urine.

Oestrogens
NR: See table below (units: µg/24 hours)

<table>
<thead>
<tr>
<th>Oestrogen</th>
<th>Male</th>
<th>Oestradiol</th>
<th>Oestriol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oestrone</td>
<td>0 to 5</td>
<td>0.3 to 2.4</td>
<td></td>
</tr>
<tr>
<td>Oestraphol</td>
<td>0 to 5</td>
<td>0.3 to 2.4</td>
<td>0.3 to 2.4</td>
</tr>
<tr>
<td>Oestriol</td>
<td>0 to 10</td>
<td>5 to 30</td>
<td>2.2 to 7.5</td>
</tr>
</tbody>
</table>

Ind: Female infertility, determination of menopause state, sex determination.
Int: HIGH (female) - Sex hormone therapy
     HIGH (male) - Feminisation due to taking female hormones or abnormal hormone production within body.
     LOW - Infertile.
Phys: Oestrogen is divided into several different types - oestrone, oestradiol and oestriol.
Together they stimulate ovulation (the release of an egg from an ovary once a month) and the development of breasts, pubic hair and other sexual characteristics in women.
See also Oestradiol, 17beta, Blood

Osmolality
NR: 500 to 800 mmol/kg.
    12 hour water deprivation: Greater than 800 mmol/kg.
    Excess fluid in body: Less than 100 mmol/kg
Ind: Kidney disease.
Int: Result compared with blood osmolality to separate kidney causes of frequent passing of urine from causes of frequent passing of urine coming from diseases outside the kidney.
See also Osmolality, Blood

Oxalate
NR: 0.22 to 0.44 mmol/day.
Ind: Recurrent kidney stones.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Int:** HIGH - Inherited tendency to form calcium oxalate kidney stones.

**Phys:** 24 hour collection essential. Levels vary with diet.

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**PR**

**Pb**

See Lead

**pH**

**NR:** 4.6 to 8.0 (mean 6.0).

**Ind:** Urinary tract infection.

**Int:** Varies with diet.

LOW - Acidic - Bacterial infections (particularly *Escherichia coli*).

HIGH - Alkaline - Bacterial infections (particularly *Proteus* sp.), renal tubular acidosis (failure of kidney), medications used to alkalinise urine with urinary infections (eg. Ural, Citravescent).

**Phys:** The *Proteus* bacteria splits urea in urine to give ammonia and thus an alkaline reaction.

**Phosphate**

**NR:** 10 to 40 mmol/day.

**Ind:** Parathyroid and bone disorders.

**Int:** HIGH - Kidney disorders, hyperparathyroidism (over active parathyroid glands), osteomalacia (bone softening disease), hypercalcaemia (excess calcium in blood).

**Phys:** The parathyroid glands in the neck control the level of calcium and phosphate in the body and bones. Excess levels of parathyroid hormone will cause phosphate excretion.

*See also Calcium, Blood*

**Porphobilinogen**

**NR:** Less than 10 µmol/L.

**Ind:** Porphyria.

**Int:** HIGH - Various forms of porphyria.

**Phys:** Test is only positive when symptoms of porphyria are present.

**Porphyrins**

**NR:** Absent

**Ind:** Porphyria.

**Int:** PRESENT - Acute porphyria, liver disease, alcoholic liver cirrhosis, lead poisoning, infections, anaemia, carbon tetrachloride (CCl₄) poisoning.

*See also Coproporphyrins*

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See Disease Definitions section at back of book for explanation of unusual diseases.
Potassium
[K]
NR: 30 to 90 mmol/day.
Int: HIGH - Diuretic (fluid tablet) therapy, excess potassium intake.
See also Potassium, Blood

Protein
NR: Less than 0.07 g/L (less than 0.15 g/day).
Ind: Indications.
Int: HIGH - Many different kidney and bladder diseases including glomerulonephritis,
cystitis, pyelonephritis, nephrotic syndrome, kidney stone, kidney or bladder tumour,
algesic nephropathy (kidney damaged by excessive use of the pain killer
phenacetin), kidney transplant rejection, congenital disorders of the kidney and
toxaemia of pregnancy. Other causes include hypertension (high blood pressure),
systemic lupus erythematosus (SLE), diabetes mellitus, Wilson's disease (excess
copper in body), sarcoidosis, analgesic nephropathy, congestive heart failure,
amyloidosis, myelomatosis, Alport syndrome, prolonged high fever, strenuous exercise,
emotional stress, and prolonged bed rest.
Phys: Damage to the filtering mechanisms (glomeruli) in the kidney increases their
permeability and allows blood protein to escape into the urine. Bleeding within the
urinary tract (eg. by a tumour or stone) often causes this test for protein to be positive.
See also Bence-Jones Proteins

Red Blood Cell Count
See Haematuria

Renin Activity
NR: 1.3 to 4.0 ng/mL/hour.
Ind: Aldosteronism, secondary hypertension.
Int: LOW - Primary aldosteronism (Conn syndrome), adrenal gland tumour, adrenal gland
overactivity.
HIGH - Secondary hyperaldosteronism (over production of aldosterone due to factors
outside adrenal gland).
Phys: Aldosterone is a hormone secreted by the outer part (cortex) of the adrenal glands, one
of which sits on top of each kidney. It acts to control the amount of sodium, and
therefore the amount of fluid, in the body. Excess fluid can lead to high blood pressure.

ST
SG
See Specific Gravity

See Disease Definitions section at back of book for explanation of unusual diseases.
Sodium

[Na]
NR: 40 to 200 mmol/day (40 to 200 mEq/day).
Int: HIGH - Addison's disease, chronic nephritis (kidney failure).
See also Sodium, Blood

Specific Gravity

[SG]
NR: 1.003 to 1.030
Ind: Kidney disease.
Int: HIGH - Diabetes mellitus.
LOW - Diabetes insipidus, pituitary gland disease, kidney damage due to hypercalcaemia (excess calcium in blood) or hypokalaemia (lack of potassium in blood), kidney failure.
Phys: Specific gravity is the density of a fluid compared to distilled water, which has an SG of 1. The SG is high in diabetes mellitus due to sugar in urine.
See also Specific Gravity, Serum, Blood

Sugar
See Glucose

Testosterone/Epitestosterone Ratio

NR: Less than 6.
Ind: Testosterone doping in sport.
Int: HIGH - Extra testosterone injected or taken as an aid to sporting performance.
Phys: Both testosterone and epitestosterone are produced by the testes. If extra testosterone is added the ratio will be abnormal.
See also Testosterone, Blood

Urate, Urinary 24 Hour Excretion

NR: Less than 3.6 mmol/day (< 600 mg/day).
Ind: Gout.
Int: HIGH - Urate overproduction type of gout.
LOW - Urate under excretion type of gout, kidney disease.
Phys: Test after 5 days on low protein diet. Overproduction treated with allopurinol or similar drug, under excretion with uricosuric drug.
Urea
NR: 420 to 720 mmol/day.
Ind: Kidney disease.
Int: HIGH - Blood urea high, excess protein intake.
      LOW - Renal insufficiency.
Phys: Urine must be collected for 24 hours for test.
See also Urea, Blood

Urinary Urate
See Urate, Urinary 24 Hour Excretion.

Urine, Blood
See Haematuria

Urine Acidification Test
NR: Adult: pH less than 5.3
    Child: pH less than 5.5
    Ammonium less than 35 µmol/min/m²
Ind: Kidney disease.
Int: pH HIGH - Distal renal tubular acidosis (kidney disease).
    pH NORMAL - Metabolic acidosis, proximal tubular acidosis (kidney disease).
    AMMONIUM LOW - Proximal tubular acidosis.
Phys: One hour urine specimen collected from acidotic patient (acidosis is induced if necessary). Test of blood gases confirm acidosis. Acidosis (excessively acidic blood) can be due to numerous kidney and metabolic diseases which may be differentiated by this test.
See also pH, Blood

Urine Casts
See White Cell Count

Urobilinogen
NR: Less than 4.23 µmol/day (0 to 2.5 mg/day) (0.1 to 1.0 Ehrlich units/100 mL).
Ind: Liver disease.
Int: HIGH - Parenchymal liver disease, haemolytic anaemia.
Phys: Bacteria convert bilirubin produced in the liver to urobilinogen.

V-Z

Vanillylmandelic Acid
See 4-Hydroxy-3-Methoxy Mandelic Acid.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

WCC
See White Cell Count.

White Cell Count
(Addis Count)
NR: Less than 3000/mL (1 to 2/HPF) (less than 5/mm$^3$).
Ind: Kidney disease.
Int: HIGH - Inflammation of urinary tract (eg. infection, irritation, kidney disease autoimmune diseases etc.)
   RED CELL CASTS HIGH - Kidney bleeding.
   HYALINE CASTS HIGH - Fever, diuretics (fluid tablets), exercise, severe kidney disease.
   WHITE CELL CASTS HIGH - Pyelonephritis (kidney infection).
   GRANULAR CASTS HIGH - Non-specific kidney disease.
   WAXY CASTS HIGH - Chronic kidney disease.
Phys: White cells are non-specific signs of kidney, ureter or bladder damage. Casts are the remnants of dead white cells, and localise damage to the kidney. Cells counted on a grid under a x40 microscope lens.

Xylose Absorption Test
NR: 5 to 8 g/5 hours.
Ind: Poor food absorption.
Int: LOW - Sprue, kidney disease, coeliac disease.
Phys: 25 g of xylose is given, and its excretion into the urine is measured over 5 hours. Xylose is absorbed in the jejunum (part of small intestine). Often an unreliable test.

Zinc
[Zn]
NR: 8 to 11 µmol/day.
Ind: Zinc lack or excess in body.
Int: HIGH - Catabolic (tissue breakdown) diseases, excess zinc in blood.
   LOW - Zinc deficiency, liver disease, poor wound healing may result.
Phys: Indication of amount of available zinc in body.
See also Zinc, Blood

Zn
See Zinc

See Disease Definitions section at back of book for explanation of unusual diseases.
Other Test Substances

Breath, Breast Milk, Cells, Lungs, Placenta, Semen, Skin, Sputum, Stomach Fluid, Stones, Sweat, Tears, Tissue etc.

Almost every part of the body, and its secretions, waste products or contents can be tested in some way in order to diagnose diseases related to different organs.

**Breath tests** may be performed by breathing into machines that test the volume and rate of breathing, or may analyse what is actually in the breath (eg. alcohol).

**Cells** are normally examined under a microscope, often after they have been stained by various dyes to make specific characteristic of the cells more obvious. Many cancers are diagnosed this way as well as other diseases of organs that affect the cells.

The **placenta** (afterbirth) can be examined in numerous ways to detect abnormalities that may affect the infant.

**Skin** may be scraped or biopsied (small piece cut out) and examined for everything from parasites and skin diseases to cancer and fungal infections. Reactions in the skin can diagnose some infections (eg. tuberculosis) or allergies.

The **gastric fluid** within a stomach is extremely acidic in order to break down food in preparation for absorption into the body. The gastric fluid can be sampled by passing a fine tube through the nose or mouth and down into the stomach. The tube passes down with a normal swallow reflex and causes minimal discomfort.

**Semen** is the ejaculate from the penis during sex. It may need to be analysed to detect cancers or infection, or determine a man’s fertility. This is done after the man stimulates himself to cause an erection and then ejaculation. The entire ejaculate is collected in a sterile container and then examined as soon as possible (usually within an hour).

**Sputum** can be examined under a microscope for abnormal cells (eg. cancer, infection) or be cultured in order to find the bacteria or fungus responsible for an infection. It is collected, sometimes with the help of a physiotherapist, by coughing sputum up into a sterile container.

**Stones** usually develop in the gall bladder, kidney, bladder and salivary glands. Analysis of the type of stone present can give vital clues to the disease process that caused their formation.

**Sweat** can give clues to an amazing range of diseases. the serious lung condition cystic fibrosis can often be detected by a mother who notices that her child tastes salty when kissed, due to the excess salt these patients have in their sweat. A lack of, or excess sweat, may be due to other disease processes.

**Tears** may also be abnormal, and samples are taken with a dropper or on blotting paper put under the lower eyelid.
Medical Tests Explained

**Tissue** taken from the body by a biopsy or during surgery can be examined under a microscope, stained and have its DNA examined in order to make a diagnosis.

Many other bodily fluids (e.g., peritoneal fluid from within the belly, breast milk) may also be analysed when appropriate. Smears from areas as diverse as the inside of the cheek (buccal smear) to the cervix (pap smear) can be analysed to detect abnormal cells.
Tests on Other Substances

\(^{14}\text{C} \text{ Breath Test}\)
See Carbon-14 Urea, Breath

\textbf{Acidity, Gastric Fluid}
See pH, Gastric Fluid

\textbf{Acid Output, Gastric Fluid}
\textbf{NR:} 0 to 6 mEq/hour (24 to 29 mEq/L).
After stimulation of acid producing cells in stomach with histamine:
- Males 10 to 40 mEq/hour
- Females 5 to 30 mEq/hour
\textbf{Ind:} Peptic ulcer.
\textbf{Int:} HIGH - Peptic ulcer tendency.
- LOW after histamine - Pernicious anaemia, postvagotomy (operation to cut nerves to stomach for peptic ulcer disease).
\textbf{Phys:} Gastric fluid is the fluid within the stomach when a patient has been starved for 12 hours. Patients with duodenal ulcers have higher numbers of acid secreting parietal cells than normal.
\textit{See also pH, Gastric Fluid}

\textbf{Breast Milk Analysis}
\textbf{NR:} \textbf{Colostrum} (1 to 5 days after birth of baby).
- Energy 239 kJ/100 mL (57 calories/100mLs).
- Total protein 1460 to 6800 mg/100 mL.
- Lactose (milk sugar) 1100 to 7900 mg/100 mL.
- Amino acids 700 to 4000 mg/100 mL.
- Total fats 2740 to 3180 mg/100 mL.
- Total solids 10 to 16 g/100 mL.
- Sodium 26 to 135 mEq/L.
- Iron 0.02 to 0.05 mg/100 mL.
\textbf{Transition Milk} (5 to 10 days after birth).
- Energy 264 kJ/100 mL (63 calories/100mLs).
- Total protein 1270 to 1890 mg/100 mL.
- Lactose (milk sugar) 6100 to 6700 mg/100 mL.
- Amino acids 600 to 1000 mg/100 mL.
- Total fats 2730 to 5180 mg/100 mL.
- Specific gravity (SG) 1.034 to 1.036.
- Total solids 10.5 to 15.5 g/100 mL.
- Sodium 19 to 53 mEq/L.
- Iron 0.04 to 0.07 mg/100 mL.
\textbf{Mature Milk} (more than 15 days after birth).
- Energy 272 kJ/100 mL (65 calories/100mLs).

\textit{See Disease Definitions section at back of book for explanation of unusual diseases.}
Medical Tests Explained

Total protein 730 to 2000 mg/100 mL.
Lactose (milk sugar) 4900 to 9500 mg/100 mL.
Amino acids 900 to 1600 mg/100 mL.
Total fats 1340 to 8290 mg/100 mL.
Specific gravity (SG) 1.026 to 1.037.
Total solids 10.3 to 17.5 g/100 mL.
Sodium 6 to 43 mEq/L.
Iron 0.02 to 0.09 mg/100 mL.

Ind: Infant feeding problems, failure to thrive.
Int: Abnormal results indicate inadequate or inappropriate milk production.

Breath Test, Carbon-14 Urea
See Carbon-14 Urea, Breath.

Buccal Smear
Int: Microscopic examination of cells scraped from the inside of the cheek (buccal mucous membrane) enables the sex of the individual to be determined. The presence of a Barr body on the nucleus indicates female, its absence indicates male.

See also Oestrogens, Urine

Calculi, Renal
See Kidney Stones.

Carbon-14 Urea, Breath
(14C Breath Test)
NR: Negative
Ind: Peptic ulcer in stomach.
Int: POSITIVE - Confirms presence of the bacteria Helicobacter pylori which is a causative agent of peptic ulcers.
Phys: A small amount of radioactive urea is swallowed on an empty stomach. After 15 minutes, samples of breath carbon dioxide are collected into a solution. Radioactive carbon 14 (14C) activity is measured by a geiger counter type device. High levels are positive.

See also CLO Test; Helicobacter pylori Antibodies

Casoni's Test, Skin
NR: Negative
Ind: Hydatid disease (Echinococcosis).
Int: POSITIVE - Hydatid disease, false positive possible.
Phys: Superseded skin test as blood hydatid antibody test is more reliable.

See also Hydatid Antibodies, Blood

Cervical Smear, Cervix
See Papanicolou Smear.
Medical Tests Explained

Chloride, Sweat

\[ Cl^- \]
NR: 4 to 50 mmol/L (4 to 50 mEq/L).
Ind: Malabsorption of foods.
Int: HIGH - Cystic fibrosis (fibrocystic disease).
Phys: Sweat is collected on special salt free gauze pads.

Chorionic Villus Sampling, Placenta

Ind: Suspected congenital disease.
Int: Abnormal results may be obtained in Down syndrome (mongolism), inherited disorders of blood (haemoglobinopathies), cystic fibrosis, Huntington's chorea, haemophilia, Christmas disease, X-linked muscular dystrophy and some metabolic disorders. Foetal sex may also be determined.
Phys: Sample of chorionic villi from placenta obtained during pregnancy by a needle inserted through the abdominal wall, under ultrasound guidance, between the 9th and 12th week of pregnancy. Tissue obtained may be subjected to chromosome, DNA or enzyme analysis.

Chromosomes, Cell

NR: 22 pairs + 1 pair sex chromosomes (X, Y).
Ind: Genetic abnormalities, sex determination.
Int: 47 chromosomes - Down syndrome (mongolism).
      XXY - Klinefelter syndrome.
      XO - Turner syndrome.
      Many other abnormalities known.
Phys: Cells (blood white cells, bone marrow, amniotic fluid, placenta) from the patient are grown in culture and have their division (mitosis) arrested by the drug colchicine. Examination under a microscope determines chromosome pattern and numbers.

CLO Test, Stomach biopsy
(Campylobacter Like Organism Test)
NR: Negative
Ind: Peptic ulcer.
Int: POSITIVE - *Helicobacter pylori* (the bacteria responsible form many peptic ulcers) present.
Phys: Test on stomach biopsy specimen taken during gastroscopy.
See also Carbon-14 Urea Breath Test; Helicobacter pylori antibodies, Blood

DNA Probes, Tissue
(Gene Mapping)
NR: Absent.
Ind: Congenital (inherited) diseases.
Int: POSITIVE - Presence of specific congenital disease.
Phys: A very small sample of tissue from the patient is necessary. The range of DNA probes available is rapidly increasing. Those currently available include tests for alpha- and

See Disease Definitions section at back of book for explanation of unusual diseases.
beta-thalassaemia, sickle cell disease, haemophilia, Duchenne muscular dystrophy, cystic fibrosis, neurofibromatosis, Huntington chorea, polycystic kidney disease, phenylalanine hydroxylase deficiency, myotonic dystrophy, fragile X syndrome, X-linked retinitis pigmentosa, Leber optic atrophy, alpha1-antitrypsin deficiency, X-linked hydrocephalus, Friedreich ataxia, fructose intolerance. A sample of tissue from the placenta of a pregnant woman may be used as the tissue sample in diagnosis of a condition in a foetus before birth. May identify identical twins.

FEV₁
See Forced Expiratory Volume in 1 Second, Air

**Forced Expiratory Volume in 1 Second, Air**

[FEV₁]

**NR:** 84% ± 7%
Male 3.5 ± 1.5 L
Female 2.5 ± 1.0 L

**Ind:** Test of lung function.

**Int:** LOW - Asthma or other lung disease.

**Phys:** FEV₁ is the percentage of lung air capacity that can be expelled in 1 second by forcibly breathing out. Reduced by airway narrowing, spasm or secretions. Measured by a machine called a spirometer.

**Fructose, Seminal Fluid**

**NR:** 3.5 to 28 mmol/L.

**Ind:** Male infertility.

**Int:** LOW - Obstruction of ejaculation, infection of seminal vesicle (sperm storage sac), Leydig cell deficiency (lack of cells to produce sperm - common at puberty).

**Phys:** Fructose is the energy source for sperm. Low levels cause reduced sperm movement.

**Heaf Test**
See Tuberculin Skin Test.

**HER-2/neu**
See Human Epidermal Receptor 2 neu, Breast Tissue.

**Human Epidermal Receptor 2 neu, Breast Tissue**

[HER-2/neu]

**NR:** IHC (immunohistochemical) method:
Under 1+ staining intensity normal.
2+ staining intensity equivocal.
3+ staining intensity positive.
FISH (fluorescent in situ hybridisation) method:
2.2 ratio normal.
Over 2.2 ratio abnormal.

**Ind:** Breast cancer.
Medical Tests Explained

Int: HIGH - Increased risk of breast cancer spreading to other organs.
Phys: Test targets gene located on chromosome 17. Test is positive in 30% of breast cancers. Patients with increased risk may be suitable for more intensive treatment (eg. with specific monoclonal antibodies).
See also Cancer Associated Antigens 15-3 and 549, Blood; Carcinoembryonic Antigen, Blood

Kidney Stones
(Renal Calculi)
Ind: Passing a kidney stone.
Int: The following substances may form a kidney stone -
   CALCIUM OXALATE - 40% sole ingredient, 85% partial ingredient. Causes include excess soft drinks, oxalate foods (eg. silverbeet, rhubarb, chocolate, nuts) but often no identifiable cause.
   CALCIUM PHOSPHATE - 2% sole ingredient, 35% partial ingredient. Causes include over active parathyroid gland in the neck (hyperparathyroidism), excess calcium in the blood (hypercalcaemia), kidney disease (distal renal tubular acidosis), or they may be no specific cause.
   URIC ACID - 10% sole ingredient, 30% partial ingredient. Causes include kidney failure and excess urate in blood (hyperuricaemia), or excessively acid urine (aciduria).
   CYSTINE - Rare. Usually an inherited characteristic (familial amino aciduria).
   MAGNESIUM AMMONIUM PHOSPHATE - 2% of stones. Caused by long term urinary infection.
Phys: Stone collected by sieving urine after symptoms of kidney stone present, or analysis of gravel in urine. Analysis of the stone may allow the cause of its formation to be determined.

