

PHYSIOLOGY, PHARMACOLOGY, AND TOXICOLOGY OF ALCOHOL

Glossary of Terms - Update 2006

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Absorption. This refers to the uptake of a drug (e.g. alcohol) from the site of administration into the blood-stream. The absorption of alcohol occurs by passive diffusion and begins immediately after drinking. For ethanol, absorption starts in the stomach but occurs more rapidly from the upper part of the small intestine (duodenum). When the alcohol molecules reach the portal blood they are transported to the liver and thereafter the heart and peripheral circulation. The rate of absorption depends on many factors, e.g. food in the stomach, type of beverage consumed, anatomy of the gut, gastric emptying rate, concomitant drug use, smoking, time of day etc.

Accreditation. Accreditation of a laboratory is formal recognition by an authorized agency that the analytical laboratory is competent to perform certain measurements or tests.

Accuracy. Is a measure of the closeness of agreement between the result of analysis and the true value of the quantity being measured.

Acetaldehyde. The first product of ethanol metabolism by all known pathways. Acetaldehyde (CH_3CHO) is produced in the liver and is a highly toxic and chemically reactive substance.

Acidosis. Too much acid in the blood and body fluids (opposite = alkalosis).

Acute tolerance. The development of tolerance within the course of a single exposure to a drug.

Addictive Drug. The name given to a drug or chemical agent often self-administered usually without a medical prescription, repeatedly and compulsively.

Adulterate. Means to contaminate by addition of another substance or to make impure but still maintain the same appearance as the original, e.g. dilution of drug concentrations in urine by adding another liquid such as water. In connection with the illegal manufacture and sale of illicit drugs, the pure drug e.g., cocaine or heroin is often blended with some other cheap inert substances a process known as "cutting" before being distributed and sold to consumers.

Agonist. An agonist is a chemical substance, drug or other molecule that binds to a receptor to produce an effect or start a sequence of events leading to a physiological response.

Agreement. The extent to which two different tests or two different observers agree with each other when measuring the same thing.

Alcohols. A collective name for a class of organic compounds containing carbon, hydrogen and oxygen and the hydroxyl (-OH) group.

Alcoholism. A primary chronic disease with genetic, psychosocial, and environmental factors influencing its development and manifestations.

Alcohol dehydrogenase (ADH). The enzyme (actually class I ADH) catalyzing the conversion of primary alcohols into aldehydes and secondary alcohols into ketones. Thus, ethanol is oxidized into acetaldehyde and isopropanol becomes acetone.

Aldehyde dehydrogenase (ALDH). The mitochondrial enzyme (very low k_m) that converts acetaldehyde to acetate.

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Allele. One or two or more variants of a gene or other DNA sequence. Different alleles of a gene generally serve the same function e.g. code for proteins that determine eye color, but may produce different phenotypes (e.g. blue, green or brown eyes). Some alleles may be defective and produce a protein (e.g. an enzyme) that has no function at all or an abnormal function.

Alveolar. Pertaining to the alveolar sac - the air cells - the site of gas exchange in the lungs.

Alveoli. The alveoli are situated at the extreme ends of the branches of bronchial tree and are the air sacs at the base of the bronchioles where gases and volatile substances such as oxygen and carbon dioxide can enter and leave the pulmonary circulation.

Alveolar air. Alveolar or end-expired air represents that fraction of the exhaled breath remaining after the deadspace region has been ventilated. For determination of alcohol in breath at least 1.5 liters of a prolonged exhalation should be discarded prior to sampling.

Amino acids. Organic compounds containing both an acid and amino group, e.g. carboxylic acid (-COOH) and amine (-NH₂) groups. Twenty amino acids are important in human nutrition and biology and they are the building blocks of proteins.

Amylase. An enzyme produced in the pancreas to catalyze the digestion of carbohydrates (sugars).

Analyte. The specific component or substance measured in a chemical analysis.

Analytical specificity. Ability of a measurement procedure to determine solely the desired substance it purports to measure without responding to any others.

Analytical sensitivity. The ability of a method or instrument to discriminate between samples with different concentrations of substance or containing different amounts of the analyte. The slope of the analytical calibration function (plot) is one index of the methods sensitivity.

Analytical wavelength. Any wavelength at which an absorbance measurement is made for the purpose of the determination of a constituent of a sample.

Analytical run (series). A set of measurements carried out successively by one analyst using the same measuring system, at the same location, under the same conditions, and during the same short period of time.

Anaerobic. A biological process not requiring oxygen.

Anemia. A deficiency of hemoglobin in the blood which can result from a decrease in the proportion of erythrocytes - an abnormally low number of red blood cells.

Antagonist. A chemical substance (drug) that binds to a receptor to block or reverse the action of another drug or chemical substance; Naloxone is an opiate antagonist that blocks the action of morphine at its receptor.

Anthropometric data. Are physical measurements (height, weight, age) that provide an indirect assessment of body composition and development.

Antibody. An antibody is a large protein molecule produced by the body's immune system to recognise and bind foreign molecules such as viruses.

Anticoagulant. A chemical substance that delays or counteracts blood clotting. Heparin is a natural anticoagulant in the body. Potassium oxalate, EDTA, and sodium fluoride are other examples of chemicals added to Vacutainer tubes to prevent clotting.

