Glossary

amino acids: a set of organic compounds that constitute **proteins**. They contain an amine group (NH_2) and a carboxyl group (COOH).

nucleic acid: a polymer formed by the linking up of **nucleotides**. There are two: **RNA** (ribonucleic acid), in particular **messenger RNA**, which specifies the **sequence** of **amino acids** in a **protein**, and **DNA** (deoxyribonucleic acid), which is the support of genetic information in each living cell.

actinide: a natural or artificial **radioelement** with an atomic number (number of protons in the nucleus) between 89 (actinium) and 103 (lawrencium). **Major actinides** are **isotopes** of uranium or plutonium present or formed in nuclear **fuel**. **Minor actinides** are formed in relatively small amounts in a reactor by successive capture of neutrons from the nuclei of the irradiated nuclear fuel. These long-lived isotopes are principally neptunium (237), americium (241, 243) and curium (243, 244, 245).

activation: process by which a stable **nuclide** is converted into a **radioactive** nuclide, for example in the structural materials of nuclear reactors, by the action of a flux of neutrons or other particles.

activation (of a gene)**:** activation of the **expression** of the **gene**.

activation product: see **activation**.

activity: number of spontaneous nuclear transitions (**decay** events) that occur in a given quantity of a **radionuclide** in a sufficiently small time interval, divided by that interval. Its unit is the **becquerel** (**Bq**) which corresponds to one transition per second, and so is an extremely tiny unit.

adenocarcinoma: malignant tumour that grows at the expense of glandular tissues.

adsorption: fixation of a vapour phase on a solid medium.

aerosol: very fine solid or liquid particles (with characteristic size range of between 0.01 and 100 micrometres) suspended in a gas.

alkali metal: an element in Group I of the periodic table.

alkaline earth metal: an element in Group IIA of the periodic table, which comprises beryllium, magnesium, calcium, strontium, barium and radium. These highly electropositive metals are light and soft, and react with water to give weakly soluble bases (hydrated magnesia, slaked lime, barium hydroxide, etc.), of formula $X(OH)_2$, where X is the alkaline earth metal. These elements are not found as free metals in nature because, like the **alkali metals**, they are powerful **reducing agents** and react readily with many **non-metals**.

allele: one of the different forms of a **gene**. In a diploid cell, each gene has two alleles.

analyte: compound to be analysed.

angiography: method of medical exploration using X-rays to examine blood vessels that are invisible by standard radiography (arteriography for the exploration of arteries and phlebography for veins) by means of an iodine-based radio-opaque contrast agent introduced into vessels.

angioma: tumefaction formed by an agglomeration of blood or **lymph** vessels.

anion: negative ion.

apoptosis: cell suicide (programmed cell death).

ATP: see **mitochondrion**.

base: in a **DNA** or **RNA** molecule, a purine or a pyrimidine.

becquerel: unit (**Bq**) of **activity** equal to the number of nuclear transitions (**decay** events) that a **radionuclide** undergoes per second.

bioavailability: the extent to which a substance is biologically available to act at particular sites in a living organism.

biokinetics: study of the distribution (**biodistribution**), retention and excretion of a substance in a living organism.

biogene: factor indispensable for the constitution of living matter.

biological half life: time by which half the mass of a substance has been eliminated from the body by physiological processes only.

biosphere: all the ecosystems of the planet, comprising all living beings and their habitats.

blood-brain barrier: a system formed of **endothelial** cells located in the brain capillaries, at the interface between the blood and the parenchyma of the central nervous system, and which limits the transfer to this system of certain substances.

Prussian blue: a ferric ferrocyanide similar to the pigment discovered in the seventeenth century by a Berlin chemist, used medically to **chelate** cæsium in the digestive tract.

bystander effect: occurrence of damage in a cell that, unlike its neighbours, has not been directly irradiated.

carcinogen: a physical or chemical agent is said to be carcinogenic when exposure to it causes an increase in the **incidence** of cancer.

carcinogenesis: all the steps leading to the formation of a cancer.

carcinoma: cancer of **epithelial** cells.

catalysis: acceleration of a chemical reaction due to an accelerating substance, called a catalyst (e.g., **enzymes** in biology), that is recovered unchanged.

cation: positive ion.

chelation: reversible chemical combination, generally with a high affinity for a metal ion such as iron, calcium or magnesium.

chromosome: rod structure formed by a molecule of **DNA** associated with **proteins** (histones) that this molecule adopts during cell division. The number and form of these chromosomes are characteristic of a particular species.

code: in computer software, the set of coded mathematical expressions composing the simplified representation (**modelling**) of a system or process for purposes of simulation.