Kveim Test, Skin
(Kveim-Siltzbach Test)
NR: Negative
Ind: Suspected sarcoidosis.
Int: POSITIVE - Sarcoidosis (disease that damages and inflames a wide range of organs within the body, most commonly the lungs).
Phys: Heat treated extract of sarcoid is injected into the skin. The injected site is biopsied 1 month later; 80% show sarcoid-like lesions. 5% false positive.

Lung Function Tests
See Forced Expiratory Volume in 1 Second; Peak Expiratory Flow Rate; Vital Capacity

Mantoux Test, Skin
See Tuberculin Skin Test

Papanicolou Smear, Cervix
NR: Normal
Ind: Routine every 24 to 36 months for all sexually active women.
Int: Atypical cells - Smear should be repeated in 3 to 6 months.

See Disease Definitions section at back of book for explanation of unusual diseases.
CIN 1 DYSPLASIA - Colposcopy (examination of the cervix through a microscope) advised with repeat smears frequently.
CIN 2 DYSPLASIA - Colposcopy and punch biopsy (small sample of abnormal tissue cut out) followed by appropriate treatment and follow-up.
CIN 3 carcinoma in situ - Definitive treatment necessary (eg. cutting out abnormal tissue in a cone biopsy procedure) and careful follow-up.
Invasive carcinoma - Definitive treatment essential (eg. hysterectomy, irradiation).

Phys: Vaginal infections often also reported on smears. CIN is an index of cervical intraepithelial neoplasia (the degree of abnormality in the cervix cells sampled).

Paracentesis Fluid from Abdominal Cavity
(Ascitic Fluid; Peritoneal Fluid)
NR: Colour - clear.
Red blood cells - nil.
White blood cells - nil.
Ind: Ascites (excess fluid in the abdomen).
Int: Colour
STRAW - Cirrhosis (liver failure), infection in abdomen, cancer in the abdomen, heart failure.
PINK/RED - Blood in abdomen due to cancer, TB, or pancreatitis.
WHITE - Lymph duct obstruction, infection in abdomen.
Red blood cells
FEW - Cirrhosis (liver failure), infection, cancer in abdomen.
NUMEROUS - Pancreatitis, TB, advanced cancer, damage to blood vessel during procedure to sample abdominal fluid.
White blood cells
Less than 250 x 10^6/L - Cirrhosis, cancer in abdomen, heart failure.
More than 250 x 10^6/L - Infection, TB, pancreatitis.

Phys: A fluid sample is drawn out of the belly using a long needle and syringe (a procedure called paracentesis) then examined under a microscope. The peritoneum is the membrane lining the belly.

See also Serum-Ascites Albumin Gradient

Peak Expiratory Flow Rate, Lungs
NR: Correlation of Peak Expiratory Flow Rate with patient height

<table>
<thead>
<tr>
<th>Height (cm)</th>
<th>Peak flow rate (L/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>160-320</td>
</tr>
<tr>
<td>140</td>
<td>310-480</td>
</tr>
<tr>
<td>160</td>
<td>480-630</td>
</tr>
<tr>
<td>180</td>
<td>620-780</td>
</tr>
</tbody>
</table>

Ind: Lung diseases.
Int: LOW - Asthma, chronic obstructive airways disease (eg. chronic bronchitis), emphysema.

See also Forced Expiratory Volume in 1 Second, Air

See Disease Definitions section at back of book for explanation of unusual diseases.
**Medical Tests Explained**

**Pericardial Fluid, Heart**

**NR:** Protein over 25g/L : Exudate.
Protein under 25g/L : Transudate.

**Ind:** Fluid collection around the heart, but inside the pericardium, which forms the sack in which the heart is supported.

**Int:** EXUDATE - Infection (eg. TB), cancer.
TRANSUDATE - Congestive cardiac failure, cirrhosis of the liver, nephrotic syndrome (kidney failure), Meigs syndrome, hypothyroidism (under active thyroid gland).

**Phys:** Fluid taken through a needle from around the heart.

**Peritoneal Fluid**

See Paracentesis Fluid

**Pertussis IgA Antibodies, Nasopharyngeal Secretions**

**NR:** Absent

**Ind:** Suspected pertussis (whooping cough).

**Int:** POSITIVE - Recent or current pertussis infection.

**Phys:** Swab taken from nose and/or throat tested (the nasopharynx). Result positive early in infection, but short lasting. The equivalent blood test (Pertussis IgA antibodies) increase late, and persist long term, but only occur with infection, not vaccination.

**pH, Gastric Fluid**

(Gastric Fluid Acidity)

**NR:** 0.9 to 1.5

**Ind:** Peptic ulcer.

**Int:** HIGH - Pernicious anaemia), postvagotomy (operation to cut vagus nerve to stomach which reduces production of stomach acid).
LOW - Peptic ulcer tendency

**Phys:** Measure of the strength of the acid in the stomach. Acid of this strength could burn a hole through a thin metal plate if taken from the stomach.

*See also Acid Output, Gastric Fluid*

**Pleural Fluid, Lung Pleura**

**NR:** Protein over 25g/L : Exudate.
Protein under 25g/L : Transudate.

**Ind:** Pleural effusion (fluid around lungs).

**Int:** EXUDATE - Infection (eg. TB, pneumonia), cancer of lung.
TRANSUDATE - Congestive heart failure, cirrhosis of liver, nephrotic syndrome (kidney disease), Meigs syndrome, hypothyroidism (under active thyroid gland).

**Phys:** The pleura is the membrane surrounding the lungs. Fluid may collect between the pleura and the lung, and a sample can be taken through a needle using a syringe (a procedure known as pleurocentesis).

**Renal Calculi**

See Kidney Stones.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Respiratory Function Tests
See Forced Expiratory Volume in 1 Second; Peak Expiratory Flow Rate; Vital Capacity.

Schirmer's Test, Tears
NR: More than 5mm. of damp filter paper.
Ind: Eye irritation.
Int: LOW - Xerophthalmia (dry eye).
Phys: A strip of filter paper 5 mm x 35 mm is folded 5 mm from one end. The short flap is inserted under the lower lid of each eye and the eye is closed lightly. After 5 minutes, length of strip from eye margin that has been dampened by tears is measured.

Semen Analysis
NR: Volume : 2.5 to 10 mL (average 4 mL).
Number of sperm : More than 20,000,000/mL.
Motility (activity) : More than 70% active.
Morphology (structure of sperm) : More than 60% normal forms.
Colour : Cream.
Leucocytes (white cells) : Less than 15/HPF.
Erythrocytes (red blood cells) : nil.
Haemoglobin (Hb) : nil.
Ind: Infertility.
Int: LOW VOLUME, COUNT OR MOTILITY - Infertile.
OVER 70% ABNORMAL FORM - Infertile, mumps orchitis (infection of testicles), poor nutrition, drugs, radiation, excess local heat, surgery, vas deferens infection, cryptorchidism (small testes from birth), germinal aplasia (failure of sperm producing cells in testes to develop), pituitary or thyroid hormone defects.
COLOUR WHITE - Infection.
COLOUR CLEAR - Low sperm count.
COLOUR RED - Injury to testicles, cancer, kidney damage, prostate gland damage.
LEUCOCYTES HIGH - Prostatitis (prostate gland infection), urethritis (infection of urine tube), epididymitis (infection of sperm collecting tubes), orchitis (infection of testicles).
ERYTHROCYTES OR Hb HIGH - Injury, genital cancer, kidney damage.
Phys: Measured by direct examination of semen under a microscope or automatic analyser of sperm. Sample obtained by masturbation immediately before examination.

Seminal Fructose
See Fructose, Seminal Fluid.

Sex Determination
See Buccal Smear.

Smear Test
See Papanicolou Smear.
Sperm Antibodies, Seminal Fluid
NR: Absent.
Ind: Infertility, vasectomy reversal.
Int: POSITIVE - Sperm survival unlikely.
Phys: Test performed on male’s ejaculated seminal fluid. Positive result would indicate cause for infertility. Vasectomy reversal unlikely to be successful if result positive.
See also Sperm Antibodies, Blood

Sperm Count
See Semen Analysis

Sputum, Microscopy of Gram Stained Smear
Ind: Lung infection.
Int: Moderate numbers
Gram-positive or negative cocci - Normal flora.
Gram-positive or negative bacilli - Normal flora.
Large numbers
Gram-positive diplococci - Pneumococcal bacteria infection.
Gram-positive cocci in clusters - Staphylococcal bacteria infection.
Gram-negative pleomorphic coccobacilli - Haemophilus bacteria infection.
Gram-negative bacilli - Coliform or Pseudomonas bacteria infection, excessive normal flora.
Phys: A sample of sputum is stained with a specific dye (gram stained) and examined under a microscope. They are described as gram positive if they absorb the dye and become stained, and gram negative if they do not. Cocci, diplococci and bacilli are different types of bacteria. Infection may cause bronchitis or pneumonia. Severe lung infections are best diagnosed by culture and sensitivity tests to antibiotics of responsible bacteria. Information from microscopy may be useful in immediate selection of antibiotic agent while awaiting culture result.

Stones, Kidney
See Kidney Stones

Sweat Chloride
See Chloride, Sweat

Tuberculin Skin Test
(Heaf Test, Mantoux Test)
NR: Negative.
Ind: Tuberculosis (TB) screening.
Int: POSITIVE (over 10 mm indurated area) - Past or present tuberculosis.
DOUBTFUL (5 to 9 mm indurated area) - Recent TB infection, cross-sensitivity to other mycobacteria, allergy.
NEGATIVE (under 5 mm indurated area) - TB not likely.

See Disease Definitions section at back of book for explanation of unusual diseases.
**Medical Tests Explained**

**Phys:** Tuberculin antigen is injected just under the skin by multiple punctures (Heaf test) or by scratch (Mantoux test). Skin reaction is measured. Indurated area is the area of skin affected by the injection by becoming thickened and red.

**Tzank Smear, Skin Blister**

**NR:** Negative

**Ind:** Suspected Herpes infection.

**Int:** POSITIVE - Herpes zoster (shingles or chickenpox), Herpes simplex (genital herpes or cold sores).

**Phys:** The roof of an intact skin blister is removed and the floor of the blister is scraped with a rounded scalpel blade. The material is smeared onto a slide and stained. Multinuclear giant cells with viral inclusions are seen if Herpes present. This test cannot distinguish between types of Herpes.

*See also Herpes Simplex Antibody*

**Urea, Breath**

See Carbon-14 Urea, Breath

**Urease, Breath**

See Carbon-14 Urea, Breath

**VC**

See Vital Capacity, Lungs

**Vital Capacity, Lungs**

**[VC]**

**NR:** Units: Litres (L)

See table below:-

<table>
<thead>
<tr>
<th>Normal Vital Lung Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>20 to 50</td>
</tr>
<tr>
<td>Over 50</td>
</tr>
</tbody>
</table>

**Ind:** Lung disease.

**Int:** LOW - Inadequate lung ventilation due to asthma, bronchitis, tuberculosis (TB), bronchiectasis, pneumonia, surgery, etc.

**Phys:** Vital capacity is the maximum volume of air that can be expired (breath out) after maximal inspiration (breath in).

*See also Forced Expiratory Volume in 1 Second*

**Wood’s Light, Skin**

**NR:** No fluorescence.

**Ind:** Fungal infection of skin or hair.

**Int:** FLUORESCENCE - Fungal infection present.

- Bright yellow/green hairs (not skin) - Tinea capitis.
- Red/pink skin (not hairs) - Erythrasma.
- Aqua green/light green skin - Pseudomonas.

*See Disease Definitions section at back of book for explanation of unusual diseases.*
Bright yellow skin - Pityriasis versicolor.

**Phys:** Filtered ultraviolet light (wavelength 365 nm.) causes fluorescence. Lamp must be turned on for about 3 minutes to obtain maximum effect and held 10 cm. from skin. Lint in hair fluoresces white.
DISEASE DEFINITIONS
Medical Tests Explained

DEFINITIONS OF DISEASES MENTIONED IN THE PATHOLOGY SECTION OF THIS BOOK

Acromegaly
Acromegaly causes excessive growth of the hands, feet, jaw, face, tongue and internal organs. Patients also suffer from headaches, sweating, weakness, cessation of menstrual periods and loss of vision. It is caused by excess production of growth hormone in the pituitary gland which sits underneath the brain. This hormone is required during the normal growth of a child, but if it is produced inappropriately later in life because of a tumour in the gland, acromegaly results. The diagnosis is made by blood tests, X-rays and CT scans of the skull. Treatment will involve specialised microsurgery through the nose, and up into the base of the brain, to remove the tumour.

Addison’s disease
The adrenal glands sit on top of each kidney, and produce hormones that control the level of vital elements in the body and regulate the breakdown of food. Addison's disease occurs when these glands do not produce sufficient hormone. It is rare, with symptoms of weakness, lack of appetite, diarrhoea and vomiting, skin pigmentation, mental instability, low blood pressure, loss of body hair and absence of sweating.

Adenitis
Lymph nodes are collections of infection fighting white cells that filter out bacteria, viruses and other organisms and abnormal cells (eg: cancer cells) from the organs whose waste products they drain. These nodes (often incorrectly called glands) are concentrated in the neck, arm pits, groin and in the membrane (mesentery) that loosely connects the intestine to the back wall of the abdomen. Adenitis is an infection or inflammation of lymph nodes. If those in the abdomen become infected (mesenteric adenitis), they can cause pain in the belly that may be confused with appendicitis or diverticulitis.

ADHD
See Attention deficit hyperactivity disorder

Adhesions
After surgery to the abdomen, particularly for the treatment of infections (eg: appendicitis, pelvic inflammatory disease), raw areas may be left behind on the surface of the intestine, bladder, uterus, liver or other organs. These raw areas may come into contact and adhere to each other to form adhesions. These adhesions may be drawn out with time to form bands, and the bowel and other organs may become twisted, distorted or inflamed by these adhesions and bands. Various symptoms may occur including quite severe abdominal pain, nausea and changes in bowel habits. Treatment is difficult as further surgery may only create more raw areas that then form more adhesions.

Adrenogenital syndrome
Congenital adrenal hyperplasia (adrenogenital syndrome) affects the adrenal glands which sit on top of each kidney, and stimulates them to produce abnormal steroids in the body which

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

affect sexual development. The clitoris becomes enlarged, high blood pressure may occur, breasts are very small, pubic hair pattern may be masculine, hair may develop excessively on the body, and female characteristics are reduced.

**AIDS**
AIDS is caused by the human immunodeficiency virus (HIV). It causes a multiplicity of symptoms as the body’s ability to prevent cancer and control infection is reduced. Some of the more common problems include a fever, rash, weight loss, bruising, abnormal bleeding, enlarged liver and spleen, arthritis and tumours.

**Aldosteronism**
See Conn syndrome

**Alopecia areata**
Alopecia areata causes a small area of the scalp to be completely hairless. The area starts as just a tiny patch, but may slowly spread to result in hairless patches a few centimetres across. In the worst case, the entire scalp may be affected (alopecia totalis). There is often no apparent cause, but sometimes extreme stress, psychiatric disturbances and drugs may be found responsible. Treatment is difficult, and must be started as soon as possible after the hairless patch is discovered. Potent steroid ointments and injections are sometimes successful in reversing the hair loss, while in other patients, the problem corrects itself spontaneously.

**Alport syndrome**
An inherited condition of boys that causes deafness, progressive kidney failure, blood in the urine and sometimes cataracts (clouding of the lens) in the eyes.

**Alzheimer disease**
Alzheimer disease (senile dementia or second childhood), is one of the most common forms of dementia in the elderly, but unfortunately it may strike as early as the mid-fifties and cause extreme distress to spouses, family and friends. It is characterised by loss of recent memory, loss of initiative, reduced physical activity, confusion, loss of orientation (patients become confused about where they are and dates), and then it gradually progresses to loss of speech, difficulty in swallowing (drooling results), stiff muscles, incontinence of both faeces and urine, and a bedridden state in which the patient is totally unaware of themselves or anything that is happening around them. It is caused by a faster than normal loss of nerve cells in the brain. There is no cure, but there are some medications that slow the progression of the disease. Most treatments are aimed at keeping the patient content and ensuring that the family is able to cope with him/her at home for as long as possible.

**Amoebiasis**
An infestation of the gut with microscopic animals (amoebae) that is usually caught in tropical areas with very poor hygiene. It causes belly cramps, a constant desire to pass faeces and foul smelling faeces.

**Amsterdam dwarfism**
See Disease Definitions section at back of book for explanation of unusual diseases.
Amyloidosis
A rare disease in which millions of microscopic fibres made of a dense protein jelly infiltrate and replace the normal tissue of different parts of the body. The kidneys, lungs, heart and intestine are commonly involved. It may be triggered by another disease, such as tuberculosis, rheumatoid arthritis, cancer or drug abuse. The symptoms of the disease are very variable, depending on which organs are involved. Complications such as pneumonia and kidney infections may be treated, but amyloidosis is incurable.

Anaphylactic reactions
Anaphylactic reactions are immediate, severe, life-threatening reactions to an allergy-causing substance. The patient becomes rapidly sweaty, develops widespread pins and needles, may develop a generalised flush or red rash, or swelling in one or more parts of the body, starts wheezing, becomes blue around the lips, may become incontinent of urine, loses consciousness, convulses and stops breathing. Swelling of the tongue and throat alone may be enough to cause death if air is unable to pass into the lungs. The patient may need to be given mouth-to-mouth resuscitation and external cardiac massage. Medical treatment must be sought urgently, as an injection of a drugs such as adrenaline, hydrocortisone, aminophylline and an antihistamine can reverse the allergic reaction rapidly and save the patient's life.

Angina
Angina pectoris is a pressure-like, squeezing pain or tightness in the chest, usually central, that starts suddenly, often during exercise, and settles with rest. It may occur at almost any time, but is uncommon during sleep. Pain may extend into the left arm, neck, upper abdomen and back. It is due to a narrowing of one or more of the three small arteries that supply blood to the heart muscle. This narrowing can be due to hardening of the arteries (atherosclerosis), or a spasm of the artery caused by another disease, smoking, excitement, heavy meals or stress. If the heart is deprived of blood because of these narrowed arteries, it does not receive sufficient oxygen, it cannot work effectively, and waste products build up in the heart muscle. This inflames the nerves in the muscle to cause the characteristic pain of angina. Angina may lead to a heart attack, or a heart attack may cause angina, but they are two different problems. In a heart attack, part of the heart muscle dies while angina is not nearly as serious.

Angleman syndrome
Also known as the happy puppet syndrome, Angleman syndrome is due to a genetic defect and causes damage to lungs and liver, deep set eyes, mental retardation and a prominent forehead on a small head.

Ankylosing spondylitis
Ankylosing spondylitis is a long-term inflammation of the small joints between the vertebrae in the back, which leads to pain, worsening stiffness and eventually back joint fusion and a fixed forward curvature of the back. It is more common in men, usually starts in the early thirties, but takes many years to become a serious problem. It may be associated with arthritis.
of other joints, heart valve disease, weakening of the aorta and inflammation of the eyes. It is diagnosed by X-rays of the back and blood tests. The disease may settle for a few months or years, but then progresses further. There is no cure available, but treatment can give most patients a full life of normal length.

**Angioneurotic oedema**
Angioneurotic oedema is a sudden, severe swelling of the eyelid and other tissues around the eye caused by an allergy reaction. The trigger is usually a pollen, dust, chemical or other substance that has blown into the eye or from rubbing the eye with a contaminated finger. The affected tissue my be slightly itchy, but is not usually painful or tender.

**Anorexia nervosa**
A psychiatric condition that normally occurs in young women who have a distorted image of their own body. They believe that they are fat when they are not, and so starve themselves in order to lose excessive amounts of weight. The patient can become seriously undernourished and emaciated, to the point of death, if adequate treatment is not available. Other symptoms include a cessation of menstrual periods, diffuse hair loss, an intolerance of cold, a slow pulse, irregular heart beat and other complex hormonal disorders. Patients practice deceit to fool their family and doctors by appearing to eat normal meals but later vomit the food, use purgatives to clean out their bowel, or hide food during the meal.

**Anthrax**
This infection is caused by a bacterium of cattle, horses, sheep, goats and pigs, that rarely spreads to people. It is caught by the bacteria entering the body through scratches and grazes, or rarely by inhalation into the lungs. Initially, a sore appears at the site of entry. Then the nearby glands become inflamed, a fever develops, followed by nausea, vomiting, headaches and collapse. If the infection enters the lung, a severe form of pneumonia occurs.

**Antiphospholipid Syndrome**
A syndrome that may be triggered by an adverse reaction to medications or drugs, or infections (eg. malaria, mumps, TB) that results in a lack of substances that prevent blood clotting. The symptoms include recurrent blood clots in veins, recurrent miscarriages, skin blemishes, and alterations to brain and nerve function.

**Aortic aneurysm**
The aorta is the main large artery that takes blood from the heart to the abdomen and legs, and is between 2 and 3 cm. in diameter. If the thick wall of the aorta develops a weak spot, sometimes due to deposits of hard cholesterol in its wall, the artery may start to balloon out at one point to form a firm, pulsing lump known as an aneurysm. This aneurysm is at imminent danger of bursting, and if this occurs there is severe pain, and even in the best hospitals, half the patients die. Surgical correction of an aneurysm at the earliest opportunity is therefore vital.

**Apert syndrome**
A congenital (present since birth) condition that causes a prominent forehead, protruding eyes, small jaw and webbing of the fingers.
Aplastic anaemia
A very serious, and potentially fatal condition in which there is a failure in the production of blood cells by bone marrow. The symptoms include weakness, fatigue, frequent infections, abnormal bleeding and easy bruising. It may be caused by an autoimmune reaction (inappropriate rejection by the body of its own tissue), chemicals (eg: benzene, toluene, insecticides), radiation, drugs (eg: chloramphenicol, gold, quinine, phenylbutazone, phenytoin), liver infections (eg: hepatitis), pregnancy (very rare) or may have no apparent cause.