Antidiuretic hormone (ADH). A hormone produced in the posterior pituitary gland that promotes the conservation of body water by its effect on the kidney thus influencing the production of urine.

Antigen. A molecule that binds to an antibody.

Artery. An artery is a blood vessel that carries oxygenated blood from the heart and lungs to the rest of the body.

Ascites. Is the pathologic accumulation of fluid in the peritoneal cavity. This condition is often associated with alcoholism and develops as one consequence of chronic liver disease (cirrhosis). The volume of ascites fluid might reach 10 liters or more.

Asthma. A chronic inflammatory disorder of the airways which causes airflow obstruction and forced expiratory volumes are markedly reduced. Those suffering from asthma might not be able to fulfill the sampling requirements (time-pressure-volume) of some breath-alcohol analyzers.

Ataxia. Inability to coordinate voluntary muscle movements owing to various influences (drugs or diseases) on the cerebellum.

Atrophy. Means the wasting away or shrinkage of tissue caused by cell death.

Autopsy. The word autopsy derives from the Greek word meaning "to see for oneself." In UK necropsy is used instead of autopsy also from Greek, which means "seeing a dead body." In USA autopsy is synonymous with postmortem examination by a medical examiner.

Bariatric surgery. Bariatric comes from the Greek words *baros*, which means weight and *iatic* which means treatment. Hence bariatric surgery is an operation for treatment of being severely overweight (obesity) and usually involves making the stomach smaller by gastric banding or a gastric bypass.

Basal metabolism. The total energy output of the body at rest after a 12 h fast amounting to 1.0 kcal/kg/h for men (0.9 for women). For a 150 lb (68 kg) man the energy requirement for basal metabolism is 1632 kcal/day.

Baseline measure. An observation or quantitative measurement made before administration of a drug or an experimental treatment. When evaluating results, the post-treatment measures are usually compared with the baseline measure.

Beer's law. The absorbance of a homogeneous sample containing an absorbing substance is directly proportional to the concentration of the absorbing substance.

Bias. A systematic error of measurement expressed as the difference between the expected result of a measurement and a true value (compare with accuracy).

Bibliometrics. The quantitative study of published articles and books and evaluation of these in terms of authorship, readership and citation practices.

Bile. A greenish-yellow secretion produced in the liver and collected and stored in the gallbladder until needed. Bile is an emulsifier which promotes mixing and digestion of fatty foods.

Biological specimen. A material of human or animal origin commonly used for identification of the individual (DNA) or forensic or clinical laboratory analysis of endogenous or exogenous substances.

Biopsy. Removal and laboratory examination of tissue from a living body, e.g. liver biopsy is the gold standard for investigating liver cirrhosis.

Blind (masked) sample. A proficiency test sample for which the analyst or laboratory is unaware of the test nature of the sample at the time of analysis. Thus an undeclared proficiency trial entails submitting samples for analysis blinded or masked.

Blood-brain-barrier. Permeable barrier controlling the passage of substances from the blood into the brain tissue and cerebrospinal fluid.

BMI. Stands for body mass index and is the most widely used definition of an individual's degree of obesity. The index is derived by dividing the person's weight in kg by the square of the height in meters, hence the units (kg/m²). Normal BMI is from 18.5 to 24.9, overweight is from 25-29.9, obesity (grade I) is from 30-34.9, obesity (grade II) is 35-39.9 and obesity grade III is > 40.

Bolus. The amount of drug swallowed at one time.

Bronchi. The large air-tubes or conducting airways of the lungs (one such tube is a bronchus).

Bronchioles. Small subdivisions and tiny branches of air tubes within the bronchi.

Candida Albicans. An yeast or fungi sometimes found in living humans (skin, mouth, gut, vagina), that can utilize glucose to produce ethanol.

Capillary. A small blood vessel that branches from an artery; capillaries connect arteries to veins. Exchange of oxygen, nutrients and waste material takes place across capillary walls.

Carbohydrate Deficient Transferrin (CDT). Transferrin is a glycoprotein normally present in serum which helps to transport and delivery iron to the body. The analysis of CDT (a carbohydrate deficient form) has proven to be a sensitive and specific biological marker of heavy continuous drinking. After drinking about 80 g ethanol per day for men and 60 g per day for women for 7 continuous days CDT levels are elevated.

Central nervous system (CNS). The central part of the nervous system consisting of the brain and spinal cord.

Cerebellum. The structure at the base of the brain involved in the control of muscle tone, balance, and sensorimotor coordination.

Cerebral cortex. This is the outer layer of gray matter covering the cerebellum. The cerebral cortex processes sensory information for controlling motor functions, speech, higher cognitive functions, emotions, behavior, and memory.

Cerebrospinal fluid. The clear fluid that fills the cavities (ventricles) that surround the brain and spinal cord.

Chain-of-custody. The procedure used to document how laboratories receive and handle specimens from the moment of collection, during transport, arrival at the laboratory, and during the testing process.

Chromosomes. Microscopic rod-shaped structures composed of double stranded DNA and proteins and located within the cell nucleus. There are normally 46 chromosomes 23 inherited from each parent.

Chronic tolerance. The gradual decrease in degree of intoxication at the same blood alcohol level in the course of repeated exposures.

Cirrhosis. Advanced liver disease in which the liver cells have died, hardened and turned an orange color.