colloid: system in which very fine particles are suspended in a liquid, solid or gas, with a very high surface/volume ratio.

compartment: in a living organism or ecosystem: a biological space, most often of measurable volume, in which is homogeneously concentrated a substance or molecular population that exhibits specific behaviour and has a single physicochemical form.

complex formation: formation of a molecular construction (or **complex**), neutral or charged, made up of ions and molecules (organic or inorganic), or more rarely atoms, bound **covalently** to a metal ion.

controlled zone: zone where access and residence are subject to special regulations for protection against ionising **radiation** and confinement of **radioactive** contamination. A **monitored zone** is subject to appropriate monitoring for the purposes of **radioprotection**.

co-ordination number: number of bonds that an ion is able to form with electron donor atoms.

covalent: describes a chemical bond between two atoms formed by electron sharing.

cytokine: extracellular signalling **protein** or **peptide** acting as a local communication mediator between cells.

cytoplasm: part of the cell bounded by a plasmic membrane containing different **microstructures** including the membrane **organelles** (Golgi apparatus, **mitochondria**, **vesicles**, small spherical organelles, etc.).

cytotoxicity: toxicity for the cell.

decay: see **radioactive**.

decorporation: extraction of a toxic agent from the body after its **intake**; **decorporant:** substance able to increase the extraction of the toxic agent.

Glossary

depleted uranium: uranium in which the proportion of **isotope** U-235, the only **fissile** one, is lower than its natural level (natural uranium is composed of three isotopes [99.3% by mass of ^{238}U, 0.72% of ^{235}U and traces of ^{234}U]). It is mainly obtained either as the co-product of an enrichment process (about 0.3% of ^{235}U), or as a by-product (1% of ^{235}U) of **fuel** reprocessing after being consumed in a reactor. In this second case the depleted uranium contains traces of ^{232}U (**half life** 70 years) and ^{236}U (half life 23 million years).

deterministic effect: an effect that is expected to occur above a threshold of **exposure** and its gravity is proportional to **dose**.

differentiation (cell)**:** process by which a cell is transformed, during embryo growth, into a specialised cell type.

dispersion: mixture of small particles (organic or inorganic) in a homogeneous medium.

divalent: see **valency**.

DNA: see **nucleic acid**.

DNA microarray: device (sometimes called DNA chip) using the methods of microelectronics to detect the presence of a strand of **DNA** by matching it with its complementary strand attached to the chip, called a probe, on hybridisation sites based on the principle of the DNA double helix. Using this method it is possible, for example, to analyse the global genetic **expression** of a cell.

dose: see **Box F**.

dose factor: coefficient used to calculate a delivered **dose** (in **sieverts**) corresponding to the ingestion or inhalation of an **activity** of 1 **becquerel** of a given **radionuclide**.

dosimetry: theory and application of principles and methods of measurement or estimation of **doses** (*absorbed* or *equivalent*) of ionising **radiation** received or liable to be received.

effective half life: for a given **radionuclide** the effective half life (Te) depends on the **physical half life** (Tp) and the **biological half life** (Tb) according to the relation 1/Te = 1/Tp + 1/Tb. It is thus equal to the time needed for the specific **radioactivity** of the molecules of a given population to halve after correction for the **decay** of the radionuclide.

electrolyte: ions in solution that are indispensable for growth and development of a life form: potassium ion K^+, sodium ion Na^+, calcium ion Ca^{2+}, magnesium ion Mg^{2+}, chloride ion Cl^-, etc.

element: substance composed of atoms that have the same number of protons in their nuclei (atomic number).

endosteum: layer of tissue lining the internal (medullar) cavity of the long bones containing the bone marrow.

endothelial: of or pertaining to the tissue structure (endothelium) formed of a single layer of contiguous flat cells that lines the vessels and the heart.

enzyme: protein that carries out a biochemical reaction by **catalysis**.

epidemiology: science that studies the relationships between diseases and the various factors that may influence their frequency, distribution and evolution.

epithelium: cell coat, made up of one or more cell layers, covering the outer or inner surface of a cavity; **epithelial:** of or pertaining to these cell layers.

exogenous: coming from outside the organism, as opposed to **endogenous**.

expression (of a gene)**:** production by a **gene** of an observable **phenotype**, usually *via* the synthesis of a **protein**.

ex vivo*:** see ***in vivo.

fibrin: protid that envelops blood and **lymph** cells during clotting.

fibrinolysis: destruction of **fibrin**.

fibroblast: cell of the conjunctive tissue synthesising **protein** fibres (collagen) and many basic substances, and which proliferates well in cell culture.