Appendicitis
The caecum is a dead end at the beginning of the large intestine. The last part of the small intestine (ileum) opens into the side of the caecum, and the appendix is a narrow 10 to 15 cm. long dead end tube that attaches to the end of the caecum. If the opening from the appendix to the caecum, or the appendix itself, is blocked by a piece of faeces or indigestible food (eg: a seed or fruit pip), it will become infected to cause appendicitis. Steadily worsening pain that starts in the centre of the abdomen, then moves to the right lower side, occurs in association with a fever, loss of appetite, nausea and diarrhoea.

Arteriosclerosis
Hardening of the arteries (arteriosclerosis) is usually caused by hard fatty plaques within the arteries due to an above average level of blood cholesterol, and is aggravated by high blood pressure. The narrowed arteries restrict the flow of blood to the tissues beyond. If the leg arteries are involved, the leg muscles will be painful, particularly when climbing stairs. If the arteries that supply blood to the heart muscle are involved, angina occurs. In the brain patients may develop a multitude of bizarre symptoms and become light headed, dizzy, confused, or black out. Affected arteries may also rupture into the brain to cause a stroke.

Asherman syndrome
This is an unfortunate complication of surgically clearing out the uterus after a miscarriage or for heavy bleeding after childbirth. The lining of the uterus is permanently damaged and the opposing walls stick together to obliterate the cavity in the uterus. A permanent lack of menstrual periods and infertility result.

Asperger syndrome
Patients with the psychiatric condition Asperger syndrome have the inability to feel emotion, inappropriate social interactions, poor communication skills, poor coordination and become violent. It is more common in men.

Asthma
Asthma is a temporary narrowing of the tubes through which air flows into and out of the lungs. This narrowing is caused by a spasm in the tiny muscles which surround the air tubes. The problem is further aggravated by the excess production of phlegm in the lungs and swelling of the lung tissue through inflammation. The narrowing of the airways causes shortness of breath and wheezing. Asthmatics usually find they cannot breathe out easily because, as they try to exhale the lung collapses further, and the small amount of space left in
the airways is obliterated. Asthmatic symptoms also include coughing, particularly in children, and tightness and discomfort in the chest.

**Atrial fibrillation**
The heart has two small chambers (atria) which receive veins from the lungs and body, and two large chambers (ventricles) which pump blood out through arteries to the lungs and body. The pacemaker of the heart is located in the left atrium. If the atria are damaged by disease (e.g. heart attack, infection) they may beat in a rapid uncoordinated manner (atrial fibrillation). The more important ventricles will receive only intermittent signals from the pacemaker, and will beat in an irregular rapid rhythm.

**Attention deficit hyperactivity disorder**
ADHD is a very complex problem of children. The classic symptoms include fidgeting, inability to remain seated for long, easily distracted and unable to sustain attention, always impatient, difficulty in following instructions, often move from one incomplete task to the next, unable to play quietly, violent towards others and objects, talk excessively, often interrupt or intrude, do not seem to listen, poor short term memory, often lose items, engage in physically dangerous activities. These symptoms create learning disabilities, emotional, social and family difficulties, low self-esteem and sometimes depression.

**Autism**
Autism is thought to be an abnormality in the development of the brain, and may be due to brain damage during growth in the womb, at birth, or in the first years of life. The child fails to develop normal social, language and communication skills. Repetitive habits are common. Occasionally autistic children have exceptional talents in a particular area (e.g. maths or music - the idiot savant syndrome). There is no effective treatment, and life expectancy is close to normal.

**Autoimmune diseases**
These diseases cause the body to inappropriately reject some of its own tissue in the same way that a body tries to reject foreign tissue (e.g. a kidney transplant). Examples include systemic lupus erythematosus, rheumatoid arthritis and scleroderma.

**Bartter syndrome**
An inherited disorder that affects children or young adults to cause short stature, thirst, frequent passing of urine, and muscle weakness and spasms.

**Basal cell carcinoma**
Cancers of the deeper layers of the skin are called basal cell carcinomas (BCC) and are not nearly as serious as melanomas. They occur rarely before 25 years of age, and are caused by prolonged exposure to sunlight, and so occur most commonly on the face and back, but they are uncommon on the arms and legs. BCCs may appear as shiny, pink, rounded lumps that often change in size and colour, or they may present as an ulcer that fails to heal. The ulcer often has a pearly, rounded edge.

**Bassen-Kornzweig syndrome**

See Disease Definitions section at back of book for explanation of unusual diseases.
The Bassen-Kornzweig syndrome (abetalipoproteinaemia) is caused by the inborn error of metabolism that prevents the absorption and utilisation of fats. These children do not gain weight, have poor coordination, eye damage and usually die at an early age. A fat free diet is the only treatment.

**BCC**

See Basal cell carcinoma

**Beckwith syndrome**

This syndrome is often inherited and causes prominent eyes, a large tongue, enlarged organs in the abdomen and low blood sugar levels.

**Behçet syndrome**

This is a seriously disabling condition characterised by recurrent mouth and gum ulcers, genital ulcers, eye inflammation, arthritis and brain damage.

**Bell’s palsy**

Bell’s palsy is a peculiar condition in which the nerve that controls the movement of muscles on one side of the face stops working. The cause is unknown. The onset is quite sudden, and a patient may find that one side of their face becomes totally paralysed in a matter of hours. They feel well, have no other medical problems or areas that are affected. Treatment with steroids in the very early stages may speed recovery, but this is controversial. The usual course is that the weakness completely recovers without treatment or discomfort in two to ten weeks. The main problem is the peculiar appearance of the patient as there is no expression on the affected side of the face, and the mouth appears to be crooked. The eye on the affected side may need to be protected with lubricants, as it cannot be closed properly. A very small number of patients, usually older ones, fail to recover completely. There is no treatment available in these cases.

**Beriberi**

Beriberi is caused by a severe lack of vitamin B (thiamine), usually in people like alcoholics who have an inadequate diet. It causes leg cramps, loss of appetite, pins and needles sensation, irritability, heart failure and oedema due to overdilation of arteries and veins in the legs and arms.

**Bernard-Soulier syndrome**

A congenital (present since birth) defect of platelets that reduces their ability to stick together and form clots, which results in abnormal bleeding, particularly into the skin.

**Bilharzia**

Bilharzia (schistosomiasis) is transmitted by a species of snail that is found in freshwater streams, rivers and lakes in Egypt, tropical Africa as far south as Zimbabwe, the Caribbean and eastern South America. It is caused by a microscopic animal called a fluke (trematode) that enters into the body by burrowing through the skin. Once in the bloodstream, the fluke travels to the veins around the large intestine. Here, eggs are laid, and pass out with the faeces or urine to infect water supplies. Once in the water, the eggs hatch, and the larvae

See Disease Definitions section at back of book for explanation of unusual diseases.
seek out and burrow into the flesh of certain species of freshwater snail. Here they mature, and emerge from the snail ready to enter and infect another human host. Eggs may also spread to infect the liver, lungs or spinal cord to cause symptoms involving these organs. The first symptom is an itchy patch at the site of skin penetration, then diarrhoea, abdominal pain and fluid, bloody urine, organ damage and death.

**Blepharitis**
A superficial bacterial infection of the eyelid margin around the base of the eyelashes. It is often associated with dandruff.

**Bloom syndrome**
A rare inherited condition that only occurs in children of Jewish heritage to cause sun sensitive skin, low birth weight, underdeveloped cheeks, and a high risk of leukaemia and other cancers.

**Boerhaave syndrome**
A sudden, unexpected rupture of the oesophagus (gullet) that causes severe generalised chest pain. It often follows episodes of gluttony in obese people who have excessive fat deposits in the muscles of the oesophagus that weaken as a result. It is often fatal.

**Bornholm disease**
Bornholm disease (pleurodynia) is a viral infection that attacks the membrane surrounding the lungs (the pleura). Patients experience sudden, severe, lower chest pain that is aggravated by chest movements such as a deep breath or cough. Other symptoms include a fever, headache, nausea, and sore throat. There is marked tenderness of the lower ribs.

**Briquet syndrome**
This is a form of hysteria which results in the patient presenting with multiple, unexplained (and unexplainable) symptoms which have no physical basis. It tends to run in families, and treatment is difficult.

**Bronchiectasis**
A disease that occurs if the tubes within the lung that carry air (the bronchi) are damaged, scarred and permanently overdilated. The damage can be present from birth in diseases such as cystic fibrosis, or be caused in childhood by immune deficiencies. Bronchiectasis may develop in adult life due to recurrent attacks of pneumonia or to the inhalation of toxic gases (eg: smoking). Patients have a constant cough that brings up large amounts of foul phlegm, and they may cough up blood, become anaemic, lose weight, have chest pains and develop frequent attacks of pneumonia and other lung infections that are triggered by minor stress, a cold or flu.

**Bronchiolitis**
A viral lung infection of children under two years and especially under six months of age that is most commonly caused by a virus called the respiratory syncitial virus. It tends to occur in epidemics. The child has a cough and wheeze, may be short of breath and a have a runny nose. In severe cases, the child may be very weak, blue around the mouth, and dehydrated.
**Bronchitis**

An infection of the major tubes (the bronchi) that carry air within the lungs. It occurs in two very different forms, acute and chronic. Acute bronchitis is most commonly caused by a viral infection, frequently by bacteria, and rarely by a fungus which cause swelling and inflammation of the lung tissue, and the mucus in the tubes becomes thick and purulent. Phlegm plugs up the bronchi, a wheeze occurs, and coughing is stimulated in an attempt to clear the blockage. Chronic bronchitis is a semi-permanent condition caused by repeated attacks of acute bronchitis, long-standing allergies, or constant irritation of the bronchi by noxious gases, particularly those found in tobacco smoke. Patients have a chronic cough, are short of breath, are unable to take much exertion, and may be blue around the lips.

**Brucellosis**

An infection of cattle, goats and pigs, which can spread to man. Patients develop a fever, tiredness and intermittent sweats. It may be several weeks before further symptoms of headache, joint pains and swellings, loss of appetite and belly pains (from a large spleen and/or liver) develop. Occasionally the lung, brain, and heart may be involved causing specific problems in those areas. Long-term complications include arthritis, and bone weakness.

**Budd-Chiari syndrome**

If the vein draining blood from the liver becomes blocked by a blood clot (thrombosis) there will be rapid, painful and serious swelling of the liver as blood continues to be pumped into it through the hepatic artery, and accumulation of fluid in the belly. This condition is known as the Budd-Chiari syndrome and is usually fatal within a year or two.

**Buerger’s disease**

Damage to the small arteries in the feet and hands caused by smoking. These arteries go into a constant spasm, and the tissue they supply aches, withers and dies. Gangrene of the fingers and toes is a complication, and amputation of these may be necessary. Stopping smoking will cure the condition, but these patients have such an intense addiction to nicotine that they are unable to do so.

**Bulimia**

A psychiatric condition in which anxious patients consume excessive amounts of food, often sweets or fatty foods, and then vomit to get rid of the food and so stay slim. The patient (almost invariably high achieving, middle to upper class young females) may gorge and vomit or purge themselves for hours, days or weeks. The condition may be associated with anorexia nervosa. Complications can include menstrual period irregularities, sore throat, bowel problems, dehydration, lethargy, and dental problems due to the repeated exposure of the teeth to stomach acid.

**Bursitis**

Bursae are tiny sacs that lie near every joint, and produce the synovial fluid that fills the joint. If the sac becomes inflamed or infected (bursitis), the joint will become painful, hot, tender and swollen.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Carcinoid syndrome**
Facial flushing, swelling of the head and neck, belly cramps, diarrhoea, asthma, heart and liver damage are characteristics of the carcinoid syndrome, which is caused by a rare tumour (argentaffinoma) in the intestine or lungs that produces a substance that triggers these effects.

**Carotenaemia**
This is caused by the excessive eating of vitamin A tablets, or yellow fruit (e.g: mangoes, paw paw) and vegetables (e.g: carrots, pumpkins). Huge quantities must be consumed, but patients may develop loss of appetite and weight, yellow colouring of the skin (particularly the palms and soles), brittle nails, dry and cracked skin, sore gums, headaches and other more bizarre conditions.

**Carotid body tumour**
The carotid body is a bundle of nerves that sits on each side of the neck at the point where the major arteries (carotid arteries) that supply the head, divide into their internal and external branches. This body controls blood pressure and supply to the brain. A tumour or cancer in the carotid body may be first noted as a lump in the neck.

**Carpal tunnel syndrome**
The carpal tunnel syndrome is caused by inflammation in the narrow tunnel on the palm side of the wrist through which many of the hand flexing tendons, nerves and blood vessels that supply the hand must run. If any of these tissues are damaged or strained, they will swell to place pressure on the adjacent nerves, and therefore pain. Common causes of the carpal tunnel syndrome are pregnancy, weight gain, an underactive thyroid gland, diabetes, rheumatoid arthritis and systemic lupus erythematosus (SLE).

**Cataract**
A cataract is clouding of the lens in the eye, and will cause gradual loss of sight over many years in the elderly, often associated with visual halos. Rarely, babies are born with a cataract. The lens can be surgically replaced to restore normal vision in most cases.

**Cellulitis**
Cellulitis is an infection of the tissue immediately under the skin, and can occur anywhere on the body, but is more common at points where the skin is more easily injured, such as over joints. The skin is hot to touch as well as red, and often swollen and tender. The infection may spread to the adjacent joint or other tissues, or into the blood to cause septicaemia. The skin may also break down into an ulcer. Rapid treatment with an effective antibiotic is essential.

**Cerebral palsy**
Cerebral palsy (spasticity) is a form of brain damage that occurs during pregnancy, usually for no obvious reason. A poorly functioning placenta, or a foetus who takes nutrition from its twin, are possibilities. Muscle spasms and hypertonicity are inevitable, and convulsions and mental retardation may occur, but many spastics are totally normal mentally, although they may look like drooling idiots.
Medical Tests Explained

Cerebrovascular accident
See Stroke

Cervical rib syndrome
Some people are born with an extra rib in the neck above the normal first rib. This cervical rib can put pressure on the nerves running from the neck to the arm (Naffziger syndrome), affecting their function and causing pins and needles sensation, pain and weakness in the hand and arm.

Chancroid
A bacterial sexually transmitted infection that is rare in western countries. About four days after sexual contact with a person who has the disease, a sore develops on the penis or vulva, and the patient becomes feverish and generally ill. The sore breaks down to form a painful ulcer, and the infection may spread to the lymph nodes of the groin, which may break down into abscesses that discharge pus.

Charcot-Marie-Tooth disease
Gradually progressive degeneration of nerves that supply the arms and legs. The disease is a genetic abnormality that runs in families. Patients initially have an abnormal gait (way of walking) and foot deformities in late childhood or early adult life. Gait gradual worsens over several years with weakness and loss of sensation in the legs, and later the arms. Paralysis of both arms and legs is the eventual result. There is no effective treatment.

Charles Bonnet syndrome
This is a rare disorder that causes vivid, elaborate and recurrent visual hallucinations in elderly people who are demented, isolated from outside stimulation and often have eye problems.

Chediak-Higashi syndrome
An inherited condition that can pass to subsequent generations. It causes recurrent skin and lung infections, partial albinism and sometimes liver, spleen and lung damage.

Chiari-Frommel syndrome
When a woman attempts to cease breast feeding her baby, a tumour in the pituitary gland in the centre of the head may produce abnormal quantities of the hormone prolactin which is responsible for breast milk production. The result is the Chiari-Frommel syndrome which causes a lack of menstrual periods, and continued breast milk production without nipple stimulation.

Chickenpox
A virus called Herpes zoster causes chickenpox. It can be found in the fluid-containing blisters, breath and saliva of patients. Infection occurs when some of these virus particles pass from the patient to another person. Patients are infectious for a day or two before the spots appear, and remain infectious until all the sores are covered by scabs and no new blisters are appearing - usually about eight days. It takes 10 to 21 days from exposure to the virus for the first spots of the disease to appear. The early signs of infection are a vague

See Disease Definitions section at back of book for explanation of unusual diseases.
feeling of being unwell, headache, fever and sore throat. The rash usually starts on the head or chest as red pimples. They then spread onto the legs and arms, and develop into blisters before drying up and scabbing over. New spots may develop for three to five days, and it may be two weeks or more before the last spot disappears. Complications are usually chest infections such as bronchitis, but a type of meningitis (brain infection) can occur in rare cases.

**Chilblains**
Itchy, red skin spots that can develop as a result of exposure to extreme cold, normally on the fingers and toes, but other exposed areas such as the nose may also become involved. The spot may form a blister, and the itching is aggravated by warmth. Recurrent chilblains can lead to a permanent scar forming at the site.

**Chinese restaurant syndrome**
A reaction to preservatives and flavour enhancers (eg: monosodium glutamate) in the food that causes nausea, flushing, facial pressure and headache.

**Chloasma**
Chloasma is a mark of motherhood, as it results in pigment being deposited in the skin of the forehead, cheeks and nipples. Unfortunately, it is also an uncommon side effect of using the contraceptive pill. The pigmentation affects some women far more than others, and some races more than others. If your mother, sister or grandmother has the problem, you are more likely to have it too.

**Cholecystitis**
Inflammation or infection of the gall bladder, usually caused by gall stones that have formed within it. In most cases it causes pain and indigestion, particularly after eating a fatty meal, but if the gall bladder becomes very swollen it may obstruct the bile duct to prevent bilirubin from leaving the liver to cause jaundice (yellow skin).

**Cholesteatoma**
A cholesteatoma is a foul smelling growth in the ear canal caused by a long standing middle ear infection. A sac on the ear drum develops which is filled with chronically infected material that antibiotics cannot reach effectively. This infected sac slowly enlarges and eats away the surrounding bone, including the fine bones which transmit sound vibrations from the ear drum to the hearing mechanism in the inner ear.

**Chronic fatigue syndrome**
A controversial diagnosis, as there are no tests that can prove its existence, and no effective treatments. Patients have fevers, aches, constant tiredness that is worsened by any activity, and intermittently enlarged lymph nodes.

**Churg-Strauss syndrome**
Causes asthma, inflammation of arteries in several organs and symptoms depending upon which organs are affected (eg: nerve irritation, heart failure, diarrhoea).

**Ciguatera poisoning**

See Disease Definitions section at back of book for explanation of unusual diseases.
Results from eating large tropical reef fish that contain the ciguatera toxin. It cannot be destroyed by cooking and there are far higher concentrations of the poison in the gut, liver, head and roe. The symptoms of the poisoning vary dramatically from one victim to another, and can include unusual skin sensations and tingling, diarrhoea, nausea, abnormal sensations, headaches and irregular heartbeats.

**Cirrhosis**
Damage to the liver that results in its normal tissue being replaced by scar tissue. As the disease progresses the liver is unable to function successfully, and it cannot clear bilirubin out of the blood, resulting in jaundice, nausea and itching. Cirrhosis may be caused by serious long lasting infections (eg: hepatitis B), poisons or excessive alcohol intake over a long period.

Cirrhosis. In this, the soft normal liver tissue is replaced by firm scar tissue that is unable to process the waste products of the body adequately. The other vital actions of the liver in converting and storing food products and producing chemicals essential to the body are also inhibited.

**Cluster headaches**
Cluster headaches are not common, but cause a very characteristic pattern of headache, usually associated with excess sweating of one or both sides of head. They occur in episodes once or twice a year to cause severe pain around or behind one eye which spreads to a temple, the jaw, teeth or chin. They often begin during sleep, and other effects may include a red, watery eye, drooping eyelid, altered pupil in the eye, stuffy nose and flushed face. Cluster headaches may be triggered by alcohol, temperature changes, wind blowing on the face or excitement. They usually last for 15 minutes to three hours, and are named because of their tendency to occur in clusters for several weeks. An unusual but effective cure is to breathe pure oxygen for 15 minutes.

**Coarctation of the aorta**
The aorta is the main artery running from the heart to the body. If this has a narrowed segment (coarctation of the aorta) caused by cholesterol deposits, an aneurysm (ballooning of the artery), damage to the lining of the artery or a birth defect, the blood supply beyond the narrowed segment will be reduced, and blood pressure will rise in order to compensate.

**Coeliac disease**
Patients with coeliac disease (sprue) are unable to digest the protein gluten which is found in cereal grains such as wheat, rye, barley and oats, but not in rice or corn. Eating any foods containing gluten will cause diarrhoea, belly discomfort, weight loss, excess wind and bloating. The disease may start at any age from childhood to midlife, and the only treatment is to exclude all these cereals from the diet.

**Coffin-Lowry syndrome**
An inherited condition of males characterised by prominent lips, coarse facial features, slanted eyes and curved back.

**Coffin-Siris syndrome**

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Causes underdeveloped toe nails as well as excess body hair, mental retardation and coarse facial features.

**Cogan syndrome**
Occurs in young adults for no apparent reason, and recovery normally occurs spontaneously. Symptoms include noises in the ears (tinnitus), dizziness, eye inflammation, deafness and inflammation of other organs.

**Congenital adrenal hyperplasia**
See Adrenogenital syndrome

**Congestive cardiac failure**
CCF occurs when a damaged heart is unable to beat effectively enough to clear blood out of the lungs and pump it out to the rest of the body. The lungs fill up with excessive amounts of blood in the veins, which can leak out into the airways to cause shortness of breath and coughing of blood.

**Conjunctivitis**
A bacterial or viral infection, or an allergy reaction, on the surface of the eye. The eye waters, is painful, itchy with an allergy, and if a bacteria is responsible, pus will form on the eye and the eyelids may stick together. Because of the watering and pus, the vision is blurred.

**Conn syndrome**
The adrenal glands sit on top of each kidney at the back of the abdomen. Conn syndrome (aldosteronism) is a rare disease caused by a non-cancerous tumour in one of the adrenal glands that produces excessive amounts of a substance called aldosterone. Aldosterone is a hormone that controls the amount of salt in the body, and excess causes too much salt to be retained in the body. This in turn causes high blood pressure, an excessive production of urine, muscle weakness, pins and needles sensations, headache and thirst.

**Conrad syndrome**
This syndrome is present from birth and causes cataracts, limb contractures, deafness and mental retardation.