Clandestine Laboratory. A clandestine laboratory is a secret and unlawful facility for production of narcotic drugs. These labs take many forms and might be a kitchen, garage, bathroom, or out-house equipped with the necessary glassware, apparatus, chemicals, organic solvents, and other materials necessary for the synthesis, isolation, or purification of drugs of abuse.

Clinical laboratory science. This entails the examination of some part of the living patient – his excreta, or blood or secretions – to help the physician reach a diagnosis or provide a better treatment.

Cognition. The term cognition involves all the mental functions through which information and knowledge is processed. It includes global functions such as consciousness, drive and attention as well as specific functions like memory, language and calculations.

Collagen. The major protein of fibrous connective tissue e.g. tendons and ligament involve din the production of scar tissue produced in the liver.

Concentration. The quantity of substance contained in a unit quantity of sample. When working with solutions, the recommended unit of concentration is grams of solute per liter of solution.

Congeners. Substance or thing of the same kind or form, e.g. the other constituents of alcoholic beverages besides alcohol and water such as other higher alcohols, aldehydes and esters.

Correlation coefficient. A statistic which measures the strength of the relation between two methods of measurements (association), but not whether two methods agree. It is important to note that high correlation does not necessarily mean good agreement.

Controls. Tests performed in parallel with experimental samples and designed to demonstrate that a procedure worked correctly.

COPD. Chronic obstructive pulmonary disease is characterized by airflow limitations caused by chronic bronchitis and emphysema. Those suffering from COPD have reduced forced expiratory volumes and might be unable to satisfy the breath-sampling requirements with some breath-alcohol analyzers. ref. NEJM 343;269-279, 2000.

Creatinine. Is a waste product derived from creatine a substance synthesized from amino acids mainly in muscle cells. Creatinine is excreted in the urine without being reabsorbed and U-creatinine analysis is therefore used as a test for impaired renal function. In connection with urine-drug testing, a creatinine concentration below 0.2 g/L indicates a highly dilute specimen.

Cross reactivity. This refers to the response in an assay caused by a substance other than the target drug being analysed. Usually an antibody for an immunoassay recognises only a part of the target drug by binding to a specific functional group or structure in the molecule.

Cytochrome P450. A family of enzymes that can metabolize (detoxify) foreign chemical substances that enter the body as well as many endogenous species. The P450 enzymes are found in the microsome fraction of cells especially liver cells (hepatocytes). The particular P-450 enzyme that metabolizes ethanol is denoted P450IIE1.

Cytoplasm. Or cytosol is the soluble fraction or jelly-like substance within cells and outside the nucleus where many of the cell's biochemical reactions take place.

Depressants. These represent a class of psychoactive drugs, both licit and illicit, that relieve anxiety by depressing the central nervous system (CNS). Such drugs have a high abuse potential and ethyl alcohol is the prime example along with barbiturates and the sedative hypnotic chloral hydrate.

Digestive system. The organs responsible for getting food into and out of the body consisting of the esophagus, stomach, liver, gallbladder, pancreas, small intestine, colon and rectum.

Distribution. The transport of absorbed drug or alcohol by the blood-stream to all parts of the body. The distribution of alcohol follows the distribution of body water and the rate of distribution depends on the rate of flow of blood to various organs and tissue.

Diuretic. A drug that promotes water excretion through an increase in the volume of urine.

DNA. Deoxyribonucleic acid, a family of large molecules within the cells of an organism that carry genetic information by specifying the structure of proteins. DNA is composed of a linear sequence of nucleotides.

Drug. Any chemical substance that influences body function.

Duodenum. The first part (~12 inches) of the small intestine from the pylorus to the jejunum.

Ecstasy. Is the popular name for the drug 3,4-methylenedioxymethamphetamine (MDMA). Like amphetamine, MDMA is a derivative of phenethylamine.

Edema. Excess accumulation of fluid in body tissues usually resulting in swelling.

Electromagnetic spectrum. A spectrum of electromagnetic radiation or energy ranging from very high energy (short wavelength) such as gamma rays to very low energy (long wavelength) such as radio waves. X-rays, ultraviolet, visible, infrared, and microwaves are other examples of electromagnetic radiation.

Elimination. The term used to denote removal of a drug (e.g. alcohol) from the body. The process of elimination involves both metabolic breakdown (biotransformation) and removal in an unchanged form in breath, urine, and sweat (excretion).

EMIT. Is an acronym for Enzyme Multiplied Immunoassay a modern technique of chemical analysis. This method of analysis is a homogenous assay which does not require a prior clean-up or extraction of analyte prior to analysis. EMIT involves an antibody-antigen reaction where a candidate drug in the biological specimen (urine or blood) and the same drug labelled with the enzyme e.g. glucose-6-phosphate dehydrogenase compete for binding sites on the antibody.

Endocrinology. This is the study of hormones and their effects and the system of glands that produce hormones.

Endocrine glands. Ductless glands that secrete hormones into the bloodstream. The pituitary, adrenal, and thyroid glands are examples.

Endogenous. Produced or originating within the body by natural processes such as metabolism.

Endoplasmic reticulum. Membrane structure within the cytoplasm of cells.

Enzymes. Protein molecules that serve to speed-up chemical reactions in the body - An enzyme acts as a catalyst for promoting biochemical reactions.