fibrosis: fibrous transformation of a biological tissue.

fissile: see **fuel**.

fission product: nuclide generated either directly by nuclear **fission**, or indirectly by the **decay** of fission fragments.

fuel (nuclear)**:** matter containing **nuclides** that by **fission** (splitting into two pieces of an heavy nucleus) in a nuclear reactor release energy in a controlled chain reaction.

gene: DNA sequence on a **chromosome** composing a unit of hereditary information that can generate a **phenotypic** character *via* the production of one or more **proteins**.

genomics: study of the structure, function and evolution of the **genomes** (all the genetic material) of living organisms. It comprises the inventory, physical mapping (representation of the arrangement of the **genes** on the **chromosomes**) and identification of the genes, and the study of their structures (**structural genomics**) and of their **expression** and therefore their function. Computer-assisted data processing is important in genomics, for example for classifying genes according to homologies in their **sequences** along the **DNA** molecules.

genotoxic: toxic towards **genes** through damage to **DNA**.

germinal cell: reproductive cell.

glomerulus: part of the **nephron**, elementary component of the kidney.

granulometry: measurement of the size and shape distribution of particulate materials.

gray: unit of absorbed **dose**: 1 gray (**Gy**) corresponds to an absorbed energy of 1 joule per kilogram of matter.

hæmatopoietic: related to the generation of blood cells, mainly in the bone marrow.

hæmatopoietic marrow: bone marrow where blood cells are formed.

half life (radioactive or physical)**:** time for half the atoms in a sample of a **radioactive nuclide** to **decay**.

halogen: a chemical element in Group VII of the periodic table (chlorine, bromine, iodine, fluorine, or astatine).

heavy metal: a metal of density greater than 4.5 g/cm^3, e.g., zinc (7.14), cadmium (8.6), or lead (11.35).

hepatocarcinoma: cancer of the liver.

hormone: substance produced by a group of cells or an organ and carried by the blood, and which exerts a specific action on another organ or on other cells.

hydrolysis: decomposition of a chemical species (molecule or ion) by water.

incidence: number of *new* identified cases of a disease (for example cancer) over a period (generally one year) in a given population.

intake: see **decorporation**.

in vitro*:** Latin for "in glass", with reference to analysis initially carried out in glass containers. Describes all laboratory examinations of biological materials outside living organisms, as opposed to ***in vivo examinations (Latin for "in living matter").

ion channel: protein located in the cell membrane, forming a channel that selectively allows certain ions (mainly sodium, potassium, calcium and chloride) to enter or leave the cell.

ionic strength: sum of the concentrations of all the ionic species present in a solution.

ischæmia: arrest or insufficiency of blood irrigation of a tissue or organ.

isotopes: different forms of the same chemical element, i.e., with the same atomic number, in which the nucleus contains different numbers of neutrons.

karyotype: all the **chromosomes** of a cell in its **metaphase** (phase of assembly during cell division), specific to an individual or species.

keratinocyte: cell constitutive of the outermost layer of the skin (epidermis) and integument (nails, hair, feathers, scales, claws, etc.). It synthesises keratin, a fibrous **protein** insoluble in water, which makes the skin waterproof.

keratosis: thickening of the outermost layer of the epidermis.

lanthanides: the family of **elements** with atomic numbers (numbers of protons in the nucleus) between 57 (lanthanum) and 71 (lutetium), historically known as the **rare earths**. These metals have atoms containing six layers of electrons; the internal layers differ, but the two outer layers have the same configuration, which gives them very similar chemical properties and so makes them difficult to separate. However, their different nuclei give them different physical, in particular nuclear, properties.

lethal dose 50 (LD_{50}) is the standard parameter used to express and compare toxicity, in particular of chemicals. It is the **dose**, most often expressed in milligrams per kilogram of body weight (mg/kg) or in parts per million (ppm), that kills half the exposed subjects in a given time.

ligand: molecule or ion bound to the central atom of a **complex**.

cell line: population of cells of a given type that are able to divide indefinitely in a cell culture.

linear no-threshold (effect)**:** an effect that is proportional to the intensity of its cause (e.g., exposure to ionising **radiation**), without a threshold below which no effect is observable.

lipid: organic molecule containing a fatty acid or a derivative of a fatty acid, insoluble in water but soluble in non-**polar** (hydrophobic) organic solvents. The **phospholipids**, the main constituents of cell membranes, are amphiphilic molecules, i.e., they possess a hydrophilic phosphate (polar) end and a hydrophobic lipid (apolar) end.