**Costen syndrome**
Occurs when abnormal stresses are placed on the jaw joint and muscles of chewing because of poor closing of the mouth with irregular teeth or jaw injury (eg: fracture). Symptoms include ear pain, headaches in the temple, ringing in the ears (tinnitus) and poor hearing.

**Creutzfeldt-Jakob syndrome**
A rapidly progressive condition that usually kills victims within a year. It is caused by a viral infection of the brain and its symptoms include jerking, convulsions, paralysis, dementia, visual disturbances and loss of speech.

**Crohn disease**
See Disease Definitions section at back of book for explanation of unusual diseases.
A thickening and inflammation of the small or large intestine. It is associated with variable bowel habits, belly pain and dark blood in the faeces. It is a relatively uncommon condition, but early treatment by surgical removal of the affected sections of gut can sometimes prevent it spreading.

**Cronkhite syndrome**  
Patients with abnormal pigmentation of the fingers, palms and soles may be suffering from Cronkhite syndrome.

**Croup**  
A viral infection of the throat in children which causes swelling of the tissues in the throat that results in a seal-like barking cough, difficulty on breathing in, and excessive chest movement with breathing, in a child under five years of age. There is usually only a slight fever, and minimal pain in the throat.

**Crouzon syndrome**  
An inherited condition which causes an abnormally shaped face and skull, protruding eyes, a squint and other eye abnormalities.

**Cushing syndrome**  
Cushing syndrome is caused by an over production of steroids such as cortisone in the body, or taking large doses of cortisone to control a wide range of diseases, including asthma and rheumatoid arthritis. Headache, obesity and muscle weakness are common symptoms of this syndrome.  
Cushing syndrome is caused by an over production of steroids such as cortisone in the body, or taking large doses of cortisone to control a wide range of diseases, including asthma and rheumatoid arthritis. Headache, obesity, thirst, easy bruising, impotence, menstrual period irregularities, red face, acne, high blood pressure, bone pain and muscle weakness are common symptoms of this syndrome.

**Cystic fibrosis**  
Cystic fibrosis is a disease caused by a genetic defect. It has extremely varied symptoms because it is a disease of mucus glands, and not one particular organ in the body. Mucus glands are found throughout the body, but particularly in the lungs and gut. In the lungs, the mucus becomes thick and sticky, the lungs clog up, become infected, and the lung tissue is destroyed. In the gut, excess mucus is produced and food moves along too quickly, resulting in diarrhoea. Because the glands in the reproductive organs are involved, these patients are usually sterile, and so cannot pass the disease on to their children. The glands in the skin is affected too, and the sweat produced is far saltier than that of normal people.

**Cystitis**  
If the bladder becomes infected by bacteria (cystitis) the patient will have a fever, feel pain low down in the front of the belly, will pass urine more frequently, and pain will be felt when passing urine. In severe cases the urine will be cloudy and sometimes blood will be seen in the urine.
da Costa syndrome
Causes persistent palpitations triggered by a psychiatric disturbance.

delange syndrome
Also known as Amsterdam dwarfism, de Lange syndrome is a rare genetic defect that results in microcephaly, severe mental retardation, bushy eyebrows that meet in the centre, low birth weight, below normal growth, excessive body and head hair and death in late childhood.

Delirium tremens
Occurs when an alcoholic is deprived of alcohol. The withdrawal effects may start within 24 to 72 hours and include mental confusion, tremor, hallucinations, excessive sensitivity to all sensations, body chemistry disturbances, sweating, occasionally seizures and rarely death.

Depression
Depression may be a reaction to circumstances (eg: loss of job, death in the family), or may have no apparent cause (endogenous depression). Patients with endogenous depression have an imbalance of chemicals that normally occur in the brain to control mood. If too much of one chemical is produced, the patient becomes depressed - if too much of another, the patient becomes manic. They slowly become sadder and sadder, more irritable, anxious, unable to sleep, lose appetite and weight, and may feel there is no purpose in living. They may feel unnecessarily guilty, have a very poor opinion of themselves, feel life is hopeless and find it difficult to think or concentrate. They are not able to pull themselves together and overcome the depression without medical aid, but doctors can alter the abnormal chemical balance by giving antidepressant medications.

del Quervain tenovaginitis
Causes the prominent bone (radial styloid) at the side of the wrist above the thumb to become painful, tender and swollen, and the muscles that attach to this bone to cause pain in the bone when used.

Dermatitis herpetiformis
Occurs on the elbows, knees and backside. It consists of small, intensely itchy, fluid-filled blisters on red, inflamed skin. It often appears scratched and bleeding because of the almost irresistible itching. In some cases it is caused by a substance called gluten found in many cereals, and the dermatitis can be cured by avoiding them.

Dermatomyositis
A rare disease of unknown cause that combines a persistent dark red rash (cheeks, nose, shoulders and upper chest and back usually affected) with gradually progressive weakness and pain of the muscles in the neck, upper arms, shoulder, buttocks and thighs. It most commonly attacks those in late middle-age. Other symptoms include swollen bruised eyelids, redness and bleeding under the nails, cold hands, and a scaly rash over the knuckles. It can be diagnosed by blood tests and by taking a reading of the muscle's electrical activity.

Dermographia

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Occurs in some people who have particularly sensitive skin. When a blunt object (eg: fingernail) is moved firmly over the skin, a raised red line will appear in the skin a few seconds after the pressure is removed. This effect is more common on the back, and lines or letters can be drawn on the patient’s skin that will remain visible for some minutes or hours.

**Diabetes mellitus**

Diabetes mellitus is caused by a lack of insulin production in the pancreas (type 1 or juvenile diabetes), or is due to the cells of the body becoming resistant to insulin and preventing it from transporting sugar from the blood and into the cell (type 2 or maturity onset diabetes). The early symptoms are unusual tiredness, increased thirst and hunger, excess passing of urine, weight loss despite a large food intake, itchy rashes, recurrent vaginal thrush infections, pins and needles and blurred vision. There are many complications, including an increased risk of both bacterial and fungal skin and vaginal infections, the premature development of cataracts in the eye, damage to the retina at the back of the eye, inadequate kidney function, poor circulation to the hands and feet, the development of brown skin spots on the shins, and sensory nerve damage that alters the patient's perception of vibration, pain and temperature. Insulin is given by injection to treat type 1, and tablets to control type 2. An appropriate diet is essential in both forms.

**Diabetes insipidus**

An uncommon disease that has no connection with the common sugar diabetes (diabetes mellitus). Patients with this condition experience frequent and excessive passing of urine, excessive thirst, lose weight, develop headaches and muscle pains, become easily dehydrated, and may have an irregular heart beat. It is caused by a failure of the pituitary gland, situated in the centre of the head, to produce the hormone (vasopressin) that controls the rate at which the kidneys produce urine. It may be triggered suddenly by a head injury, or develop slowly over many months because of a brain infection, tumour or stroke.

**Diphtheria**

The incidence of diphtheria is now low due to vaccination, but some children still catch the disease each year. It is caused by a bacterium called *Corynebacterium diphtheriae* which attacks the throat and trachea (the tube leading to the lungs) to cause a sore throat, fever, nasal discharge, hoarse voice and obvious illness, with overwhelming tiredness and muscle aches. A thick, grey, sticky discharge from the infected tissue forms a membrane across the throat that the patient is constantly fighting to clear. The throat is also very swollen and narrowed. The patient becomes very ill very quickly, and death may occur within the first day of the disease. The infection may spread to the heart, nose, skin and nerves, to cause further complications.

**Disseminated intravascular coagulation**

A rare and horrendous reaction to many different types of severe disease (eg: septicaemia, cancer). Massive blood clots occur in an artery in one part of the body which may result in the blood supply to an organ, finger or limb being cut off partially or completely to cause gangrene. This clot uses up all the clotting factors available in the body, and the blood is no longer able to clot normally elsewhere, leading to bleeding internally to other organs, externally into the skin and from most body openings.

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

**Diverticular disease**
The formation of numerous small outpocketings (diverticulae) of the large gut due to increased pressure in the intestine from inadequate fibre in the diet. It is a common problem in older people who tended to have a high protein diet in their youth. When these diverticulae become infected diverticulitis results, which causes belly pain, diarrhoea and sometimes bleeding. It can be controlled by diet and medication.

**Down syndrome**
Down syndrome (mongolism) is one of the commonest causes of mental retardation, and is due to the presence of three copies of chromosome 21 instead of two. Other features are flattened facial features, short stature, low set ears, thick tongue, broad hands with only a single transverse crease and slanted eyes. It occurs more commonly in older mothers.

**Dubin-Johnson syndrome**
Occurs in children who are born without a gall bladder. The jaundice they are born with gradually subsides and they require no long term treatment.

**Dubowitz syndrome**
An inherited condition characterised by small size of baby at birth, ptosis, small jaw, sparse hair, short stature, eczema and mild mental retardation.

**Duchenne muscular dystrophy**
A sex linked inherited condition affecting only males. Females can be carriers, and statistically half the sons of a carrier are affected. It starts in infancy or early childhood, and progresses rapidly with worsening weakness of the pelvic, shoulder, arm and leg muscles resulting in inability to walk by 12 years of age. Eventually the muscles essential for breathing are affected. It is diagnosed by specific blood tests, electrical studies of muscle action, and muscle biopsy. No effective treatment or cure is available, but physiotherapy is beneficial. Eventually leads to death in the twenties or thirties.

**Eclampsia**
A rare complication of pregnancy in developed countries, but in poorer areas still occurs regularly. Extremely high blood pressure results in kidney damage, brain damage, convulsions, coma and if not treated, death.

**Ectopic pregnancy**
An ectopic pregnancy is the development of a growing foetus in the fallopian tubes instead of the uterus. The tube becomes swollen and sensitive, and pain during deep sex may be noticed some days before other painful symptoms develop. Urgent surgery is essential once the diagnosis is made.

**Eczema**
The term eczema describes a large range of skin diseases that cause itching and burning of the skin. It typically appears as red, swollen skin that is initially covered with small fluid-filled blisters that later break down to a scale or crust. The many different forms of eczema also have innumerable causes, both from within the body (e.g. stress) and outside (e.g.
allergies, chemicals). The appearance of an eczema depends more on its position on the body, duration, severity and degree of scratching than the actual cause. The specific diagnosis of the type of eczema is therefore quite difficult.

**Ehlers-Danlos syndrome**
Patients with Ehlers-Danlos syndrome have joints that are excessively loose and can be over extended, fragile skin, scarred skin over the knees and elbows and lumps under the skin around joints. It is caused by abnormal elastic tissue in skin and connective tissue.

**Emphysema**
An incurable disease that is caused by smoking, exposure to other noxious gases, or recurrent attacks of bronchitis or pneumonia that break down the millions of tiny bubbles (alveoli) in the lung through which oxygen is absorbed into the blood. Symptoms include constant shortness of breath and cough, a barrel shaped chest, excessive sputum, wasting and emaciation.

**Encephalitis**
An infection of the brain which may be confused with meningitis which is an inflammation of the membranes that surround the brain. The symptoms include headache, intolerance of bright lights, fever, stiff neck, lethargy, nausea, vomiting, sore throat, tremors, confusion, convulsions, stiffness and paralysis. This can progress to coma, and sometimes to death. The disease can occur at any age, but is more common in children and the elderly.

**Endometriosis**
A sinister disease which is due to cells that normally line the inside of the uterus becoming displaced, and moving through the fallopian tubes to settle around the ovary, in the tubes themselves, or on other organs in the belly. In these abnormal positions they proliferate, and when a menstrual period occurs, they bleed as though they were still in the uterus. This results in pain, adhesions, damage to the organs they are attached to, and infertility. The diagnosis can only be made by surgical examination of the interior of the pelvis by a laparoscope (telescope like tube). Treatment involves a combination of surgery and medication.

**Eosinophilia-myalgia syndrome**
The eosinophilia-myalgia syndrome is a severe condition caused by sensitive individuals eating excessive amounts of the protein L-tryptophan. It causes a high level of a type of white cell (eosinophils) in the blood, muscle aches (myalgia), shortness of breath, joint pains, nerve inflammation, rashes and skin thickening. It may be fatal.

**Epididymo-orchitis**
A bacterial or viral infection of the epididymis (sperm collecting ducts on the back and top of the testicle) and the testicle itself. The symptoms include pain, tenderness and fever.

**Epiglottitis**
The epiglottis is a piece of cartilage that sticks up at the back of the tongue to stop food from entering the wind pipe (trachea) when we swallow. If this becomes infected (epiglottitis)
by bacteria (eg: Haemophilus influenzae B - Hib), it can swell up rapidly and cause a very sore throat, fever and obvious illness. Rarely, it can keep swelling and cover the wind pipe completely, and rapidly cause death through suffocation. This complication is far more likely in young children than older ones.

**Epilepsy**
A condition that causes recurrent seizures (fits). Some people are born with epilepsy, while others acquire the disease later in life after a brain infection, tumour or injury. Brain degeneration in the elderly, removing alcohol from an alcoholic or heroin from an addict, or an excess or lack of certain chemicals in the body can also cause epilepsy. Fits can vary from very mild absences in which people just seem to lose concentration for a few seconds, to uncontrolled bizarre movements of an arm or leg, to the grand mal convulsion in which an epileptic can thrash around quite violently and lose control of bladder and bowel. It can be explained most easily by an analogy to a computer that develops a short circuit. Parts of the brain are able to short circuit after very minor and localised damage. This can stimulate another part of the brain, and then another, causing the responses that we see.

**Erb-Duchenne palsy**
Occurs in infants because of damage to the nerves in the neck from excess pulling on the head during a difficult delivery. There is weakness or paralysis of the shoulder muscles, and sometimes numbness of the overlying skin.

**Erythema multiforme**
An acute inflammation (redness) of the skin, which may be triggered by drugs, bacterial or viral infections, cold sores and other herpes infections, or it may appear for no apparent reason. Patients develop several types of rash simultaneously and the insides of the mouth and the vagina, and also the eyes, may be involved.

**Erythema nodosum**
Erythema nodosum is characterised by very tender, painful red lumps that develop on the front of the leg, usually below the knees. Other areas that are affected less commonly include the arms, face and chest. The lumps persist for about six weeks before slowly disappearing. Patients also have a fever, joint pains and general tiredness. The full cause of this disease is unknown, but it often appears to be a reaction to certain types of bacterial infection, drugs or more serious underlying diseases.

**Erysipelas**
A bacterial infection of the layer of fat just under the skin, often on the cheek, but any area of the body may be affected. The skin becomes swollen, red, painful and hot, and the patient is feverish, may shiver, and feels ill. It may start at the site of a scratch or bite, but often there is no apparent cause. Fluid filled blisters sometimes develop on the infected skin.

**Felty syndrome**
A complication of rheumatoid arthritis that causes intermittent arthritis in numerous joints, enlargement of liver, lymph nodes and spleen, low white blood cell numbers and leg ulcers.
Fibroids
Fibroids are balls of scar tissue in the muscular wall of the uterus that develop with age and after pregnancies. They can distort the shape of the uterus to cause painful spasms with a period, and irregular, heavy bleeding.

Fibromyositis
Occurs in large muscles that have been overused and damaged repeatedly by heavy work or exercise. Scattered muscle cells are replaced by fibrous scar tissue to disrupt the structure of the muscle and cause a deep ache that worsens with use. The muscles are stiff and fatigue easily.

Fixed drug eruption
A fixed drug eruption is an adverse reaction to a drug (eg: blood pressure medications, thiazide diuretics - fluid tablets) that may have been taken for years without previous reaction. These itchy, red, patchy, raised rashes are often very slow to go away after the drug is ceased.

Foetal alcohol syndrome
Caused by the mother drinking excessive amounts of alcohol during pregnancy, and results in a small baby that grows very slowly in the first few years of life. Small amounts of social drinking, and even the occasional episode of drunkenness during pregnancy do NOT cause this problem (although they are not advisable).

Folliculitis
Hair follicles are microscopic pits in the skin that slowly produce new hairs all over the body. Folliculitis is a bacterial infection of a hair follicle. It usually occurs on the neck, upper lip and groin. Folliculitis is far more common in men than women, in diabetics, those with poor personal hygiene, and patients with very hairy and oily skin. One or more sore, red, tender, itchy, pus filled blisters, sometimes still containing a hair, appear on the skin.

Food poisoning
Due to the presence of a bacteria, or a toxin produced by bacteria, in food. The diagnosis is most strongly suspected when a whole family or group of people is affected simultaneously. The symptoms and the severity of the attack will depend upon the bacteria causing the poisoning, the amount eaten, and the age and general health of the victim. Most attacks of food poisoning occur abruptly, within eight hours (and often one or two hours) of eating the contaminated food, but some types may take up to 24 hours to give symptoms. The patient suddenly starts vomiting, and has explosive diarrhoea associated with intermittent stomach pain. Blood may be vomited or passed in the motions. Foods that are particularly likely to be infected are dairy products, fish, chicken or other meat that has been inadequately refrigerated, fried foods and meat dishes that have been reheated, and stale bread.

Fragile X syndrome
This syndrome is believed to cause a quarter of the mental retardation in males. All men have only one X chromosome paired with a Y chromosome. Females, who have two X chromosomes, may be carriers from one generation to the next. The X and Y chromosomes
determine the sex of every individual. Other symptoms include over activity, epilepsy, large build, large jaw and testes, and short sightedness.

**Frey syndrome**
Frey syndrome is sweating and redness of the face that occurs when eating, caused by an inappropriate nerve reflex.

**Friedreich’s ataxia**
An inherited condition which usually starts in childhood or early adult life. It is caused by damage to chromosome 9, and symptoms include an abnormal way of walking, incoordination, clumsiness, weakness and abnormal sensation.

**Fröhlich syndrome**
Causes a late onset of puberty, general loss of libido and sexual function, thin wrinkled skin, scanty body hair, obesity around the genitals and buttocks and persistent tiredness.

**Furuncle**
A furuncle is a boil caused by the bacterial infection of a hair follicle on the skin or in an ear. They often start after an injury to the ear canal from a cotton bud, hair pin or other foreign object, and produce an excruciatingly painful swelling that may completely close the ear canal. The pain may be aggravated by chewing and may spread to the lymph nodes on that side of the neck. In due course, the furuncle may burst and discharge copious amounts of pus. They are more common in diabetics.

**Galactosaemia**
A disturbance of the metabolism (breakdown) of the sugar galactose in milk to cause vomiting, failure to thrive, liver disease and eye cataracts.

**Gastritis**
The stomach contains concentrated hydrochloric acid that is used to digest food. Extra amounts are secreted when food is eaten, or even the smell of food may trigger acid secretion. The stomach is lined with a thick mucus that protects it from being digested by the acid it contains. Gastritis is an inflammation of the stomach caused by the mucus lining becoming too thin, or excessive acid secretion. Upper belly pain, often made worse after eating, and burping, are the most common symptoms. If the acid succeeds in damaging the stomach or small intestine, a peptic ulcer will develop, and pain may become more constant.

**Gastroenteritis**
By far the most common cause of diarrhoea is a viral infection of the intestine (viral gastroenteritis). This infection is passed from one person to another by close contact or on the breath, and usually occurs in epidemics, often in springtime. The usual symptoms are six to twelve hours of vomiting followed by one to three days of diarrhoea, and painful gut spasms also occur. Diet and adequate fluid intake are the only treatments.

**Gaucher disease**
An inherited condition that causes fat to accumulate in cells throughout the body.
Medical Tests Explained

Enlargement of the spleen, anaemia, damage to bones in the back and thigh, and bone pain occur. It is more common in those of eastern European and Jewish heritage.

**Genital herpes**
Causes a blister which bursts to form a very painful, tender, shallow ulcer that persists for ten to twenty days. The virus that causes the infection (*Herpes simplex*) is highly contagious. These ulcers can now be treated successfully by medication, but only if treatment is started within 72 hours of the start of the rash.

**Genital warts**
Caused by the human papilloma virus, which is passed from one partner to another during sex. These warts are usually external on the male, but internal in the woman. They can become itchy, but more seriously, the virus can cause cancer of the cervix in women.

**Giardia**
*Giardia lamblia* is a microscopic animal that can easily enter the body and cause an infection in the small intestine. It passes from one person to another by poor personal hygiene. The condition is far more common in children than adults, who may have no symptoms. Patients develop a mild diarrhoea with foul-smelling stools, smelly flatus (farts), general tiredness, nausea, vomiting, burping and cramping pains in the belly. A long-term result may be malnutrition, particularly amongst Aborigines and children in third-world countries, as the constant diarrhoea prevents them from absorbing the small amount of food that they are able to obtain and eat.

**Gilbert syndrome**
An inherited condition in which the liver fails to adequately clear bilirubin from the blood. The patient is mildly jaundiced at times, but otherwise not affected. Treatment is not normally necessary.

**Giles de la Tourette syndrome**
Children with the rare Giles de la Tourette syndrome develop convulsions, twitching and uncontrolled swearing.

**Glandular fever**
Glandular fever (infectious mononucleosis) is caused by the Epstein-Barr virus which is passed from one person to another through the breath. It is very common in teenagers and in the early twenties, but uncommon later in life. Patients usually have a sore throat, raised temperature, croupy cough, large glands in the neck and other parts of the body, extreme lethargy, and generally feel absolutely lousy for about four weeks. Complications include secondary bacterial infections while others may have their spleen infected by the virus, or in even rarer cases the liver, heart and brain may be involved.

**Glanzmann disease**
This condition is characterised by recurrent episodes of prolonged bleeding from lining of mouth, nose and vagina, due to an inherited defect in the structure of platelets (blood cells essential for clotting). Platelet transfusions on a regular basis is the only treatment. It is a

*See Disease Definitions section at back of book for explanation of unusual diseases.*
lifelong problem resulting in significant disability.

**Glaucoma**
Glaucoma is due to an increase in the pressure of the jelly like fluid inside the eye. This may come on gradually, or may be quite sudden. If inadequately treated, total blindness may result. Early symptoms include an eye ache or pain, blurred vision, seeing halos around objects, red eye, a gradual loss of peripheral vision, and there is an hereditary tendency.