Epidemiology. Derived from the Greek *epidemia* or prevalence of disease. The branch of medical science concerned with the incidence and distribution of disease.

Epilepsy. The term epilepsy applies to a group of central nervous system disorders characterized by recurrent seizures, which are sometimes called convulsions. Seizures can affect vision, speech or movement and can affect only part of the brain.

Erythrocytes. The name given to the red blood cells.

Esophagus. A tube connecting the pharynx with the stomach.

Excretion. Is the removal of a drug or alcohol in an unchanged form in body excreta - urine, breath, sweat, stools, and saliva (if not swallowed).

Exogenous. Produced or originating outside the body.

External proficiency trial. A test programs whose design and management are outside the control of the participating laboratory.

Extravascular. Outside of the blood stream.

Extracellular fluid. Fluid outside the cells (interstitial fluid and plasma) amounting to about 20% of body weight.

Exocrine glands. These are glands that secrete their product out of the gland through a duct and into a cavity; the enzyme producing glands of the pancreas are typical examples.

False positive rate. This represents the proportion of healthy subjects who give a positive test result when screened for a certain disease state.

False negative rate. This is the proportion of subjects with the disease but who give a negative test result.

Fatty liver. An accumulation of fat in the liver representing the first stage of deterioration of the organ often the result of a period of heavy drinking. Fatty liver is reversible after a period of abstinence.

Fatty acid. A compound made up of a hydrocarbon chain (either saturated or unsaturated) terminating in a carboxylic acid group.

Fermentation. An enzymatically controlled anaerobic decomposition of carbohydrates to carbon dioxide and ethanol.

Fibrosis. The formation of fibrous (scar) tissue another intermediate stage of liver deterioration.

First-pass metabolism. This refers to the metabolism (removal) of part of the dose of a drug such as alcohol when administered orally before it reaches the systemic circulation. First-pass metabolism can occur either in the stomach or in the liver and for some substances also in the lung.

Forensic. From the Latin word *forensis* meaning of the forum. In ancient Rome the forum was where debates took place and as such served as the courtroom.

Free radicals. Molecular intermediates that have a single unpaired electron and often arise during oxidation reactions. They are highly reactive and readily attack other molecules.

GABA. Gamma aminobutyric acid a major inhibitory neurotransmitter within the brain and is involved in the mechanism of alcohol's effects on behavior.

Gas Chromatography. An analytical technique for separating volatile substances on the basis of their solubility and volatility.

Gastrectomy. Surgery to remove part of the stomach.

Gastric bypass. A surgical operation to treat grossly obese individuals. The operation involves dramatically reducing the size of the stomach.

General anesthetic. An agent (drug) that renders a person unconscious and oblivious to pain.

GERD. Abbreviation for gastroesophageal reflux disease which is a clinical syndrome that manifests as heartburn and regurgitation owing to reflux of gastric contents into the esophagus.

Gene. A combination of DNA segments that together constitute a unit capable of expressing one or more functional gene products.

Generic. A nonproprietary drug name usually describing the drug's chemical structure and which is not protected by a trademark.

Glucagon. A hormone secreted by cells of the pancreas in response to low blood sugar. This hormone promotes an increase in blood sugar levels by initiating the breakdown of liver glycogen to produce glucose.

G-Proteins. G-proteins are involved in signal transduction through the cell membrane and have the ability to activate different cellular amplifier systems. They get their name because they bind guanosine triphosphate (GTP). Various aspects of alcohol addiction such as development of tolerance and dependence may depend on altered signals through G-proteins. The discovery of G-proteins and the elucidation of their function by the US scientists Gilman and Rodbell was recognized by the award of the Nobel prize in Medicine or Physiology for 1994.

Gluconeogenesis. The synthesis of glucose molecules from non-carbohydrates such as protein and fat. This process begins when blood glucose levels are diminished and cellular levels of carbohydrates are depleted.

Glutamate. An amino acid that serves as the major excitatory neurotransmitter in the brain.

Glutathione (GSH). An antioxidant molecule found naturally in the body, composed of three amino

acids, glutamate, cysteine and glycine.

Glycogen. A polysaccharide and the principle carbohydrate reserve in the body. Excess glucose is converted to glycogen and is stored in the liver and muscle. Glycogen can be converted easily into glucose when more energy is required.

Glycogenesis. Formation of glycogen from glucose molecules.

Glycogenolysis. Hydrolysis of glycogen to glucose.

Glycolysis. The metabolic breakdown of glucose to pyruvic acid.

Gout. A painful metabolic disorder characterized by accumulation of urate (uric acid crystals) which deposit in the joints - often a side effect of heavy drinking.

Hallucinogens. Are substances that bring about a state of dreaming or wandering of the mind characterized by an altered perception of sight and hearing. Hallucinogens e.g. LSD (lysergic acid diethylamide) are psychoactive substances often occurring naturally in various plants or fungi and if taken alter mood and perceptions of reality.

Hematocrit. The percentage of blood volume occupied by erythrocytes, 44-54% in men and 38-48% in women.

Hemolysis. The bursting of red blood cells.

Hepatic vein. The vein that receives blood after it passes through the central veins of the liver and transports blood into the inferior vena cava of the heart.