**Globus**
A relatively common phenomenon, but often goes unrecognised. The patient complains of a distressing intermittent lump in the throat, but on examination by a doctor, nothing can be found. It is caused by subconscious tension and anxiety which causes a spasm and uncomfortable tightness of the throat muscles. It may also extend down into the gullet (oesophagus) to cause swallowing difficulties.

**Glomerulonephritis**
A degeneration of the filtering mechanism (glomeruli) of the kidney that occurs in two forms - acute and chronic. Acute glomerulonephritis is often triggered by a bacterial infection (e.g. tonsillitis) but may start as a result of other diseases in the body. The patient feels tired, has no appetite, develops headaches and has a low-grade fever. Other symptoms can include a low urine output, loin (kidney) pain, swelling of the ankles and around the eyes, and cloudy urine. Doctors may detect an increase in blood pressure. Some patients do not recover from acute glomerulonephritis, and are considered to have chronic glomerulonephritis. There are usually no symptoms until the kidneys start to fail and excessive levels of waste products build up in the bloodstream.

**Glue ear**
If phlegm from the nose enters the middle ear through the eustachian tube, or other secretions accumulate in the cavity, it is difficult for them to escape back through the eustachian tube to the back of the nose, particularly if the adenoids which surround the opening of the tube into the nose are swollen. This is glue ear, and may be responsible for recurrent infections in the ear, deafness and low grade ear discomfort. The surgical insertion of a small tube (grommet) through the ear drum to relieve the pressure is often necessary.

**Goitre**
A goitre is an enlarged thyroid gland in the front of the neck. The thyroid hormone (thyroxine) controls the rate at which all bodily chemical processes (metabolism) occur. An enlarged thyroid can be due to an excess or lack of thyroxine production. Iodine is essential for the production of thyroxine, and a lack will cause the gland to enlarge in an attempt to produce adequate quantities of the hormone. If too much thyroxine is being produced, the gland will swell to allow this level of production. Other causes include cysts, tumours or cancer in the gland.

**Goltz syndrome**
Causes abnormally formed nails and scar like areas of thin skin on the scalp, thighs and sides of the belly.
Gonorrhoea
A common sexually transmitted disease caused by the bacterium *Neisseria gonorrhoeae*. It has an incubation period of three to seven days after contact. In women, there may be minimal symptoms or a foul discharge from the vagina, pain on passing urine, pain in the lower abdomen, passing urine frequently, tender glands in the groin, and fever. The infection can spread and involve the uterus and Fallopian tubes. In men symptoms include a yellow milky discharge from the penis, pain on passing urine and inflamed glands in the groin. If left untreated, the prostate gland and testes can become infected. Through anal intercourse, a rectal infection with gonorrhoea can develop to cause an anal discharge, mild diarrhoea, rectal discomfort and pain on passing faeces.

Goodpasture syndrome
Caused by a defect in the body’s immune system, and results in shortness of breath, persistently coughing up blood, anaemia, lung and kidney damage.

Gout
Gout is caused by the build up of excess levels of uric acid in the blood. Uric acid itself is a break down product of proteins, particularly those found in red meat, offal and shellfish. The excess uric acid may be caused by a high protein diet, or more commonly an inability of the kidney to transfer uric acid from the blood into the urine. The uric acid level in the fluid in all joints (synovial fluid) is the same as in the blood. If this reaches a critical level, particularly in joints that are put under considerable pressure (eg: ball of the foot), the uric acid may come out of solution and form crystals which under the microscope look like double ended needles. In the affected joint they feel like double ended needles, and cause severe pain, tenderness, redness and swelling of the joint. The onset of a gout attack may be triggered by excess alcohol intake, although alcohol does not itself break down into uric acid. Medications are available to both prevent and treat gout by reducing the level of uric acid in the blood, and therefore the joint.

Gradensigo syndrome
Gradenigo syndrome is ear pain and infection, headache, face pain and double vision caused by an infection of one of the bones in the skull (petrous bone) that involves a nerve (sixth nerve) that runs to the ear and face.

Granuloma inguinale
A sexually transmitted disease caused by the bacteria *Donovania* or *Calymmatobacterium granulomatis*. It is rare in Australia, but common in more primitive countries. It results in painless nodules that break down to shallow skin or genital ulcers.

Guillain-Barré syndrome
The Guillain-Barré syndrome often occurs in young people and causes progressive symmetrical weakness of the limbs and face, numbness in hands and feet, nerve pain, difficulty in speaking and swallowing. It often follows a viral infection, and although treatment is unsatisfactory, 80% of patients recover.

See Disease Definitions section at back of book for explanation of unusual diseases.
Hallermann-Streiff syndrome
Causes cataracts, facial and dental abnormalities, lack of hair and stunted growth.

Hand-foot-mouth disease
Virtually every child will eventually develop hand foot mouth disease, but it is usually so mild that it causes no symptoms. The condition is caused by a Coxsackie virus and in severe cases, a child will develop blisters on the soles and palms, and mouth ulcers that persist for three to five days before settling. The rash may be accompanied by a mild intermittent fever, headache and irritability.

Hand-Schueller-Christian syndrome
Children are the usual victims of Hand-Schueller-Christian syndrome which is one of a group of diseases known as histiocytosis X. It causes diabetes insipidus (passing huge amounts of urine), patchy bony absorption in the skull, protruding eyes, lung damage and outer ear inflammation. Other symptoms may include skin rashes and gum inflammation.

Hartnup disease
A rare inherited disorder of body chemistry that leads to a deficiency of niacin (vitamin B3) and symptoms similar to those of pellagra including poor coordination, emotional personality, mental confusion and a sun sensitive red scaling rash.

Haemochromatosis
A congenital (present since birth) inability of the body to correctly process iron. Excessive amounts of iron are stored in the liver, pancreas, kidneys, heart, testes and other tissues. It is far more common in males than females, and because it is a very slowly progressive condition, it usually causes no problems until the patient is in his 50s or 60s. The common symptoms are liver enlargement and reduced liver function, joint pains, heart enlargement, impaired heart function, diabetes, dark skin and mouth discolouration and impotence. The disease can be diagnosed by specific blood tests and liver biopsy.

Haemolytic anaemia
A condition in which the body destroys its own blood cells, resulting in tiredness from the anaemia and subsequent lack of oxygen, as well as a large spleen and constant low fever.

Haemophilia
There are some people who are born with defects in these chemical pathways, or who develop a lack of one of the essential elements for clotting, and become bleeders. Instead of stopping within a few minutes of an injury, bleeding may persist for hours, and the slightest injury may cause massive bruises, or bleeding into joints that leads to arthritis. Haemophilia (lack of factor VIII) is an inherited diseases of excessive bleeding. This disease only occur in males, but females act as the carriers from one generation to the next. This can occur because the female has two X chromosomes, while the male has only one. Some of the chemicals (known as factors) essential for clotting are produced by genes attached to the X chromosome. If one X chromosome is faulty, in the female there is another one to take over, but there is no equivalent back-up system in the male. There is no cure for haemophilia, however it is possible to replace the missing factors which may be extracted from blood
donations.

**Happy puppet syndrome**
See Angleman syndrome

**Heart attack**
See Myocardial infarct

**Heberden’s nodes**
Bony lumps that develop beside finger joints in patients with severe osteoarthritis.

**HELLP syndrome**
Complication of pregnancy involving destruction of blood cells. Name is an acronym of medical terms for characteristic symptoms - Haemolysis (breakdown of red blood cells resulting in anaemia), Elevated Liver enzyme activity (due to liver damage from excess waste products from destroyed red blood cells) and Low Platelet count (blood cells essential for blood clotting) in a pregnant woman. Other symptoms that may occur include high blood pressure, pre-eclampsia (see separate entry) and abdominal pain. Early confinement, if possible, is the only treatment.

**Henoch-Schoenlein purpura**
Due to a self-limiting disorder of the immune system that causes bleeding into the skin, lungs, intestine, joints and bladder from inflamed arteries.

**Hepatitis**
A viral infection of the liver (hepatitis) may be caused by a number of viruses (eg: hepatitis A, B, C etc.). Most forms of hepatitis have both an acute (severe illness) and a chronic (persistent illness) stage. In the acute stage, varying degrees of illness may be experienced, with symptoms that may include a fever, loss of appetite, nausea, vomiting, diarrhoea, belly pains, jaundice and weight loss. The chronic stage may lead to cirrhosis or liver cancer.

**Hiatus hernia**
A hiatus hernia occurs when part of the stomach pushes up through the diaphragm (the sheet of muscle that separates the chest and abdominal cavities) into the chest. The muscle ring that prevents stomach acid from coming back up into the oesophagus then fails to work effectively, and both acid and gas can then enter the lower oesophagus to cause burning pain behind the breast bone, burping and an acid taste at the back of the tongue.

**Hirschsprung disease**
A rare birth defect in which the nerve supply to a section of large bowel fails to develop. This part of the intestine fails to contract at all, and effectively slows then blocks the movement of faeces through this section. Surgically cutting out the affected part of the bowel solves the problem.

**Histiocytosis X**
See Hand-Schüller-Christian syndrome

See Disease Definitions section at back of book for explanation of unusual diseases.
Histoplasmosis
Histoplasmosis is a fungal (mould) infection that can be caught in south-east Asia, North and South America and Africa. The spores that cause the infection are present in the soil and can be inhaled to cause a form of pneumonia. Most cases of histoplasmosis are very mild and may pass unnoticed or cause mild flu-like symptoms. Sometimes a moderately severe case of pneumonia may develop, and in rare cases a severe and fatal form of pneumonia may occur. The symptoms resemble those of a normal pneumonia with a cough, wheeze, shortness of breath, marked tiredness and a fever.

Hodgkin disease
Hodgkin’s disease is a cancer of lymph nodes that spreads at an early stage to involve the liver and spleen. Lymph nodes are scattered throughout the belly, and may enlarge to a size when they can be felt if affected by this disease.

Horner syndrome
Occurs when nerves are compressed in the brain, neck or upper chest by a pneumothorax (air outside the lung in the chest), lung cancer, tumours of the base of the brain or upper spinal cord in the neck, or poor blood supply from narrowed arteries in the brain or spinal cord. It causes drooping of one eyelid, contracted pupil of the other eye, reduced sweating, and a sunken in appearance to the eyes.

Hunter syndrome
An inability to process certain fats appropriately. It causes stiff joints, distorted facial appearance, large spleen, heart abnormalities, mild mental retardation and deafness.

Huntington chorea
Huntington’s chorea is a devastating inherited condition that does not make its presence felt until the patient is 40 or 50 years old. By this time they have usually married and had children who may have inherited the gene, but will not know until they also are in middle age. These patients suffer progressive loss of limb control and mental deterioration. There is no treatment, and death occurs about 15 to 20 years after diagnosis.

Hyaline membrane disease
The infantile respiratory distress syndrome (hyaline membrane disease) occurs within a few hours of birth in premature babies to cause severe shortness of breath, rapid breathing, chest retraction, grunting and blue tinged skin (cyanosis). It is due to a lack of an essential lubricant in the lung, that does not normally develop until a few weeks before birth.

Hydatidiform mole
One in every 750 pregnancies results in a uterine (or hydatidiform) mole caused by the overdevelopment of the placenta (afterbirth) with multiple cysts. Any embryo that is present dies at an early stage. The woman may not be aware of the problem until it is well advanced, when an abnormal vaginal bleed or discharge may occur. A serious complication is an invasive mole, in which the abnormal placenta penetrates through the wall of the uterus and damages it to the point where a hysterectomy is usually necessary. An even more serious

See Disease Definitions section at back of book for explanation of unusual diseases.
complication that occurs in about 4% of women with uterine moles is cancer of the abnormal tissue (choriocarcinoma).

**Hydrocele**

A hydrocele is a collection of fluid around the testicle. It is painless, but the testicle may slowly enlarge to two or three times its normal size. The testes are surrounded by a fine layer of tissue called the tunica vaginalis. Fluid may accumulate between the testes and the tunica to cause a hydrocele. They cause no permanent damage to the testicle or its function, may follow an injury or infection in the scrotum, or may occur for no apparent reason.

**Hydrocephalus**

The brain is surrounded by a supportive fluid (cerebrospinal fluid - CSF), and there are interconnected cavities within the brain that also contain CSF. If there is too much CSF produced, or insufficient is absorbed, the pressure of this fluid in and around the brain will gradually increase (hydrocephalus). The resultant pressure on the brain will affect its function and result in headaches, personality changes, memory loss, reduced intelligence and convulsions. In babies, the head will enlarge dramatically unless the excess fluid is drained.

**Hyperparathyroidism**

See Parathyroid glands.

**Hyper-reactive airways disease**

A condition similar to asthma in which there is wheezing, cough and shortness of breath, but more allergy type symptoms and less phlegm production.

**Hypoglycaemia**

Hypoglycaemia (low blood sugar) can occur in diabetics who use too much insulin or other sugar lowering medications, in alcoholics or in starvation. Symptoms may include sweating, palpitations, tremor, nervousness, hunger, dizziness, headache, confusion, blurred vision, and if left untreated may progress to convulsions and coma.

**Hypoparathyroidism**

See Parathyroid glands.

**Ichthyosis**

An uncommon congenital (present since birth) skin condition which causes widespread scaling and thickening of the skin due to insufficient oil glands.

**Ileus**

Ileus is the medical term for cessation of all contractions of the bowel. Normally the gut is constantly contracting and relaxing in waves that move the food along. These movements may be occasionally heard as loud tummy rumbles, but can always be heard by a doctor listening through a telescope. An obstruction to the gut caused by a tumour, polyp, cancer or twisting of a loop of the gut may result in ileus after some hours of increasing pain as the bowel tries to overcome the obstruction. Urgent treatment is necessary to relieve the blockage and restart bowel movement before permanent damage occurs.

See Disease Definitions section at back of book for explanation of unusual diseases.
Impetigo
School sores (impetigo) are a very common bacterial skin infection that virtually every child will catch at some stage. It is most commonly caused by the bacteria *Staphylococcus aureus*. The infection spreads easily to cause one or more itchy, red, raised, weeping or crusting sores on the skin.

Infectious mononucleosis
See glandular fever

Intertrigo
Heat, sweat and friction are the causes of intertrigo, which results in an area of red, damaged, moist, itchy and burning skin in places where the skin folds back upon itself, such as under the breasts, in the groin and armpit, and in skin folds of the abdomen and neck in obese people. In advanced cases, the skin may crack, bleed and become painful; and fungal and/or bacterial infections may also develop.

Intussusception
A polyp growing in the gut may be picked up by the waves of muscular contraction that normally move food through the gut. As the polyp is pushed along, it pulls the piece of gut it is attached to along with it, to cause an infolding of the gut into itself (an intussusception). This inevitably leads to obstruction of the gut, severe intermittent waves of pain and ileus (see above). These obstructions may occur in the small or large gut, and are most common in children. The intussusception can be relieved by a barium enema (special x-ray) or colonoscopy (passing a flexible telescope in through the anus) if the large bowel is involved, but other cases will require surgery. Children suffer from this problem far more frequently than adults.

Iritis
Iritis is an inflammation of the iris (the coloured part of the eye). The inflammation can be due to an infection such as toxoplasmosis, tuberculosis or syphilis, or it may be associated with inflammatory diseases in other parts of the body, including psoriasis, ankylosing spondylitis, and some bowel conditions. The latter form is more common. Almost invariably, only one eye is involved. It will suddenly become red and painful, a watery discharge will develop, and the vision is blurred. Bright lights will aggravate the eye pain and the pupil is small.

Irritable bowel syndrome
The irritable bowel syndrome is characterised by intermittent belly pain, irregular bowels, bloating and indigestion. It tends to occur in anxious or depressed people or may be due to stress or a low fibre diet. The large bowel is excessively active and sometimes noisy.

Irukandji syndrome
An excessive and abnormal response to some jellyfish stings which results in the lungs filling with fluid, severe shortness of breath, severe widespread pain, rapid heart rate, profuse sweating, generalised shaking and very high blood pressure.

See Disease Definitions section at back of book for explanation of unusual diseases.
**Jaccoud syndrome**
Due to repeated attacks of rheumatic fever or synovitis, resulting in arthritis and distortion of finger joints with minimal pain and relatively normal function.

**Kawasaki syndrome**
Occurs in infants to cause enlarged lymph nodes in the neck, a high fever, inflamed mouth, rash, conjunctivitis and red peeling palms and soles.

**Keratoconjunctivitis sicca**
Keratoconjunctivitis sicca can cause dry eyes and mouth due to failure of the lacrimal and salivary glands with age, infection or other disease.

**Kidney failure**
Kidney failure (uraemia) may be caused by persistent infection or inflammation of the kidney, a poor blood supply to the kidneys, severe high blood pressure, or a number of rarer diseases. When the kidneys start to fail they lose the ability to concentrate urine, and large quantities of clear, dilute urine are produced. As the disease progresses, urine production will decrease and eventually cease, leading to death.

**Kidney stone**
Very concentrated urine may result in a small stone forming in the kidney. If this stone enters the ureter (tube from kidney to bladder) it will cause intermittent excruciating pain with every movement of the stone as it is pushed and scrapes down the tube with the pressure of urine behind it. The pain tends to run from loin to groin through the pelvis and into the testicles of men. Blood may be seen in the urine.

**Kleine-Levin syndrome**
Occurs only in the teens to twenties age group to cause infrequent episodes every few months of severe excessive sleepiness, increased appetite, mood disturbances, increased sexual activity, disorientation, hallucinations and memory loss.

**Klinefelter syndrome**
Klinefelter syndrome only affects males. They have additional X chromosomes matched with a single Y chromosome. Their genetic make up is therefore XXY or XXXY instead of the normal XY. Features include delayed puberty, tall slim build, emotional disturbances and underdeveloped genitalia.

**Kwashiorkor**
A severe lack of protein in the diet (kwashiorkor) may lead to a drop in the protein level in blood, which allows fluid to seep out of the bloodstream and into tissues, particularly the belly. This explains the swollen bellies of starving people, particularly children.

**Labyrinthitis**
The semicircular canals that control balance are known as the labyrinth. If this structure becomes inflamed or infected (labyrinthitis) the patient will become dizzy, abnormal eye

See Disease Definitions section at back of book for explanation of unusual diseases.
movements will occur and noises may be heard in the ear.

**Lactose intolerance**
Lactose is the sugar found in cows’ milk. Some children are born with a lactose intolerance and develop diarrhoea whenever milk is taken, but many children, and some adults, have a temporary intolerance to lactose after viral gut infections such as gastroenteritis. This may prolong the diarrhoea from the infection if milk is given too early in the recovery phase. Avoiding all dairy products controls the problem.

**Langer-Giedion syndrome**
A rare genetic defect. It is characterised by sparse hair, bulbous nose, bony protrusions and a small head, but intelligence is often reasonable, and defects can be corrected by plastic surgery.

**Laryngomalacia**
A rare condition of children in which the cartilage of the larynx (voice box) is softened, and collapses when the patient breathes in heavily with exercise, to cause croup.

**Laurence-Moon-Biedl syndrome**
An inherited condition that causes night blindness, mental retardation, obesity, small genitals and sometimes extra fingers or toes.

**Lead poisoning**
Causes abdominal colic pain, constipation, headache, irritability, difficulty in swallowing, mental deterioration, poor coordination, convulsions and coma.

**Legionnaire's disease**
Legionnaire's disease is a form of pneumonia caused by the bacterium *Legionella pneumophila* that contaminates air-conditioning systems. Patients may develop only a mild infection with a cough and shortness of breath, and recover without treatment, but some (particularly smokers) may rapidly deteriorate and die.

**Leigh syndrome**
The features of the inherited Leigh syndrome in a child include vomiting, weight loss, weakness, convulsions, loss of vision and irregular breathing which lead inevitably to death.

**Lennox-Gestaut syndrome**
Causes multiple seizures of varied types, mental retardation and sudden faints.

**Lentigo**
Lentigo is the technical name for the flat brown “age spots” that increase in size and number on the skin of many elderly people. They also are harmless, but may be cosmetically undesirable.

**Leprosy**
Leprosy is caused by the bacteria *Mycobacterium leprae*, which is spread from one person

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*See Disease Definitions section at back of book for explanation of unusual diseases.*
to another by prolonged close contact. It starts and progresses very slowly, the cooler parts of
the body furthest from the heart, being affected first. Pale, thick patches of skin on the hands
and feet are followed by nodules that slowly enlarge. Nerves then become involved and
sensation is lost. As the disease progresses, a pins and needles sensation may be felt, ulcers
form, and bones in the fingers and toes begin to disintegrate. There is rarely any pain. A lot of
the damage and deformity in leprosy is due to unintentional burns and injuries to totally numb
fingers, toes, etc.

Leriche syndrome
Caused by a large blood clot in the arteries of the pelvis and results in pain in the legs, poor
pulses in the legs and impotence.

Lesch-Nyhan syndrome
An inherited genetic condition that affects only males. They are unable to remove the waste
product uric acid adequately from their body, and suffer from severe gout, mental retardation,
abnormal muscle movements, and are likely to mutilate themselves.

Letterer-Siwe syndrome
A nasty condition of infants causing fever, wasting, itchy raised rash, with enlarged liver,
spleen and lymph nodes.

Leukaemia
Leukaemia is a cancer of the white blood cells. It may have very varied symptoms including
weight loss, lethargy, fever, intermittent arthritis, recurrent infections, bruising, nose bleeds,
enlarged tender lymph nodes, and a large spleen and liver. It is initially detected by a blood
test, and the diagnosis is confirmed by a bone marrow biopsy (surgical sample).

Lichen planus
An uncommon skin condition which causes small, shiny, flat topped growths that may grow
and join together to form a plaque. It can occur anywhere on the body surface, including the
insides of the mouth, nose, ears, vagina and anus.

Lichen sclerosis
A scarring of the tissue on one side of the penis, associated with a thickened area of skin,
caused by infection or injury to the penis. It causes a sideways curve to the penis, that may be
painful during an erection.

Liver failure
The liver is responsible for processing most of the chemicals that are essential for bodily
function. It regulates the amount of blood sugar, assists in producing the blood clotting
mechanisms, helps to nourish new blood cells, destroys old blood cells, breaks down excess
acids to be eliminated as urine, stores and modifies fats so they can be more efficiently
utilised by cells, stores certain vitamins and minerals, and removes poisons from harmful
substances such as alcohol and drugs. The liver is also an important source of the heat which
is essential to maintain the body's temperature, and aids the digestive process by the
manufacture of bile which mixes with the digestive juices in the small intestine.

See Disease Definitions section at back of book for explanation of unusual diseases.
**Loeffler syndrome**
Severe asthmatics may develop Loeffler syndrome in which the lung is infiltrated with a specific type of white cell (eosinophils) which damage the lung structure, worsen the wheezing and cough, and cause a fever.

**Louis-Bar syndrome**
A distressing condition of teenagers caused by a spontaneous degeneration of the spinal cord and cerebellum (part of the brain). It causes bleeding onto the whites of the eyes, pinprick bruising of the face and groin, mental retardation, recurrent lung and ear infections, and poor coordination.

**Lowe syndrome**
Boys with the sex-linked inherited condition Lowe syndrome have chemical imbalances that cause mental retardation, eye cataracts and corneal (eye surface) clouding, and Asian shaped prominent eyes.

**Lung cancer**
Cause inflammation of the lung tissue, weight loss, coughing, chest pain, coughing up blood, shortness of breath and wheezing. Smoking is by far the most common cause.

**Lyme disease**
An infection passed from mice and deer to man by tics. It is common in North America, but rare elsewhere. It causes a spreading rash, fever, chills, muscle pains, headache, arthritis and enlarged lymph nodes.

**Lymphoedema**
Lymphoedema is a build up of waste products in an arm or leg due to a blockage of the tiny lymph ducts that drain wastes from every cell back to a large vein near the heart. The lymph ducts pass through lymph nodes in the groin and armpit, and if these are removed to prevent the spread of cancer, the pressure builds up in the lymph channels to cause firm swelling in the limb. The affected finger and toe nails may take on a pale yellow colour.

**Lymphogranuloma venereum**
A sexually transmitted disease caused by *Chlamydia* which is rare in western countries. After an incubation period of one to three weeks, patients develop an ulcer on the penis or vulva, which is followed by infection of the lymph nodes in the groin. These soften and may drain pus onto the skin. The infection can spread to cause joint, skin, brain and eye infections.

**Lymphoma**
A lymphoma is cancer of the lymph nodes. These are concentrated in the groin, arm pit, around the neck and in the abdominal cavity. If a lymphoma occurs in the belly, ascites may be the first sign of the condition.

**Malaria**
Malaria kills millions of people in developing countries every year. The malarial parasite is...
injected into a patient by a mosquito. The parasite then invades red blood cells, destroying them and releasing their haemoglobin, which then degenerates to bilirubin to give the characteristic jaundice. The jaundice may be so severe as to give a dark bronzed appearance to the skin, and the urine may appear black (blackwater fever). The best way to prevent malaria if visiting a tropical country is to avoid being bitten by a mosquito by wearing long sleeves, avoiding shorts and perfumes, and using mosquito nets and repellent. Medication taken on a regular basis can be a back up preventative, but is not foolproof. Treatment of malaria is usually difficult, but successful, provided the patient has access to appropriate medication and care.

**Mallory-Weis syndrome**

Prolonged vomiting from any cause may result in vomiting of blood as the junction between the oesophagus (gullet) and stomach becomes torn. This is known as the Mallory-Weis syndrome.

**Marfan syndrome**

A genetic defect that causes long limbs and fingers, a thin body and heart defects.

**Mauriac syndrome**

Poorly controlled insulin dependent diabetes may cause obesity, and in children, may reduce growth in height and enlarge the liver (Mauriac syndrome).

**Mastoiditis**

The mastoid bone is part of the back of the skull that protrudes down immediately behind the ear. It is hollow, and if the spaces in this bone become infected (mastoiditis) the patient will suffer ear and bone pain, a fever, and ear function including balance and hearing may be affected. Urgent antibiotic treatment is essential to prevent long term complications.

**May-Hegglin anomaly**

An abnormality of blood cells, the cause of which is unknown. Patients have inflamed and abnormal white blood cells associated with enlarged platelets (blood clotting cells) which are reduced in number. The abnormal blood cells can be seen under a microscope.

**Meckel’s diverticulitis**

A Meckel’s diverticulum is a side piece on the small intestine of about 3% of people that forms at the point where the gut was attached to the umbilical cord before birth. This can become infected and inflamed in the same way as the appendix.

**Meckel syndrome**

Patients with Meckel syndrome have a cleft lip and palate, extra fingers and toes, under developed kidneys, incomplete formation of the skull and sometimes eye defects.

**Meig syndrome**

Caused by inflammation of an ovary caused by a fibrous tumour growing in it. Ascites and fluid accumulation in the chest will occur, but surgical removal of the affected ovary cures the condition.

See Disease Definitions section at back of book for explanation of unusual diseases.
Melanoma

Melanomas are the most serious form of skin cancer, and over a quarter of patients who develop a melanoma will eventually die from this disease. Melanomas may be black, brown, pink or blue. The surface of a melanoma is often uneven and bumpy, and the pigment can be seen advancing into the surrounding skin. They may enlarge very rapidly, and advanced cases will bleed, scab and ulcerate. Sun-exposed parts of the skin are by far the most commonly affected areas.

Melioidosis

An uncommon infection of the lungs caused by a bacteria called *Pseudomonas pseudomallei*. It occurs throughout south and east Asia, and has been reported in Aboriginal communities in northern Australia. Cough, fever, muscle pains, loss of appetite and chest pain are the most common effects.

Mendelson syndrome

In severe cases, inhaling stomach acid with reflux oesophagitis may cause Mendelson syndrome with generalised inflammation of the bronchi and lung tissue. Patients in a coma may be affected this way as they are unable to cough away any acid that may trickle into the lungs.

Ménière's disease

Ménière's disease may occur after a head injury or ear infection, but in most patients it has no apparent cause. It is more common in men, and with advancing age. The cause is a build-up in the pressure of the fluid inside the hearing and balance mechanisms of the inner ear. The increase in pressure causes a constant high-pitched ringing noise (tinnitus is the technical term - see separate entry) in the ear. Other symptoms include dizziness, nausea and slowly progressive permanent deafness. Avoiding prolonged episodes of loud noise (eg: jet engines, rock bands) helps to reduce the incidence of the condition.

Meningitis

The brain is supported and completely surrounded by a three layered membrane (the meninges) which contain the cerebrospinal fluid. If these meninges are infected by a virus or bacteria (meningitis) the patient may experience headache, fever, fits, neck stiffness and in severe cases may become comatose.

Menopause

The menopause occurs in the late forties and early fifties in most women. Instead of cycling smoothly and evenly through the monthly changes, sex hormone levels start to change suddenly and inappropriately. This causes the symptoms of menopause which include irregular menstrual periods that can vary from very light to very heavy, hot flushes, headaches, irritability, personality changes, breast tenderness, tiredness and pelvic discomfort.

Migraine

Migraines are often associated with visual symptoms including flashing lights, shimmering,
seeing zigzag lines and loss of part of the area of vision. They usually occur on only one side of the head, are described as throbbing, and cause intolerance of exercise, light and noise. Nausea and vomiting are common. Migraines occur periodically, and may last for a few hours to several days. The patient often looks pale and drawn. There are now effective medications available to both prevent and treat migraine.

**Mikulicz syndrome**
A rare condition, more common in Scandinavia, which causes enlargement of the salivary and lacrimal glands to create excess saliva and tears.

**Moebius syndrome**
Caused by the failure of two nerves from the brain (numbers 6 and 7) to develop properly before birth. Children with this syndrome have drooping eyelids, inability to move their eyes normally, faces that cannot show expressions, difficulty in swallowing and speaking, and drool constantly, but have normal intelligence.

**Molluscum contagiosum**
A viral infection of the skin in children that causes dozens or hundreds of tiny pus filled blisters with dimpled tops to appear on the body over a few weeks. They remain for several weeks or months before disappearing spontaneously. The child feels otherwise well.

**Mongolism**
See Down syndrome

**Morning sickness**
Morning sickness usually occurs between the sixth and twelfth weeks of pregnancy, but in some women may persist for much longer. It is caused by a hormonal effect on the brain, probably arising from the developing placenta (afterbirth). A sensible diet is the main treatment, as drugs should be avoided if possible in early pregnancy.

**Morquio syndrome**
Patients with Morquio syndrome have a biochemical fault that causes damage to the heart and bones, cataracts, deafness and reduced growth.

**Motor neurone disease**
A progressive and permanent degeneration of the nerves that control muscle movement (motor nerves). Treatment is unsatisfactory.

**Multiple myeloma**
A cancer of the cells in the bone marrow of the elderly. Patients experience bone pain (back, ribs and thighs are the most common sites), tiredness from anaemia, and recurrent infections because of reduced immunity. Further complications include fractures of the weakened bones, and kidney and heart failure caused by the toxic by-products of the marrow and bone destruction. Another complication may cause the blood to become excessively thick and viscous, and this leads to a wide range of other symptoms including dizziness, vomiting, bleeding gums, mental changes and partial blindness.

See Disease Definitions section at back of book for explanation of unusual diseases.
Multiple sclerosis
A nerve disease that can affect any nerve in the body in a random and intermittent way. The covering (myelin sheath) of the nerve degenerates and it ceases to function. The myelin sheath may then regenerate to allow nerve function to return, but then another nerve is affected. Treatment is very difficult.

Mumps
In years past, mumps was by far the most common cause of painful enlarged salivary glands (particularly the parotids), but with widespread vaccination of children against the disease since the early 1980s it is now an uncommon disease. The other symptoms of mumps include a high fever and generalised aches and pains. Complications include inflammation of the brain, testicles and ovaries. The kidneys, heart and thyroid gland may also be damaged.

Munchausen syndrome
One of the more famous extremes of hypochondria, and is named after a famous 18th century German baron who suffered from the condition. Patients falsify symptoms by elaborate means in order to obtain medical attention, medications, investigations and surgery.

Myasthenia gravis
Causes a varying weakness of the muscles that control the eyelids, the movement of the eyes (double vision results) and swallowing. In severe cases, the muscles used in breathing and walking are also affected. The weakness varies in severity during the day and may disappear entirely for days or weeks before recurring, but over a period of months or years, the attacks become more severe. It is most common in young women and the symptoms are caused by a blocking of the nerves that supply the affected muscles. Treatment involves removing the thymus gland in the upper chest which is the source of most of the antibodies in the blood that damage the nerves, and using anticholinergic drugs on a regular basis to control the muscle weakness.

Myocardial infarct
A heart attack (myocardial infarct) occurs when one of the small arteries supplying the heart muscle becomes blocked by a piece of clot or debris from a cholesterol plaque. The heart muscle beyond the blockage then dies, and the patient feels chest pain and shortness of breath. The seriousness and effects of a heart attack vary depending on which part, and how much of the heart, is affected. Pain may occur in any part of the chest, neck, jaw or arms (left more than right), but the usual sites for pain are the left chest, lower front of neck, central chest and front of left shoulder. It is usually described as a crushing pressure or severe ache rather than a sharp pain. It is not affected by movement, eating or coughing, and does not usually vary in intensity. If in doubt, see a doctor now!

Myocarditis
A serious viral or bacterial heart muscle infection, or inflammation of the heart muscle that may be caused by some poisons (e.g. arsenic), toxins, irradiation and potent drugs (e.g. cytotoxics used in cancer treatment). Chest pain is the most common symptom, and may be
accompanied by a rapid pulse, tiredness, shortness of breath, swollen ankles and a cough. These symptoms are the result of the damaged heart muscle being unable to contract as forcefully as normally. Rarely, the patient may suddenly go into heart failure.

**Naffziger syndrome**
See cervical rib syndrome

**Nail-patella syndrome**
The features of the nail-patella syndrome include poorly developed or defective nails, small or absent knee caps (patellae), elbow joint abnormalities, and bony growths on the top of the pelvis.

**Narcolepsy**
An unusual disorder of the brain's electrical activity that is characterised by sudden periods of sleeping for 5 to 30 minutes several times a day, hallucinations and sudden muscle weakness immediately before and during sleep. There is a wide range of severity from those who merely appear to sleep excessively, to those who are barely able to function or care for themselves. Patients may suddenly fall asleep in the middle of a sentence, or when halfway across a pedestrian crossing. Narcolepsy therefore has obvious dangers and requires urgent treatment.

**Nephrotic syndrome**
The nephrotic syndrome occurs when the kidney fails to function properly due to a chronic inflammation, infection or autoimmune disease (inappropriate rejection by the body of its own tissue). Fluid accumulates in the belly, chest, hands and feet, the blood pressure rises, and stretch marks appear in the skin.

**The Neu-Lexova syndrome**
A rare condition in which children are born without eyelids, as well as a poorly developed nose, small jaw, abnormally thick skin, contracted joints and mental retardation.

**Neuralgia**
Neuralgia is an inflammation or injury to the nerves in the hand. The nerve may be pinched at the wrist, elbow, shoulder or neck to cause pain in the hand, or there may be direct injury to the nerve in the hand, or it may be caught by scarring and damage to muscles or other tissue at any point between the hand and the brain.

**Neurodermatitis**
Neurodermatitis (nerve rash) causes multiple small red itchy lumps to develop in response to stress or anxiety. The wrists, ankles, inside the elbows and behind the knees are the most commonly affected areas.

**Neuroleptic-malignant syndrome**
The neuroleptic-malignant syndrome is a side effect of the over or excessive use of tranquillising medication in psychiatric conditions. Symptoms include fever, muscle rigidity, tremor, loss of control of bodily functions and impaired consciousness.

See Disease Definitions section at back of book for explanation of unusual diseases.
Neurosis
A neurosis is an illness of the personality that may cause excessive anxiety, phobias (an inappropriate fear of something or some place), and physical distress (eg: shortness of breath, palpitations, nausea, abdominal pain, headache, faint). It is usually not possible to define the cause of the anxiety in patients with neuroses, and their phobias have no rational explanation. Both anxiety and fear can lead to panic attacks. Neurotic episodes tend to be more common in the week immediately before a menstrual period. Caffeine (in coffee and cola drinks) has also been associated with the onset of attacks.

Niemann-Pick disease
An inherited condition that causes the excess storage of certain fats (phospholipids) to cause convulsions, liver and spleen enlargement.

Noonan syndrome
People with Noonan syndrome are short, have a wide neck and chest, defects in major arteries near the heart, drooping slanted eye lids, a depressed nasal bridge, low set ears, broad nose, mild mental retardation and delayed puberty.

Obsessive compulsive disorder
A form of neurosis in which the patient (usually a woman) has a totally irrational desire to undertake a repetitive task (eg: hand washing). Even after completing the task, the patient feels that s/he must do it again and again, even though they are well aware that the habit is abnormal, because they fear some disaster will befall them if they do not.

Oesophageal varices
Varicose veins can occur not only in the legs, but also in the lower oesophagus (gullet), when liver disease (eg: cirrhosis from alcohol or hepatitis) increases the pressure in the veins that drain from the gut into the liver. The dilated veins in the oesophagus (oesophageal varices) can be damaged and bleed torrentially because of vomiting, reflux of acid into the oesophagus (eg: with a hiatus hernia when part of the stomach slips up into the chest), straining with heavy lifting, or swallowing hard or sharp objects.

Orchitis
A viral infection of the testicle, usually as a complication of a generalised glandular infection such as mumps or glandular fever (infectious mononucleosis). The testicle becomes acutely tender, painful and swollen, and in rare cases may be permanently damaged.

Osgood Schlatter’s disease
A relatively common condition that occurs in older children and teenagers caused by inflammation of the point where the thick tendon (patella tendon) that runs from the bottom end of the knee cap attaches to the top front of the tibia. This is also the point at which the bone softens to grow in children and teenagers, so if there is a growth spurt associated with a period of vigorous exercise of the knee, the bone may become inflamed, tender and painful at this point. Unfortunately, the only treatment is prolonged rest.
Medical Tests Explained

Osteoarthritis
Osteoarthritis is not strictly speaking a wear and tear injury to a joint, but can be considered as such without going into detailed physiology. The lining of a joint degenerates with time, and becomes inflamed, resulting in pain with any movement or pressure on the joint. Anti-inflammatory medications can control the discomfort, but only surgery can correct the arthritis permanently.

Osteogenesis imperfecta
A congenital (present since birth) disorder of bones which causes them to be extremely fragile and to break easily, which can cause arthritis in major joints. The whites of the eyes in many of these patients is a pale blue colour.

Osteomalacia
Osteomalacia is caused by a lack of calcium in the body and the resultant softening of the bones. In adults, the most common cause is a disease of the parathyroid gland in the neck, which controls the calcium balance of the body. If this gland is overactive, calcium is drawn out of the bones and osteomalacia results. Other causes of osteomalacia include a deficiency in vitamin D or phosphate (both are essential to control calcium activity within the body), kidney failure, alcoholism, poisons and a number of rarer diseases. The patient may have muscle weakness, tiredness, and bone pain. Fractures are only slightly more common than would normally be expected. Blood tests, X-rays and bone biopsy are used to confirm the diagnosis.

Osteomyelitis
An infection of bone. This causes tenderness and warmth over the affected section of bone. Urgent and appropriate antibiotic treatment is essential to prevent serious complications. Sometimes a long term infection may need surgery for a cure.

Osteoporosis
A thinning of the bones that occurs mainly in women after the menopause, due to a lack of calcium in the bones. It may result in bones breaking easily anywhere in the body, but particularly in the back where the weak vertebrae may collapse and cause pain.

Otitis externa
Otitis externa (swimmer's ear) is a bacterial or fungal (tropical ear) infection of the ear canal. The ear becomes very painful, and as the infection progresses, a discharge usually develops. It can come on very rapidly, and a patient may go from being perfectly well to rolling around in agony in an hour or two. Causes include retained water in the ear canal after swimming, irritating the ear canal with a cotton bud, hair pin or similar object, badly fitting hearing aids, sweating in dirty and dusty conditions, and dermatitis in the ear canal.

Otitis media
Middle ear infections (otitis media) are a very common cause of temporary deafness in children, that if left untreated, may progress to a permanent partial loss of hearing. The ear is painful, the child is feverish, and when a doctor examines the ear, a red bulging ear drum can be seen.

See Disease Definitions section at back of book for explanation of unusual diseases.
**Otosclerosis**
Inside the middle ear are three tiny bones that vibrate to transmit sounds from the ear drum to the hearing mechanism in the inner ear. Otosclerosis is a form of arthritis in these tiny bones, which reduces their ability to transmit vibration, and thus sounds. It is more common in women, and may be triggered by pregnancy. The symptoms are steadily worsening deafness and a constant ringing noise in the ears. Dizziness occurs in some patients.

**Ovarian torsion**
The twisting of an ovary on the stalk of tissue that supplies it with blood and nerves, cutting off the blood supply and inflaming the nerves. The ovary becomes acutely painful and tender, and urgent surgery is required.

**Paget disease of bone**
A thickening of bones, but a weakening of their structure, that may occur in elderly people, particularly men. The softened bones in the legs allow the knees to become bandy (spread apart) due to an inability to adequately carry the weight of the body, and pain occurs in the joint. Medications are available to control the progression of this disease.

**Pancoast syndrome**
Causes shoulder, arm and chest pain, drooping of one eyelid, and reduced sweating on one side of the face. It is caused by a cancer at the top of one lung.

**Pancreatitis**
The pancreas produces the digestive enzymes that normally break up food to allow it to be absorbed through the gut wall. It has a duct that leads into the first part of the small intestine (duodenum). If the pancreas is damaged by infection, gall stone, alcoholism or a cancer, the digestive enzymes will leak out and start digesting the gland itself and surrounding tissue. Excruciatingly severe pain usually occurs quite rapidly, and is unrelieved by anything except narcotic injections prescribed by a doctor.

**Parathyroid glands**
The parathyroid glands in the neck are responsible for controlling the calcium and phosphorus levels in bones and blood. If these become under active (hypoparathyroidism), patients may suffer from muscle cramps, hand spasms, tingling lips, wheeze, tight throat and abdominal cramps. It is a common problem after thyroid surgery. Overactive parathyroids (hyperparathyroidism) cause kidney stones, frequent passing of urine, high blood pressure, constipation, mental deterioration, bone and back pain, and sometimes abnormal bone fractures.

**Parinaud syndrome**
Caused by a tumour or inflammation of the pineal gland at the front of the brain, or the brain tissue surrounding this gland. Symptoms include the inability to look upwards, eye pupils do not react to light, drooping eyelids and the eye retracts inwards with a tremor when the patient attempts to look up.
Parkinson disease
Caused by degeneration of part of the brain that co-ordinates muscle movement. The usual symptoms are tremor, shuffling walk and increased muscle tone, but in advanced cases muscle weakness of the face may occur.

Parotitis
A viral or bacterial infection of the parotid glands, while sialadenitis is an infection of any of the salivary glands. Other symptoms include fever and redness over the affected gland. Bacterial infections can be cured by antibiotics, while viral infections may cause discomfort for many weeks.

Patau syndrome
The Patau syndrome is caused by the presence of an extra chromosome 13 and/or 15, and features cleft lip and palate, extra fingers and toes, heart malformations, small eyes and brain malformations.

Pellagra
Caused by a lack of niacin (nicotinic acid, vitamin B3) in the diet. Niacin is essential for the normal functioning of the body, and is found in many foods including rice, meats, vegetables and dairy products. In the early stages of pellagra patients have a poor appetite, general weakness, irritability, sore mouth and weight loss. More advanced cases develop dermatitis, diarrhoea, and become demented. If left untreated, death will eventually occur.

Pemphigoid
A skin disease of elderly women, although men may sometimes be affected. Patients develop red, scaling, itchy patches, which after a few days break down into large, fluid-filled blisters on widespread areas of the body. These huge, soft bubbles develop on the arms and legs initially, but soon spread to the trunk, and may involve the mouth.

Pemphigus
An autoimmune (inappropriate rejection of normal body tissue) skin disease. It occurs in all age groups and both sexes, but is rare in children. The rash varies dramatically in its form. Some patients may have shallow ulcers, others multiple blisters, and yet others red scaling patches. Any part of the body, including the face and the inside of the mouth, may be affected. A biopsy (sample) of the affected skin is examined under a microscope by a pathologist to make the diagnosis.