Hepatitis. Generalized inflammation of the liver, often accompanied by tissue death and fibrosis (scar tissue). Alcoholic hepatitis can prove fatal but is reversible with abstinence.

Hepatocyte. The name given to the principal cells within the liver responsible for most of the metabolic activity.

Homeostasis. The maintenance of relatively constant internal body conditions; a state of equilibrium within the body with respect to functions, composition of fluids and tissues.

Hormone. A chemical messenger produced in an organ or tissue and transported to another part of the organism where it produces a behavioral or physiological response (effect).

Hydrophilic. Attracts water - water liking

Hydrocarbon. A class of organic compounds only containing hydrogen and carbon atoms in various proportions.

Hyperglycemia. A condition resulting when an excessive amount of glucose is dissolved in the blood.

Hypertension. High blood pressure.

Hypoglycemia. An abnormally low concentration of glucose in the circulating blood.

Hypoventilation. The term hypoventilation defines a condition in which alveolar ventilation is insufficient to meet the metabolic demands of the individual and this results in an inappropriate tension of carbon dioxide.

Hypoxia. Lower than normal level of oxygen in the blood or tissue.

Impairment. The influence of alcohol or a drug manifested in the subject's decreased ability to perform a given task safely.

Incidence. The number of new cases of a variable (condition, symptoms, disease, or trait) occurring

during a particular period of time.

Inflammation. A defensive response to local tissue injury or infection, serving to prevent the spread of injury and activate the immune system.

Infrared. Pertaining to the region of the electromagnetic spectrum from approximately 0.78 to 300 μm .

Insulin. A hormone produced in the islets of Langerhans in the pancreas as a response to elevated blood sugar levels. The hormone permits the metabolism and utilization of glucose. Insulin in fairly pure form was prepared first by Banting, Best, Collip and Macleod from University of Toronto and led to successful treatment of diabetes.

Interferent. A chemical compound or substance other than the substance of interest (e.g. ethanol) to which the measuring instrument responds to give a falsely elevated result.

Inter-individual variation. The distribution of a measurement or a quantity in a given sample of individuals.

Intra-individual variation. The distribution of measured values of a quantity in a given individual over time.

Intravascular. Within the blood vessels.

Intracellular fluid. Fluid within the cells making up about 40% of body weight.

Interstitial fluid. Fluid between the cells.

In-vivo. From the Latin meaning **in the living body** a term commonly used to signify tests made with living subjects (humans or animals).

In-vitro. From the Latin meaning **in glass** a term commonly used to signify experiments in a test tube or flask as opposed to in the living organism.

Isozyme or isoenzyme. Is an enzyme with the same function as another enzyme but having a slightly different composition of amino-acids and with different kinetic properties.

Jejunum. Pertaining to the second part of the small intestine from the duodenum to the ileum.

Ketogenesis. The production of ketone bodies (acetone, acetoacetate, beta-hydroxybutyrate)..

Ketosis. A condition characterized by the enhanced production of ketone bodies, e.g. during starvation or in disease states such as diabetes mellitus.

Ketonuria. Excess ketone bodies in the urine

Ketonemia. Excess ketone bodies (acetone, acetoacetate and β -hydroxybutyrate) in the blood.

Ketone bodies. The end-products of lipid metabolism; acetone, acetoacetate and beta-hydroxybutyrate.

Kinetic properties. The characteristics of an enzyme including speed of reaction, and affinity for the substrate.

Lactic acid. An organic acid produced from pyruvate during anaerobic metabolism.

Licit. Means lawful or permitted and is the term used to describe pharmaceutical preparations obtainable on prescription or over-the-counter as opposed to illicit or unlawful drugs listed under the controlled substance act such as heroin, methamphetamine and cannabis.

Lipase. A pancreatic enzyme that facilitates the digestion of fats.

Lipids. Fatty substances - a class of organic compounds that include fats, waxes, oils, (triglycerides) phospholipid and sterols (cholesterol) consisting largely of esters formed by combining fatty acids with alcohols or other molecules.

Lipogenesis. The synthesis of lipids from glucose and amino acids.

Lipid peroxidation. The destructive metabolism of lipids (fatty substances) within cells by chemical oxidation leading eventually to the destruction of cell membranes.

Limit of detection (LOD). The smallest result obtainable by a given measurement procedure that can be accepted with a stated level of confidence as being different from the value of the measurable quantity obtained on blank material; by convention $LOD = 3 \times s_o$ where s_o is the standard deviation of measurements without the analyte present, e.g. blanks.

Limit of Quantitation (LOQ). The lower limit of concentration or amount of substance that must be present before a method is considered to provide quantitative results. By convention, $LOQ = 10 \times SD_o$, where SD_o = the estimate of standard deviation at the lowest level of concentration measurable.

Macronutrients. Refers to dietary nutrients that are required in large quantities such as protein, fat and carbohydrate.

Micronutrients. Refers to the vitamin and mineral constituents of the diet.

Malnutrition. A deficiency in protein and energy,

Matrix Effects. Influence of a component in the analytical sample other than the component being investigated and how this impacts on the measurements being made.

Mean corpuscular volume (MCV). Refers to the average size of a red blood cell. Abnormally high MCV is one indication of over consumption of alcohol.

Mellanby effect. Greater impairment on the ascending limb of the blood alcohol profile (absorption phase) compared with the descending phase (post absorptive phase) despite the same concentration of alcohol in venous blood.