Peptic ulcer
A peptic ulcer in the stomach is caused by the concentrated hydrochloric acid in the stomach penetrating the protective mucus that normally lines the organ, and eating into the stomach wall. Severe pain that is eased by eating, but worse after eating, is common.

Pericarditis
An inflammation or infection of the sac that surrounds and supports the heart (the pericardium). The disease may result in a constriction of the heart that affects its function, and a build up of blood and fluid in the lungs and belly due to increased pressure in the veins.

See Disease Definitions section at back of book for explanation of unusual diseases.
Peritonitis
An infection of the membrane (peritoneum) that lines the belly cavity. It usually results from a rupture of the gut (eg: appendix, perforated peptic ulcer), a penetrating injury to the abdomen (eg: knife wound), or spread from an infection of the fallopian tubes (salpingitis). Severe, generalised abdominal pain will occur, with acute tenderness, fever and an obviously very ill patient. Urgent medical attention is essential.

Pernicious anaemia
Pernicious anaemia is caused by an inability of the stomach to absorb vitamin B12 from food. This vitamin is essential for the formation of haemoglobin, which transports oxygen in red blood cells. Symptoms include tiredness and pallor, a red smooth and sore tongue, indigestion, lack of appetite, and occasionally jaundice (yellow skin).

Peutz-Jegher syndrome
Characterised by pigmentation inside the mouth and on the lips and fingers. Polyps develop in the intestine and these may bleed and cause a gut obstruction.

Phaeochromocytoma
A black-celled tumour of the adrenal glands that sit on top of each kidney. This rare tumour releases a substance into the blood stream that causes very high blood pressure, severe headaches, palpitations of the heart, abnormal sweating, nausea and vomiting, abdominal pains, blurred vision, and brain damage that may result in loss of speech, blindness or unconsciousness. Other associated symptoms may include increased appetite, nervousness and irritability, shortness of breath, weight loss, light-headedness and chest pain (angina). In some cases, there is an hereditary tendency, and it may be associated with cancer.

Phenylketonuria
Phenylketonuria (PKU) is caused by the inability of the body to process proteins containing phenylalanine, which builds up in the blood to damage the brain. The disease is routinely tested for by a blood test (heel prick test) of all new born babies in developed countries, and is more common in those of Scots and Irish ancestry. It can be completely prevented by a restrictive diet.

Photodermatitis
A congenital (present since birth) allergy type reaction to sunlight that results in a red, raised itchy rash on sunlight exposed skin.

Pickwickian syndrome
Very fat people may develop the Pickwickian syndrome with shortness of breath, tiredness, blue lips (cyanosis), heart failure and lung failure.

Piles
Piles can be painless, or very painful, depending on the degree of inflammation and the presence of a blood clot within the pile. Piles are basically over dilated veins around the anus, and are not harmful in themselves, but may cause discomfort and annoyance with repeated
bleeding. They are made worse by constipation, straining and heavy lifting. Treatment varies from ointments to injections and surgery.

**Pityriasis versicolor**
A fungal skin disease of the tropics that affects young adults more than the elderly and children. Initially, the fungus causes the development of pink/brown patches on the body, which may have a very faint scale upon them. After the disease has been present for a few weeks, the skin underlying the infection has the pigment reduced, so that the rash appears as white patches because sunlight is unable to tan the skin under the fungus. Areas not exposed to sunlight (e.g. armpits, breasts) may retain the pink/brown patch appearance, while in sun-exposed areas (e.g. back, arms) the same infection can cause white patches to appear on the sun-tanned skin. This effect does not occur in dark-skinned races.

**Pleurisy**
The inside of the chest cavity is lined with a smooth, slippery, shiny membrane called the pleura. As the lung contracts and expands with breathing, it slides across the pleura, which is covered with a very thin layer of fluid that acts as a lubricant. If the pleura becomes inflamed or infected, the patient has pleurisy which causes severe localised pain that is worse with breathing, coughing or any movement of the chest. It is often associated with viral infections, a fractured rib that damages the pleura, and pneumonia.

**Pleurodynia**
See Bornholm disease

**Plummer-Vinson syndrome**
Tends to occur in premenopausal women and may precede cancer of the oesophagus. It symptoms include difficulty in swallowing, an enlarged spleen, anaemia caused by a lack of iron, inflamed mouth and nail damage.

**Pneumonia**
Pneumonia is a bacterial infection of the tiny air bubbles (alveoli) that form the major part of the lung and enable oxygen to cross into the bloodstream. Usually only one part of the lungs, often at the bottom of the chest, is affected, but it may spread to other areas. The symptoms include fever, cough and chest pains, but sometimes they are insidious and may be minimal for some months with only tiredness, shortness of breath and intermittent sweats.

**Pneumothorax**
The lung is surrounded by a sac called the pleura. A pneumothorax occurs if air escapes from the lung into this pleural sac. Usually the hole in the lung through which air escapes acts as a one way valve, allowing air to escape into the pleura, but not return into the lung. The pressure of air outside the lung, but inside the pleura, slowly increases, collapsing the lung and causing shortness of breath, rapid breathing and pain.

**Polyarteritis nodosa**
An inflammation of arteries in various parts of the body. The cause is unknown, and symptoms depend upon the arteries affected, but may include a fever, muscle pains, arthritis,
rapid heart rate, rash, high blood pressure, belly pain, liver enlargement, spots in the vision, anaemia and blood in the urine.

**Polycythaemia rubra vera**
An uncommon condition in which there are an excessive number of red blood cells. These can clog up the fine capillaries that supply blood to individual cells leading to painful finger tips, itchy skin and a general tiredness.

**Polyhydramnios**
In the uterus (womb) the growing foetus is surrounded by the amniotic fluid, which is produced by the placenta (afterbirth) and the urine and faeces of the foetus. If too much fluid is present (polyhydramnios), because of a problem in the placenta or more commonly the foetus, the uterus will enlarge excessively and premature labour will occur.

**Polymyalgia rheumatica**
A generalised inflammation of muscles that particularly affects those in the hip, shoulder and arm, as well as causing a fever, tiredness and weight loss. Blood tests may give clues to the diagnosis.

**Porphyria**
Patients with porphyria have the unique ability to pass clear urine that turns a dark purple colour, and then brown if left standing for a few minutes in sunlight. There are two main forms of this quite uncommon disease. Acute hepatic porphyria is an inherited disease that passes from one generation to the next but causes symptoms in only 10% of those affected. The patient usually complains of vague abdominal pains, nausea, vomiting and abnormal sensations. Porphyria cutanea tarda is the most common form of porphyria, and again is usually an inherited disease but may be triggered by some poisons. The skin is very sensitive to sunlight, with skin thickening and pigmentation occurring in sun exposed areas such as the face and forearms. The main complication of this disease is liver damage, which may progress to liver failure or liver cancer (hepatoma).

**Portal hypertension**
An increase in the blood pressure in the veins of the abdomen that take nutrition from the intestine to the liver. Many different liver diseases may be responsible, and piles are a common effect.

**Prader-Willi syndrome**
Children who have the chromosomal defect that causes the Prader-Willi syndrome are small at birth, have poor muscle tone, eat compulsively to become obese and have small genitals. It is far more common in boys.

**Pre-eclampsia**
A complication of pregnancy that is detected in about 10% of mothers. It is thought to be due to the production of abnormal quantities of hormones by the placenta (afterbirth). It is more common in first pregnancies, twins and diabetes, and normally develops in the last three months of pregnancy, but may not develop until labour commences, when it may
progress rapidly to the far more serious condition of eclampsia. Doctors diagnose the condition by noting high blood pressure, swollen ankles, abnormalities (excess protein) in the urine and excessive weight gain (fluid retention). Not until the condition is well established does the patient develop the symptoms of headache, nausea, vomiting, dizziness, abdominal pain and disturbances of vision.

**Premenstrual tension syndrome**

The premenstrual tension syndrome is caused by the hormonal changes that precede a menstrual period. The oestrogen and progestogen (sex hormones) balance in the body is maintained by the ovaries and the pituitary gland under the brain. If the balance is not quite right a woman may become nauseated, develop sore breasts, become irritable, notice a change in bowel habits, have difficulty in sleeping, develop swollen hands and feet and become depressed for the few days preceding a period.

**Proctalgia fugax**

A severe, brief, very sharp pain that is felt in the anus for a few seconds or minutes several times a day. Patients describe the sensation as having a thin knife pushed into the anal canal and twisted. It is caused by a spasm of the muscle that controls the opening and closing of the anus (the sphincter). Normally this muscle is in constant contraction to prevent the passage of faeces and gas, but if it contracts excessively into a cramp, pain will be felt. Treatment is difficult, and often involves using ice packs, ice suppositories (large tablets inserted into the anus) and injections. Very strangely, it has been noticed that in some patients, inhaling Ventolin (normally used for asthma) will ease proctalgia fugax.

**Prolapse**

If the ligaments that support the uterus become slack after childbirth, or with obesity, the uterus may slip down the vagina (prolapse) towards the outside, and sometimes may even come partly out of the vagina. In these positions, any contractions of the uterus will be more painful than normal.

**Prostate cancer**

Cancer of the prostate is a common cancer of elderly men, but it progresses very slowly in most cases, and its presence may not be noticed until the enlarging cancer puts pressure on the urethra to make passing urine difficult. An aching pain at the front of the pelvis is the other possible symptom.

**Prostatitis**

A bacterial infection of the prostate gland at the base of the penis. Symptoms include difficulty in passing urine, pelvic and penis discomfort and pain, and sometimes a fever. It often persists for months and requires lengthy treatment with antibiotics to be cured. The infection may be sexually transmitted.

**Prostatomegaly**

The prostate gland at the base of the penis, is responsible for producing some of the fluid (semen) which is ejaculated during sex. With increasing age this tends to enlarge, putting pressure on the urethra (urine tube) which passes through the middle of the gland, and
making it more difficult to pass urine. In extreme cases, it may become impossible to pass any urine, and the bladder will increase to an enormous size causing considerable pain.

**Pseudomembranous colitis**
An inflammation of the large intestine associated with a fine membrane over the gut wall and diarrhoea caused by a serious adverse reaction to powerful antibiotics (eg: vancomycin, chloramphenicol).

**Psoriasis**
Psoriasis is a skin disease characterised by plaques of red, scaly skin, most commonly on the elbows, knees and scalp. A common complication of this condition is joint involvement and arthritis, particularly of the small joints in the hands.

**Pulmonary thrombosis**
A blood clot in one of the major arteries within the lungs (pulmonary thrombosis) will cause severe damage to that section of lung beyond the clot, leading to its collapse, cough, pain and shortness of breath. The severity of symptoms will depend on the size of the artery blocked and the amount of lung tissue damaged.

**Pyelonephritis**
An infection of the kidney in each loin that causes aching pain, fever, general feeling of being unwell, and sometimes frequent uncomfortable passing of urine.

**Q fever**
Q fever is caused by the *Coxiella burnetti* bacterium which is a parasite of sheep, cattle and goats. Many cases of infection cause very mild, barely noticeable symptoms, but in more severe cases, the patient will develop a fever, weakness, headache, muscle pains and a dry cough. In advanced cases, jaundice (yellow skin), stomach pains, and heart and brain involvement are possible.

**Rabies**
Rabies is caught from the bite of an affected dog, cat, bat, monkey, or rat. It is caused the *Lyssavirus* and the usual incubation period after a bite is three to seven weeks. The symptoms are a fear of water, muscle spasms in the throat, skin pain and tingling, generalised muscle spasms, fits and copious amounts of thick saliva. These progress to paralysis, and death is almost certain within two or three days. There is no treatment available once the symptoms of the disease appear.

**Raynaud’s phenomenon**
A spasm of arteries when tissue is exposed to cold. It causes affected tissue to go white, then blue and red, before becoming swollen and painful. The hands and feet are usually affected, and it is far more common in women than men.

**Reaven syndrome**
Syndrome X (also known as Reaven syndrome and insulin resistance syndrome) is a newly recognised and relatively common condition that may be responsible for a significantly

See Disease Definitions section at back of book for explanation of unusual diseases.
increased risk of stroke and heart attack. Its effects include high blood pressure, a tendency to develop diabetes, obesity and cholesterol imbalances.

**Reflux oesophagitis**

The stomach contains concentrated hydrochloric acid, and is protected from this by a thick lining of mucus. If the acid comes back up into the unprotected oesophagus (reflux oesophagitis), intense burning may be felt behind the breast bone, as well as a bitter taste, shortness of breath and burping.

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**Refsum syndrome**

Children with Refsum syndrome lose pain sensation in their arms and legs, become deaf and develop dry skin due to an inherited biochemical abnormality.

**Reiter syndrome**

Reiter syndrome causes conjunctivitis, inflammation of the urethra (urine tube), arthritis and painful ulceration of the gums. Its cause is unknown, but settles slowly without treatment, although recurrences are possible.

**Rett syndrome**

An inherited condition of girls that causes episodes of hyperventilation, seizures, subnormal mentality, constipation and repetitive hand movements.

**Rheumatic fever**

Rheumatic fever is a bacterial infection that was a scourge before the development of antibiotics in the 1940s. It is now rare in developed countries. Patients with rheumatic fever have two or more of a number of widely different symptoms, so every case is completely different. Patients commonly develop inflammation of the heart and the valves it contains, which may cause a rapid pulse and irregular heart beat; irregular shaped red patches and rings on the skin; uncontrolled twitching of the arms, legs and face (technically called chorea); a high temperature; and arthritis that moves from one large joint to another. The diagnosis is confirmed by blood tests and an electrocardiogram (ECG). It is treated with antibiotics, but the greatest problem is that it often causes permanent damage to heart valves.

**Rheumatoid arthritis**

Rheumatoid arthritis is a major cause of joint swelling and deformity associated with both pain and loss of function. The body develops antibodies that inappropriately reject the lining membrane of the affected joint, in the same way that the body attempts to reject a donated transplanted kidney. Medications can be used to modify the rejection process and ease the discomfort and swelling.

**Richner-Hanhart syndrome**

A congenital (present since birth) defect in the ability to break down a type of protein (tyrosine). It causes light sensitivity in the eye, ulcers on the eye surface, dry eyes, dry skin, mental retardation and convulsions.

**Rosacea**

*See Disease Definitions section at back of book for explanation of unusual diseases.*
A skin disease of the face, found most commonly in middle aged women. The cause is unknown. In early stages, the patient has excessive intermittent flushing of the face, but this soon becomes a permanent redness of the facial skin. After a few days or weeks, sores develop on the face, rather similar to a severe case of acne. In advanced cases, the surface of the eyes may be involved in a form of conjunctivitis.

**Roussy-Levy syndrome**
An inherited slowly progressive condition which causes poor coordination, kyphoscoliosis, wasting of the muscles in the hands and legs and poor muscle tone.

**Salpingitis**
Salpingitis (infection of the fallopian tubes), often by sexually transmitted diseases, may result in the tubes becoming blocked. Pelvic inflammatory disease is a more widespread infection of the organs within the pelvis. Tuberculosis is now a rare cause of infection in the tubes. Prompt treatment with antibiotics is essential to prevent permanent scarring and damage.

**Sarcoidosis**
An uncommon disease of unknown cause, sarcoidosis damages and inflames a wide range of organs within the body, most commonly the lungs. Patients may have a fever, tiredness and shortness of breath, but because almost any part of the body may be involved, the symptoms can be very varied and sometimes bizarre, and may include rashes, enlarged glands, liver or spleen enlargement, arthritis, pins and needles sensation and heart failure. Women are more commonly affected than men, and the usual age of onset is between 40 and 60.

**Scabies**
Scabies is an infestation (not an infection) that occurs when a tiny insect called *Sarcoptes scabiei* burrows under the skin to create tracks that can be 1cm or more in length. These burrows and the tissue around them become red, itchy and inflamed. It is caught by close contact with someone who already has the disease. The most common areas for it to settle are the fingers, palms, heels, groin and wrists; but it can spread across the entire body. It is unusual for the head and neck to be involved.

**Scarlet fever**
An uncommon Streptococcal bacterial infection that attacks the throat, tonsils and tongue to give a scarlet red appearance to these tissues, the cheeks and to skin on other parts of the body. The patient has a fever and sore throat for a few days before the typical rash develops. The skin of the palms and soles may flake away in severe cases.

**Scheie syndrome**
Scheie syndrome is characterised by recurrent infections of the lungs, enlarged liver and spleen, curvature of the spine, cataracts, heart abnormalities and slow growth.

**Scheurmann's disease**
A relatively uncommon bone condition that affects the shape of the vertebrae in rapidly
Medical Tests Explained

growing teenagers but may not become apparent until later in life when pain develops in the back. The vertebrae in the middle part of the back, behind the chest, do not grow properly, and instead of being roughly square in shape, they become slightly wedge-shaped. This causes the back to curve excessively giving a slightly humped appearance. The movement of the back is reduced, pain may be present due to compression of nerves, and osteoarthritis develops prematurely.

**Shistosomiasis**
See Bilharzia

**Schizophrenia**
Schizophrenia is a mental illness which causes the sufferer to have a distorted view of the world because of delusions and hallucinations. Patients often change the topic of conversation for no apparent reason, not look after themselves, become dishevelled in appearance, withdrawn, fail to communicate properly with others, hear unfriendly voices, have frightening visions, believe they are being persecuted and develop other mood and behaviour changes that seem bizarre.

**Sciatica**
Sciatica is a pain that runs down the leg from the buttock to the knee and foot. It is caused by a pinching of the large sciatic nerve that supplies sensation to the leg. This pinching usually occurs in the lower back, but the pain may be felt almost anywhere in the leg.

**Scleroderma**
An autoimmune disease (inappropriate rejection of the body’s own tissue) of no known cause. The skin and gut are most commonly affected, followed by the oesophagus (gullet), lungs and heart. It is more common in middle age and women. Symptoms include thickening of the skin, arthritis, patchy changes in skin colour, poor circulation, difficulty in swallowing, lung infections, fevers and diarrhoea. The disease is slowly progressive over many years.

**Scurvy**
Caused by a lack of vitamin C (ascorbic acid) in the diet. It was a common problem in old sailing ships when long voyages prevented taking on fresh food. It is now almost unknown in developed countries, but may still occur in areas of poor nutrition. The gums become painful, ulcerated, bleed and the teeth fall out. 50 mg. of vitamin C a day is sufficient to prevent scurvy.

**Septicaemia**
Septicaemia is a bacterial infection of the blood that usually starts in the lungs, tonsils, pelvis or liver, but in some cases the origin of the infection may never be found. Many different bacterial infections have septicaemia as a complication. Patients are usually very ill, with a high fever, prostration, diarrhoea and generalised aches and pains.

**Septic arthritis**
Infection by a bacteria of the fluid within a joint, which becomes red, swollen and painful. Urgent treatment with antibiotics is vital to prevent permanent joint damage.

See Disease Definitions section at back of book for explanation of unusual diseases.
Sézary syndrome
Causes a persistent, red, itchy rash associated with hair loss, enlarged lymph nodes and an abnormal microscopic blood picture.

SHAFT syndrome
Patients with SHAFT syndrome have a personality disorder that causes them to be Sad, Hostile, Anxious, Frustrated and Tenacious (the name is an acronym of these symptoms). They praise doctors excessively to obtain unnecessary surgery, then claim worsening of symptoms after surgery for which the doctor is blamed. It is a psychiatric neurosis that requires long term psychotherapy.

Sheehan syndrome
A critical complication of pregnancy. A significant loss of blood during or after the birth due to problems in delivering the placenta (afterbirth) may result in damage to the pituitary gland (which controls all other glands) under the brain, an inability to produce breast milk, and a failure of menstrual periods to return.

Shingles
Shingles is an infection of a spinal nerve caused by the virus Herpes zoster. This is the same virus that causes chickenpox, and once you have this infection, the virus never leaves the body, but settles at the base of nerves along the spine. At times of stress or reduced immunity, the virus may start to multiply again in one particular nerve, to cause sharp pain that gradually moves along the nerve on one side only from the back to the front of the abdomen. Shortly after the pain starts, a patchy blistering rash will appear in a line along the course of the nerve. Shingles is a medical emergency, because if treated within 72 hours of the rash first appearing, it can be cured. If diagnosis is delayed beyond this time, the pain may last for months or become permanent, particularly in elderly people.

Shy-Drager syndrome
A progressive brain degeneration that causes low blood pressure, reduced sweating, slight tremor, difficulty in talking, muscular rigidity, poor coordination, dizziness, double vision and incontinence.

Sicard syndrome
A tumour, cancer, stroke or abscess affecting the lower part of the brain may affect the nerves supplying the tongue, throat and neck so that these muscles function abnormally and cause Sicard syndrome.

Sickle cell anaemia
An inherited condition found only in Negroes that causes red blood cells to become sickle shaped (like a crescent moon) rather than round because of an abnormal form of haemoglobin. Victims are anaemic, have a large spleen, may become jaundiced (yellow), heal poorly and develop gallstones easily. They cope poorly with infections of any sort. Clumping of the abnormal cells may block small arteries and cause severe pain in wide areas of the body, and permanently damage the heart, liver, brain and other organs.

See Disease Definitions section at back of book for explanation of unusual diseases.
Silicosis
Caused by the inhalation of tiny particles of silica (in rock quarrying, stone cutting, tunnelling, pottery and those who use diatomaceous earth), asbestosis from inhaling asbestos particles, and pneumoconiosis from inhaling coal dust. Many victims are unaware that they have these diseases for some years until shortness of breath, cough and poor exercise tolerance develop. All of them, but particularly asbestosis, predispose to lung cancer. They may be diagnosed after a routine chest X-ray.

Sinusitis
Below, above, between and even behind your eyes, your skull bone is riddled with spaces called sinuses. All these sinuses are connected together by small holes and tubes, making a complex interconnecting system. Lining this network of sinuses is a moist membrane, the same as that inside your nostrils. If bacteria or viruses enter the sinuses, an infection (sinusitis) may result and thick pus is produced. The sinuses becomes very painful and tender, then waste products from the infection enter the blood stream, and cause a fever, headaches and the other unpleasant sensations of any major infection. It is quite easy for the infection to spread through the eustachian tube from the back of the nose to the middle ear.

Sjögren syndrome
An autoimmune disease (inappropriate rejection of the body’s own tissue) that causes a dry mouth, nose, throat and vagina; rheumatoid arthritis, constipation and dry skin. Inflammation of the pancreas can be a complication.

Spasticity
See cerebral palsy

Spleen
The spleen has three main functions - it filters blood, removing damaged cells and extracting and storing reusable elements such as iron from these cells; it stores the antibodies developed by the body during an infection, so that when a similar infection occurs in the future the antibodies can be called into play quickly; and it helps to produce new white and red blood cells. If the spleen is enlarged or inflamed pain will be felt in the area. Common causes of this are infections (eg: glandular fever - infectious mononucleosis, blood infections - septicaemia, tuberculosis), malaria, leukaemia (cancer of white blood cells) and severe anaemias (eg: haemolytic anaemia). Cancer can also occur in the spleen, and it can be injured and bleed in severe accidents that involve a blow to the lower ribs on the left side.

Sprue
See Tropical sprue

Squamous cell carcinoma
A squamous cell carcinoma (SCC) is a sun induced cancer of the outermost layers of the skin. Normally they appear as red, slightly irritating, scale covered lumps that slowly enlarge, but if neglected for a long time, they may break down into an ulcer that will not heal.
Medical Tests Explained

**Steele-Richardson-Olszewski syndrome**
A variation of Parkinson’s disease that usually affects elderly women, and is characterised by muscle rigidity in the back, chest and belly; dementia, difficulty in swallowing, inability to look downwards and frequent falls.

**Stein-Leventhal syndrome**
Causes multiple cysts in the ovaries to affect their function. Menstrual periods cease or become irregular, weight increases and hair growth on the body may be excessive.

**Stevens-Johnson syndrome**
A form of erythema multiforme that progresses to cause infection and ulceration of the eyes, mouth inflammation, fever and ulcers in the vagina, urethra (urine tube) and anus.

**Still’s disease**
Severe rheumatoid arthritis that occurs in children and may affect the knees to cause intermittent painful swelling of the joint. Fever, rash, enlarged glands and heart inflammation are other possible symptoms.

**Stokes-Adams attacks**
Caused by a sudden change in the heart rate, with the heart slowing down markedly for a few seconds or minutes, and then recovering. It is due to a problem with the conduction of electrical pulses through the heart muscle.

**Stroke**
In a stroke (cerebrovascular accident) various parts of the brain may be affected by having its blood supply cut off by a blockage in an artery, or a blood vessel in the brain may burst causing bleeding and damage to part of the brain. The onset is almost instantaneous, may be associated with a wide variety of symptoms from paralysis and headache to weakness, loss of sensation, anaesthesia, confusion and coma. If recovery occurs, most occurs in the first few days, some over the next few weeks, and a tiny amount over a few months. Any symptoms still present after a year are almost certain to persist long term. Emergency medical treatment for a stroke is vital to reduce the damage to the brain, and affected patients should be taken to a major hospital as soon as possible.

**Sturge-Weber syndrome**
Sturge-Weber syndrome is characterised by a dark red birth mark on the face, convulsions, paralysis of one side of the body and eye abnormalities.

**SUNCT syndrome**
A nerve inflammation that causes intermittent spasms of severe headache, stabs of face pain and watery eyes.

**Sweet syndrome**
Multiple tender dark red patches on the neck and limbs, fever, muscle and joint pains are characteristic of Sweet syndrome. The cause is unknown, but it occurs more commonly in women, and settles after a couple of months with no treatment.

See Disease Definitions section at back of book for explanation of unusual diseases.
Sydenham’s chorea
A complication of rheumatic fever that causes irregular jerky movements of a limb or the body, with a complete loss of muscle tone between each movement.

Syndrome X
Syndrome X (also known as Reaven syndrome and insulin resistance syndrome) is a newly recognised and relatively common condition that may be responsible for a significantly increased risk of stroke and heart attack. Its effects include high blood pressure, a tendency to develop diabetes, obesity and cholesterol imbalances.

Synovitis
There are many different forms of synovitis, which is an inflammation of the synovial membrane that lines every joint, and slowly absorbs the synovial fluid that fills the joint and is produced in the bursae (small sags) beside the joint.

Syphilis
The sexually transmitted disease, syphilis, passes through several stages over many years. In advanced stages, a variety of symptoms, including muscle pain and weakness, bone and skin tumours, liver and brain damage, weakness of major arteries (aneurysms), abnormal reflexes, dementia, and severe psychiatric disturbances may occur.

Systemic lupus erythematosus
Systemic lupus erythematosus (SLE) is an autoimmune disease (inappropriate rejection of the body’s own tissue) that can affect tissues throughout the body causing arthritis, mouth ulcers and discolouration, abnormal muscle movements, high blood pressure and a characteristic red rash across the cheeks and bridge of the nose in a butterfly pattern.

Temporal arteritis
An inflammation of the artery in the temple. There is acute tenderness over the artery and searing pain into the jaw and temples. Urgent medical attention is essential for successful treatment.

Teratoma
A rare tumour of an ovary. As the ovary contains eggs that can develop into any tissue in a developing foetus, a tumour of the germinal cells in an ovary that produce the eggs can create a mass that consists of all types of tissue including muscle, bone and even teeth.

Tetany
Rapid shallow breathing (hyperventilation) can cause the amount of carbon dioxide in the lungs to increase. This dissolves in the blood to make it more alkali (high ph) than normal, and small muscles in the hand are sensitive to this change in the blood to the point that they go into spasm with the wrist bent and fingers and thumb bunched together and pointed towards the wrist. This is known as tetany (totally different to the disease tetanus) and can be cured by getting the patient to breathe into a paper bag for a few minutes while they slow down their breathing with repeated reassurance. Hyperventilation may start after a shock.

See Disease Definitions section at back of book for explanation of unusual diseases.
surprise, injury or vigourous exercise.

**Thalassaemia major**

An inherited condition that occurs in southern Italians, Greeks, Cypriots and Malays. It causes the red blood cells to be fragile and break down very rapidly, overloading the liver’s ability to process the released haemoglobin, and the bone marrow’s ability to replace the destroyed red blood cells. These patients are constantly weak, tired and mildly jaundiced. People from these racial backgrounds who intend to marry can have a simple blood test done to find out if they carry the thalassaemia gene. If both are carriers, there is a statistical risk that one quarter of their children will be affected.

**Thrombocytopenia**

Thrombocytopenia is a lack of platelets in the blood. Platelets are cells that are essential for the formation of blood clots, and without adequate numbers, abnormal bleeding and bruising occurs. Thrombocytopenia often occurs for no apparent reason, or it may be triggered by diseases of the bone marrow or liver, autoimmune diseases (inappropriate rejection of the body’s own tissue), severe infections, alcoholism, many types of cancer, or a reaction to some medications (eg: those used to treat cancer, quinine).

**Thrombus**

A blood clot (thrombosis) in a major artery supplying a limb will markedly reduce the blood supply to that limb and cause symptoms that vary from pins and needles sensation, to numbness, severe pain and possibly gangrene.

**Thrush**

Thrush is a fungal infection of the vagina by an organism known as *Candida albicans*, and virtually every woman will have several episodes of this infection during her life. The fungus lives normally in the gut, but when there is moisture on the skin around the vagina and anus from sweating or sexual stimulation, the fungus can migrate into the vagina. Sexual intercourse helps the fungus into the vagina where it finds a nice warm, moist environment in which to live and prosper. The result is a white vaginal discharge that irritates the skin of the vulva, and creating an intense itch that is socially unacceptable to scratch in public. Antifungal creams will cure the problem, but some women need more potent tablets by mouth, or preventative treatment after each episode of sex.

**Thymus**

The thymus gland sits just behind the top end of the breast bone and is responsible for the development of immunity in infants. It almost disappears by adult life, but rare infections or cancers of the gland may occur.

**Thyroid gland**

The thyroid gland in the front of the neck produces the hormone thyroxine, which acts as an accelerator for every cell in the body. If there is a lack of thyroxine, all organs will function slowly, and symptoms will include intolerance of cold, constipation, weakness, hoarse voice, heavy periods, dry skin, hair loss, slow heart rate and anaemia. On the other hand, excess thyroxine will cause sweating, weight loss, diarrhoea, malabsorption of food, nervousness,
heat intolerance, rapid heart rate, warm skin, tremor and prominent eyes.

**Tietze syndrome**
A painful, tender swelling of one or more of the cartilages that join the end of each rib to the side of the breast bone. The cause of the inflammation is unknown, but it occurs more commonly in women, and settles without treatment after a few months.

**Tinea**
A fungal infection of the skin that may occur almost anywhere on the body, but most commonly on the scalp and in the groin. It starts as a red spot that slowly expands in size to form a red ring (ringworm) with a paler centre, that may return to skin colour if the ring becomes very large. Adjacent rings may merge, there may be a fine scale on the skin inside the ring, and there may be mild itching.

**The Tolosa-Hunt syndrome**
Causes painful paralysis of one eye, a drooping eyelid and enlargement of the pupil because of pressure on nerves to the eye caused by a swelling (aneurysm) on the main artery to the brain (carotid artery).

**Torsion of the testis**
A medical emergency in which the testicle twists around and cuts off the blood vessels that supply it. Pain occurs in both the testicle and the groin. Surgery must be performed within twelve hours or the testicle will die.

**Tourette syndrome**
See Gilles de la Tourette syndrome

**Toxic epidermal necrolysis**
A severe blistering and peeling of skin as a reaction to a serious generalised bacterial infection (usually by the *Staphylococcus* bacteria) or sometimes due to various poisons and drugs.

**Toxic shock syndrome**
The sudden onset of a fever, vomiting, watery diarrhoea, muscle pains, hypotension, headache, collapse and rash are characteristic of the toxic shock syndrome. This is caused by a toxin released from the bacteria *Staphylococcus aureus*, which may infect any part of the body, but particularly tampons that are retained for too long during a woman’s menstrual period. Up to 15% of patients with the syndrome die.

**Trachoma**
Trachoma is a type of conjunctivitis (superficial eye infection) caused by an organism known as *Chlamydia*. It is very common in areas of low hygiene where flies can transmit the infection from one person to another. A mild trachoma infection may not be very noticeable and may cause no symptoms at all. In more severe cases, eye pain, intolerance to bright lights, and a weeping swollen eye may develop. Small bubbles on the underside of the eyelids are the earliest sign of the disease. Persistent trachoma causes scarring of the cornea (the

See Disease Definitions section at back of book for explanation of unusual diseases.
outer surface of the eye) and subsequent blindness. Blood vessels grow into the scar tissue, and the coloured part of the eye and the pupil may be covered with a thick scar and obvious small arteries and veins. The lacrimal gland can also be damaged so that the eye dries out. Trachoma is responsible for most of the blindness in Aborigines and in third-world countries.

**Transient ischaemic attack**
Transient ischaemic attacks (TIA) are a temporary blocking of a small artery in the brain by a blood clot, piece of plaque from a cholesterol deposit in an artery, or spasm of an artery, which results in that part of the brain failing to function for a short time. These attacks may be prevented in some cases by low dose aspirin. They are sometimes called mini-strokes.

**Trichomoniasis**
A single-celled animal, *Trichomonas vaginalis*, may cause infections in a woman's vagina, and the urethra (urine tube) of both men and women. The infection is transmitted by sexual intercourse. In men, there are often minimal symptoms, and the condition may persist undiagnosed for many months. Discomfort on passing urine, often first thing in the morning, is the most common symptom. In women, the vaginal infection causes a foul-smelling, yellow/green, frothy discharge. There may be mild itching or soreness around the outside of the vagina. Treatment is a single dose of tablets (azithromycin).

**Trigeminal neuralgia**
Trigeminal neuralgia (tic doloureux) is inflammation of the main sensory nerve of the face. The patient experiences sudden stabs of excruciating pain on one side of the face, and usually from only one specific area of the face. The onset is sudden, and it can persist for weeks or months. Medication is available to ease the inflammation.

**Tropical sprue**
Caused by a long term intestinal infection contracted in equatorial countries. The lining of the gut is damaged to prevent adequate food absorption, and foul diarrhoea, abdominal cramps, excess wind, mouth ulcers, dry skin and muscle cramps. It is treated with vitamin and folic acid supplements, and antibiotics.

**Tuberculosis**
Tuberculosis (TB) is an infection of bone, skin, joints, lymph nodes, kidney, gut, heart, brain, or most importantly of the lung, caused by the bacterium *Mycobacterium tuberculosis*. It causes a productive cough, night sweats, loss of appetite, fever, weight loss and generalised tiredness. The bacteria may lie dormant for years, and then start multiplying to cause an initial or subsequent attack of the disease at a time when the patient's resistance is down. From the lungs, it is possible for the bacteria to gradually spread to almost every other organ of the body. The symptoms depend upon which areas are affected.

**Tuberous sclerosis**
Tuberous sclerosis is an uncommon congenital condition (present since birth) that may occur in successive generations or develop randomly. Its cause is unknown. Children with the condition have repeated convulsions and are mentally retarded. Later in childhood, a rash consisting of red nodules appears on the face and neck. Numerous other complications
develop in some victims, including eye damage, deformed nails, cysts in the heart, bone and lungs, and benign growths in the bowel.

**Tularaemia**
A bacterial infection of rats and rabbits that can spread to humans via a tick bite or direct contact with an infected animal. It causes a fever, headache, enlarged lymph nodes, tender spleen and vomiting. An ulcerating sore can usually be found at the site where the bacteria entered the body. In severe cases, pneumonia, meningitis and diarrhoea may develop.

**Turner syndrome**
Women with Turner syndrome are born with only one X chromosome instead of two. The ovaries fail to develop, the genitals remain girl like, periods do not occur, breasts do not develop and they are usually short with a wide neck. There is no treatment for the infertility, but hormone replacement therapy will give them normal adult woman characteristics.

**Typhus**
Worldwide infection that causes significant generalised illness. More common around the Mediterranean, in the Middle East and in East Africa. It is caused by various types of the primitive bacteria *Rickettsia*, which pass to humans through a tick bite. Incubation period is 3 days to two weeks. The symptoms include a black spot on the skin at the site of the tick bite, swelling of skin, widespread red large spot rash, fever, generalised aches and pains, tiredness, headache, joint pains, loss of appetite and enlarged lymph nodes. Antibiotics such as tetracycline and ciprofloxacin settle the infection in a few days. Without treatment, and with no complications, symptoms settle in three or four weeks. Up to 10% of patients die from liver damage without medical attention.

**Ulcerative colitis**
A serious disease where the lining of the large intestine becomes ulcerated and bleeds. Sometimes this occurs some distance from the anus, so by the time the blood appears it may be dark or black and mixed in with the stool. Pain and diarrhoea are other symptoms of this disease, which can be well controlled by medication in most cases.

**Uraemia**
Uraemia occurs when the kidneys fail to function adequately due to a persistent disease, infection, tumour or cyst in the organs. The result is a steady increase in waste products in the blood and body until these cause symptoms due to their adverse effects on other organs. Symptoms may include tiredness, weakness, itchy skin, easy bruising, abnormal bleeding, shortness of breath, loss of appetite, vomiting, diarrhoea, impotence, poor libido, irritability, inability to concentrate, leg cramps and restlessness.

**Urethritis**
Urethritis is an infection of the urethra by a bacteria or virus. The cause is usually a sexually transmitted disease, and there is often a discharge from the urethra, that is more easily seen in men. Urine passing through the urethra will cause pain.

**Urticaria**

See Disease Definitions section at back of book for explanation of unusual diseases.
Medical Tests Explained

Urticaria (hives) is an allergy reaction in skin that causes marked swelling in patches across the affected area, which is also red and itchy. Any one of several trillion substances, from plants, animals or chemicals, may be responsible.

Vaginitis
Bacterial infections of the vagina cause vaginitis. Many different bacteria may be responsible, and there is usually a mixture found on culture. Sexually transmitted diseases such as gonorrhoea are one cause of vaginitis. Vaginal discomfort, pain with intercourse and a yellow vaginal discharge occur.

Varicose veins
The veins in the legs contain one way valves that allow blood to only travel up towards the heart when they are squeezed by muscle action. If these valves are damaged by increased pressure (eg: during pregnancy, prolonged standing), obesity or direct injury, the blood is unable to move out of the leg as quickly, and the veins dilate with blood to form varicose veins. These may ache as well as being unsightly.

Vasovagal syndrome
The vasovagal syndrome causes recurrent fainting, low blood pressure, pale colouring, slow heart rate and often follows episodes of stress or anxiety.

Vestibular neuronitis
An inflammation of the nerve endings in the inner ear that are responsible for detecting changes in position. Dizziness will occur even when the patient is completely still, and abnormal eye movements (nystagmus) may be present.

Viral exanthema
Viral infections such as measles, rubella (german measles) and infectious mononucleosis (glandular fever), as well as many other unnamed viruses, may cause a widespread slightly itchy, red rash (viral exanthema).

Vitiligo
A patchy loss of skin pigmentation that in pale-skinned northern Europeans may be barely noticed, but in southern Europeans, Arabs, Negroes and Chinese the resultant large white patches can be quite disfiguring. The disorder can occur in all races, but its onset is uncommon over 50 years of age. The white patches are sharply defined and may appear anywhere on the body when the pigment-producing melanin cells (melanocytes) in the skin are destroyed. Any overlying hair is usually white or grey. The affected areas of skin are very sensitive to sunlight, and burn easily. There are no other side effects or complications of the disease.

Vogt-Koyanagi-Harada syndrome
A rare form of eye inflammation characterised by an inflamed iris (coloured part of eye), retinal detachment and damage, fever, headache, dizziness, deafness, and sometimes a white patch of hair and white patches on the skin. One or both eyes may be affected.

See Disease Definitions section at back of book for explanation of unusual diseases.
Von Recklinghausen's disease of multiple neurofibromatosis
This syndrome has the characteristics of multiple light brown marks on the skin, soft fatty lumps under the skin, and, in some patients, nerves may be damaged. The lumps and spots are most commonly found on the trunk, pelvis and in the armpits. They increase in size and number with age. The nerve damage is due to these soft lumps developing in the spinal canal, and in other areas where they can cause pressure on nerves. Deafness, blindness and paralysis may occur. The disease passes from one generation to the next.

Waardenburg-Klein syndrome
An inherited condition that causes deafness, broad nose, eyebrows that join in the middle, eyes of different colours and a patch of white hair at the front of the scalp.

Waterhouse-Friderichsen syndrome
Waterhouse-Friderichsen syndrome is a severe infection of the adrenal glands on each kidney caused by the *Meningococcus* bacteria that results in bleeding into and destruction of the glands. Patients are pale, collapse, develop bleeding into the skin (shallow bruises), blue lips (cyanosis) and the heart may fail.

Weil syndrome
Weil syndrome is a complication of an infection by the bacteria Leptospirosis which spreads from rats. It causes a sore throat, generalised muscle pain, diarrhoea, abnormal bleeding and damage to the liver and kidneys. Antibiotics cure the condition.

Wernicke-Korsakoff psychosis
This syndrome causes brain damage with symptoms of depression, irrational behaviour and insanity. These conditions are related to vitamin deficiencies caused by an inadequate diet while on alcoholic binges.

Whipple disease
A widespread infection of the gut that prevents food absorption. The infection spreads to involve the eyes, heart, lungs, joints, kidneys and brain. Symptoms include diarrhoea, belly pain, fever, enlarged lymph nodes, arthritis, blindness, headaches and tissue swellings. Antibiotics used for over a year may cure the condition.

Whooping cough
Children with whooping cough (pertussis) have a cough that becomes steadily more severe, comes in increasingly distressing spasms lasting up to half an hour, and is characterised by a sudden intake of breath before each cough, each spasm leaving the child exhausted. Thick stringy mucus is coughed up and may be vomited, and the child has no appetite, rapidly loses weight, and may become blue and lose consciousness. The cough may cause bleeding in the lungs, throat and nose, and the spasms may be severe enough to cause suffocation. There is no cure, but it may be completely prevented by vaccination.

William syndrome
An inherited condition characterised by blue eyes, long nose, extra skin folds in the eyelids, prominent lips, drooping cheeks, slight mental subnormality, and a very outgoing personality.

See Disease Definitions section at back of book for explanation of unusual diseases.
Wilson disease
Wilson's disease is a rare, inherited disorder of the liver and brain that results in the excessive deposition of copper in these organs. Excess copper in the brain may cause symptoms of a psychiatric disorder, rigid muscles, writhing and tremor. In the liver it may cause jaundice (yellow skin), an enlarged liver and/or spleen, anaemia and hepatitis. Another characteristic is a brown/green ring (Kayser-Fleischer ring) around the iris (coloured part) in the eye. Excess copper can be removed by one of a number of drugs.

Wolf-Hirschhorn syndrome
The Wolf-Hirschhorn syndrome’s symptoms include cleft lip and palate, mental retardation, growth retardation, and abnormal nose.

Xanthoma
Creamy yellow, soft, smooth, fatty lumps that often appear around the eyes, but may develop elsewhere on the face and body. They are often associated with obesity and high levels of blood cholesterol.

XYY syndrome
Occurs when two Y carrying sperm fuse with one X carrying egg at the moment of conception. These men are very tall, strong, of large build and inclined to violence.

Yaws
A bacterial infection unknown in Australia, but it still occurs in some countries with very poor hygiene. Patients develop sores on the skin and in the nose and mouth which may become large, ulcerate, penetrate to the bone and cause permanent disfigurement. The lymph nodes in the armpits and groin are also inflamed.

Yellow fever
Yellow fever is a severe infection of the liver transmitted by mosquitoes in central Africa and tropical America. Symptoms may include vomiting, headache, tiredness, and eye pain in mild cases, to severe generalised body pains, high fevers, bleeding from the gums and intestine, bruising, copious vomiting, delirium, kidney failure and liver failure. A very effective long lasting vaccine is available for travellers to these areas.

See Disease Definitions section at back of book for explanation of unusual diseases.
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230