MEOS. The microsomal ethanol oxidizing system (now called P4502E1), is an enzyme system in the liver that oxidizes ethanol to acetaldehyde but also oxidizes many other drugs, solvents and xenobiotics.

Metabolism. The totality of chemical reactions occurring in a cell, an organ, or the body. The term is sometimes applied more narrowly to the breakdown of a particular substance e.g. alcohol by specific enzymes.

Metabolite. A compound produced by a chemical reaction taking place in the body such as the metabolism of a drug; acetaldehyde is a metabolite of ethanol.

Metrology. The science of measurement.

Microsomes. A subcellular fraction of cells obtained by differential centrifugation of liver homogenates that contains fragments of the endoplasmic reticulum. The microsomes are rich in drug-metabolizing enzymes.

Microsomal enzymes. Detoxifying enzymes (cytochrome P450) associated with certain membranes (microsomes) within the liver cells.

Mitochondria. Small spherical rod-shaped structures within the cytoplasm that generate most of the cell's energy through the production of adenosine triphosphate (ATP).

Motor function. This is a general term and refers to movement, mobility and behaviour.

NAD/NADH. Nicotinamide adenine dinucleotide (NAD) is a coenzyme molecule that binds with hydrogen atoms during alcohol metabolism and becomes reduced to NADH. This NAD-NADH couple moves hydrogen atoms back and forth between various oxidation-reduction reactions within the cell.

Necrosis. Cell death that occurs in response to adverse conditions in the cell's environment.

Neurotransmitter. A chemical agent or molecule released by a neuron on excitation that crosses the synaptic cleft to activate or inhibit an adjacent neuron.

Neuron. A nerve cell - the functional unit of the nervous system consisting of the nerve cell body, the dendrites and the axon.

NMDA. N-methyl-D-aspartate, a synthetic amino acid capable of activating certain glutamate receptors.

Nystagmus. Rhythmical oscillation (bouncing or jerking movement) of the eyeballs often involuntary. Gaze nystagmus occurs when the eyes gaze or move to the side along a horizontal plane.

Obesity. The word obesity is derived from the Latin word meaning "to overeat". Obesity is a medical problem and today means degree of over-weight or excess adiposity. The body mass index is the standard measure for obesity.

Ordinal scale. Ordered set of measurements consisting of words and or numbers indicating the magnitude of the possible values that a type-of-quantity can take.

Osmolality. This is a measure of the solute or particle concentration of a fluid, e.g. serum or urine. In a random urine sample osmolality might span from 50 to 1400 mOsmol/kg

Outlier. A value in a sample of values so far separated from the remainder so as to suggest that it may be from a different population.

Oxidation. A chemical reaction that usually involves removing a hydrogen atom from a molecule or adding an oxygen atom, or both.

Pancreas. Abdominal gland located behind the stomach that secretes pancreatic juice into the intestine and also manufactures the hormones insulin and glucagon that are released into the blood stream.

Pancreatitis. The pancreatic is an organ located behind the stomach in the upper abdomen and produces enzymes and hormones (insulin and glucagons) Pancreatitis is an inflammation of the pancreas and is a painful condition including nausea and vomiting. Chronic pancreatitis is often caused by excessive consumption of alcohol or gallstones.

Pathology. The word pathology comes from the Greek word *pathos*, suffering or distressed state or the disturbance of vital processes.

Per se alcohol limits. Statutory concentration limits of alcohol in blood, breath, or urine above which a motorist is in violation of the law.

Peer Review. The human judgment of a scientific study (manuscript) by individuals "peers" having expertise and experience in the same or a closely related area.

Peroxisome. Membrane bound body within the cell containing enzymes (catalase) that either synthesis or decompose hydrogen peroxide.

Pharmacokinetics. The study of absorption, distribution, and elimination of drugs and their metabolites and the associated changes in these processes over time; what the body does to the drug.

Pharmacodynamics. The study of the action of drugs in the body; what the drug does to the body and the relationship between drug concentration and the pharmacological effect produced.

Pharmacogenetics. This is the study of the role of inheritance in inter-individual variation in drug response. Thus the study of racial, ethnic, and genetic aspects of kinetics and dynamics of drugs and related substances that might explain observed variability in pharmacokinetic parameters.

Phase I reactions. A term used to describe various metabolic (detoxification) reactions whereby drugs and other chemical compounds foreign to the body are oxidized, reduced or hydrolyzed by the addition of polar groups thus rendering them less toxic and more soluble in water.

Phase II reactions. A term used to describe metabolic reactions whereby certain enzymes convert drugs or foreign chemicals entering the body into more water-soluble compounds to facilitate excretion in the urine. The main conjugates are glucuronide, sulfate, acetate, and various amino acids. A phase I reaction often precedes a phase II reaction

Physical dependence. Is a state that develops in parallel with chronic tolerance and is revealed by the precipitation of serious physiological disturbances (abstinence) when intake of the drug is terminated.

Physiology. The scientific discipline that deals with the functions of the living body.

Placebo. From Latin *"I shall be acceptable or pleasing"* thus a preparation or medicine given to please the patient. Placebos are used in experiments as control treatments - a tablet or drink that might look, taste, and smell like the active drug but devoid of any pharmacological effect.

Polycythemia. An over abundance of erythrocytes (red blood cells) resulting in increased viscosity of the blood and abnormally high hematocrit. -

Polymorphism. The presence of two or more alleles of a gene or other DNA sequence in a population. An existence of more than one form of a genetic trait,

Portal vein. A large blood vessel that collects blood from the stomach and intestine and transports nutrients to the liver.

Potentiation. The action of two drugs in which the combined effects are greater than the sum of the individual effects.

Precision. Closeness of agreement between independent results of measurements obtained by a procedure under prescribed conditions; the variation or scatter of the measurements about the mean. The precision is expressed by the standard deviation of the measured values. Near synonyms for precision are reliability, repeatability, stability, consistency, reproducibility, agreement.

Prevalence. The frequency with which a variable (condition, symptom, disease, or trait) occurs in the population at a certain point in time.

Proficiency test. A test designed to evaluate the reliability of an analytical method or procedure and the overall quality performance of a laboratory.

Proteins. Large molecules composed of long chains of amino-acids. The shape and function of a protein is determined by the sequence of its amino-acids. Proteins help to maintain the cells structure and participate in many biological reactions as catalysts (enzymes).

Protein binding. A reversible binding of a drug or endogenous compound to the major proteins of plasma (e.g. albumin). The binding consists of weak ionic bonds, Van der Waals forces and hydrogen bonding.

Psychotropic drug. A drug with its main site of action in the central nervous system (brain) often associated with altered mood, thought processes and behavior. Results in euphoria and tolerance and dependence.

Psychomotor functions. Motor functions as a consequence of mental activity.

Pyruvic acid. An endogenous substance produced from glucose as the end product of glycolysis.

Pylorus. The sphincter muscle separating the stomach from the small intestine also called *pyloric sphincter*.

Quality assurance. Those planned and systematic actions necessary to provide confidence that the work done at a laboratory meets given requirements and high standards of performance.

Radioisotope. This is an element with radioactive properties. In analytical chemistry the radio immunoassay (RIA) was the first immunoassay introduced. There are three isotopes used in RIA, tritium (^3H), carbon-14 (^{14}C), and iodine-125 (^{125}I).

Randomized controlled trials. These are the mainstay of evaluating new medicines. In such trials, the participants who receive the treatment are assigned at random or by chance, which is essential to ensure that the outcomes are determined only by the treatment.

Reaction time. The time interval between presentation of a stimulus and initiation of a response.

Receptor. A protein embedded in the wall of a neuron or other cell that recognizes and binds a neurotransmitter or other chemical messenger.

Reduction. This is a chemical reaction that usually involves removing an oxygen atom from the molecule, or adding a hydrogen to it or both.

Response latency. The time interval between presentation of a stimulus and making a response.

Reference standard. A sample prepared or acquired that has known properties in terms of its identity, purity, chemical composition, and concentration. Reference standards are used for the purpose of calibrating analytical equipment and for use as a control in actual experiments.

Repeatability. The closeness of agreement between the results of successive measurements during a short time, defined as the within-run standard deviation).

Reproducibility. The closeness of agreement between the results of measurements of the same measurable quantity on different occasions (e.g. the between run standard deviation). Different observers, different calibrations, different locations, different times.

Respiratory membrane. The membrane within the lungs being only a few microns thick across which an exchange of gases takes place.

Retrograde extrapolation. The practice of estimating a person's blood or breath alcohol concentration at some time prior to the time of obtaining a specimen for analysis - back extrapolation, back-tracking.

Ribosome. A small spherical body within cells where the synthesis of proteins occur.

Saccadic eye movements. Rapid conjugate shifts of gaze when following a target.

Second messenger. A molecule produced within a cell that carries information to a site within the cell eventually eliciting a physiological response; an example is cyclic AMP.

Sensitivity of an analytical method. This is the measured detector signal per unit increase in the concentration of the analyte as reflected by the slope of the linear calibration plot.

Sensitivity of a diagnostic test. This is defined as the proportion of the patients having a disease and for whom the test results were positive.

Sensorimotor functions. Functions involving perception of information from the senses and the resulting physical reactions of muscles.

Serotonin. 5-hydroxytryptamine (5HT) a neurotransmitter associated with mood, sleep, aggression,

anger, appetite and drinking.

Serum. The fluid portion of blood remaining after coagulation (removal of fibrin and blood cells).

Slurred speech. A clinical sign of intoxication e.g. after drinking alcohol or taking medication which is characterized by imprecise speech articulation including deviation in rate, pitch and intensity of speech and incorrect production of consonants and vowels.

Specificity of a diagnostic test. This is defined as the proportion of healthy subjects in whom the test results were negative.

Spirometer. A device for measuring the volume of respiratory gases.

Spleen. The spleen is an organ that lies behind the stomach on the left side of the abdomen. Old red blood cells and platelets are stored in the spleen, which also serves to clear and fight bacteria.

Stimulants. Are a class of drugs that stimulate the central nervous system (CNS) by interfering with the brain's neurotransmitters. CNS stimulants cause stimulation of the sympathetic nervous system by altering neurotransmission of catecholamines such as dopamine, noradrenaline and serotonin. Cocaine and amphetamine are the prototype central nervous system (CNS) stimulants.

Stroke. Any condition during which the blood supply to the brain or regions of the brain is suddenly interrupted.

Substrate. The substance (molecule) acted upon by an enzyme; its conversion to a particular product is catalyzed by a specific enzyme, e.g. ethanol is the substrate for alcohol dehydrogenase.

Symptom. Any subjective evidence of a disease or of a patient's condition.

Synapse. A microscopic gap (or cleft) separating presynaptic and postsynaptic neurons.

Synovial fluid. The fluid lubricant found inside synovial joints.

Tidal volume. The volume of air inspired and expired in a single breath being approximately 500 ml in adults.

Tolerance. A state that develops after long-term exposure to a drug. Metabolic tolerance infers a faster removal of the drug, e.g. by metabolic degradation in the liver. Functional tolerance infers a change in sensitivity of the brain to the effects of the drug.

Tolerance Interval. That range within which a specified percentage of individual values of a population are expected to fall with a stated level of confidence.

Toxicity. The ability of a substance to harm living organisms - all substances are toxic even water if ingested in large enough amounts.

Toxicology. The word toxicology derives from the Greek term "toxon", which means a bow for shooting arrows. During antiquity poisons were often placed on the tips of arrows making them more deadly, hence the word hence the word *toxicos* and *intoxicated*, which means made sick by poison..

Tracking. A laboratory test often used to measure impairment and which involves adjusting an instrument to maintain a desired value (compensatory tracking) or to follow a moving reference marker or object (pursuit tracking).

Trypsin. An enzyme in the small intestine produced in the pancreas that digests proteins.

Type I diabetes. Insulin-dependent diabetes also known as juvenile-onset diabetes.

Type II diabetes. Non-insulin-dependent diabetes (the more common form) also called adult onset diabetes.

U-Creatinine. The creatinine content of urine can span over a wide range depending on the relative concentration of water in the specimen. A U-creatinine below 0.2 g/L is taken to indicate a highly dilute specimen, which might occur after drinking water or an alcoholic beverage before voiding.

Ultraviolet. Pertaining to the region of the electromagnetic spectrum from approximately 10 to 380 nm.

Unit of alcohol. In USA a unit of alcohol is the same as 14 gram ethanol or the amount contained in a standard drink being 5 oz table wine (12%), 1½ oz spirits (40%), 12 oz beer (5%) or 12 oz wine cooler.

Upper respiratory tract. That part of the lungs comprising the nasal cavity, pharynx and associated structures.

Uroscopy. This term refers to the examination of urine especially to observe its volume, appearance, smell, color and taste to aid in making a diagnosis. Uroscopy is considered the oldest clinical test to evaluate what was going on within the body.

Vasodilation. Increased diameter of blood vessels - the opposite of vasoconstriction.

Vasopressin. The antidiuretic hormone secreted from the pituitary gland in response to dehydration, which instructs the kidney to reduce urinary volume. Alcohol inhibits the hormone thus resulting in an increased production of urine.

Vein. A vein is a blood vessel that carries blood back from body organs and tissue to the heart.

Viscera. Pertaining to the internal organs - the soft parts - the internal organs of the abdominal cavity.

Visible. Pertaining to radiant energy in the electromagnetic spectral range visible to the human eye corresponding to wavelengths from approximately 380 to 780 nm.

Vital Capacity. This is defined as the total volume of air that can be expelled from the lungs after a maximum inspiration. A healthy adult person might have a vital capacity of approximately 4600 ml, being less in women compared with men and markedly diminished in heavy smokers and those with lung disease.

Vitreous humor. Means glassy fluid and refers to a transparent jelly-like substance that fills the space between the lens and the retina and is a fluid commonly taken for alcohol analysis in postmortem toxicology.

Wavelength. A property of radiant energy, such as IR, visible or UV. The distance measured along the line of propagation, between two points that are in phase on adjacent waves.

Widmark. Erik MP Widmark (1889-1945), a pioneer worker in forensic alcohol studies and is best known for his seminal work on pharmacokinetics of alcohol published in 1932. Widmark was appointed Professor of Physiological and Medicinal Chemistry at the University of Lund, Sweden at the age of 31 y.

Widmark's β -factor. This denotes the slope of the post-absorptive elimination phase assuming zero-order kinetics; the rate of alcohol elimination from blood slang = burn-off rate.

Widmark's ρ -factor. From German "die reduzierte Körpermasse" (the reduced body mass) or the factor by which an individual's body weight needs to be lowered to obtain the theoretical body mass having the same concentration of alcohol as the blood. The factor ρ characterizes the distribution of alcohol between the body and the blood as a whole and is given by the quotient [alcohol in organism] / [alcohol in blood]. Today ρ is generally taken to mean the volume of distribution of alcohol and has units of L/kg, because dose is in g/kg and BAC is in g/L.

Xenobiotic. From the Greek xeno (foreign) and the name given to chemical substances not normally found in the living body e.g. synthetic chemicals, environmental chemicals, drugs, and organic solvents.

Yeast infection. Fungal infection caused by yeast such as *candida albicans*.

Z-score. The Z-score is one measure of the accuracy of the results obtained by a laboratory participating in an external proficiency tests. The z-score is calculated as [(laboratory result - assigned or target value)/standard deviation (SD) of all participants]. Before SD is computed outliers need to be eliminated from the material.