lymphatic (route)**:** the lymphatic system, which is involved in the body's immune defence and in the circulation, runs parallel to the arterial and venous blood circulation. It comprises lymphoid organs (tonsils, thymus, spleen, Peyer's patches (intestine), appendix, etc.) and all the lymph ducts (with dead-ends) in which flows the **lymph**, a colourless liquid resulting from blood filtration. These ducts connect the **lymph nodes** which continually filter the body's liquids and also produce **lymphocytes**. When there is an infection they bring specific defence cells into contact with the antigens.

lymphocyte: white blood cell that produces an immune response when it is activated by a foreign entity (an antigen). Its role is to eliminate infectious agents and other debris and foreign bodies carried by the **lymph**.

lysis: destruction of biological agents (of a cell in **cytolysis**) by physical, chemical or biological agents; **radiolysis** is the decomposition of matter by ionising **radiation**.

macrophage: white blood cell specialised in the capture, ingestion and digestion of particles by **phagocytosis**.

mediator: chemical messenger (**hormone**, neuromediator, etc.) released by a cell in the external medium and able to influence other cells.

metabolism: all the chemical processes that take place in living organisms and in every cell.

metabolite: organic substance formed during **metabolic** processes (synthesis or breakdown) or involved in them.

metabolome: all the organic compounds present in a biological medium as a result of the influence of the **genome** (the **protein** structure), the cell (maturation of proteins) and the environment.

metalloid: in the periodic classification of the **elements**, the former name for a **non-metal**, but more usually an element that is both metallic and non-metallic.

microstructure and **vesicle:** see **cytoplasm**.

mitochondrion: cell **organelle** in which is synthesised **ATP** (adenosine triphosphate), an energy transporter that is involved in many steps of cell **metabolism**.

modelling: simplified representation of a system or process devised to simulate it.

molecular modelling: approach based on a number of methods (**quantum chemistry**, molecular dynamics and mechanics) by which the behaviour of molecules can be predicted from their structure, or molecules can be designed to have some desired behaviour.

monovalent: see **valency**.

MOX (Mixed Oxides)**:** nuclear **fuel** based on a mixture of uranium oxide and plutonium oxide.

mucociliary: in the human respiratory tract, a system that lifts layers of **mucus** (viscous secretion containing **proteins** and glucids), containing trapped dust particles and dead cells into the mouth to be swallowed, by means of innumerable cilia located on the surface of the **epithelial** cells lining the airways.

mutagenic: that increases the frequency of **mutations**.

mutation: transmissible alteration of the genetic message by modification of a **sequence** of **DNA nucleotides**; a *point mutation* is an alteration limited to a single nucleotide.

necrosis: massive cell death when cells swell and burst, inducing an inflammatory response.

nephron: elementary functional unit of the kidney (which possesses about a million) composed of the **glomerulus** and the **tubule**.

nephropathy: kidney disease.

nucleotide: elementary link in a biological molecule made up of a **base**, a sugar and a phosphate group. The nucleotides that compose **DNA** are four in number: A, T, G and C.

nuclide: a nuclear species characterised by its *mass number* A (sum of the number of neutrons N and the number of protons Z) and its *atomic number* (number of protons Z).

vesicular organelle: see **cytoplasm**.

osteoblast: cell of the **fibroblast** family that builds bone.

osteoclast: voluminous multinucleate cell of the **macrophage** type that allows the erosion of the bone matrix deposited by the **osteoblasts**.

osteocyte: cell of mature bone, the precursor of which is the **osteoblast**.

osteosarcoma: cancer of the conjunctive tissue of the bone.

osteotropic: that displays particular affinity for bone structures.

oxidant: an agent that causes an atom or ion to lose electrons; **oxidation:** reaction in which an atom or ion loses electrons (see **oxidation state**).

oxidation state (or number)**:** the number of electrons that have to be added to or subtracted from an atom in a compound to make it neutral. Lowering the number corresponds to a **reduction** and raising it to an **oxidation**.

oxidative stress: in an organism, result of an imbalance between oxygen free radicals (atoms or molecules derived from the decomposition of a water molecule) and antioxidants. Oxidative stress can cause damage to cells that leads to cell death, free radicals being highly reactive owing to their unpaired electron.

oxyanion: negative ion of which the charge is carried by an atom of oxygen.

peptide: molecule made up of a small number of **amino acids**.

peptide bond: amide bond obtained by the condensation of two **amino acids** with elimination of water formed from a hydrogen of the amide group NH_2 on one and the OH of the carboxylic group COOH on the other.

periosteum: fibrous conjunctive membrane covering the surface of bone tissue.

pH: measure of the concentration of hydrogen ions in a liquid. Below pH7, it is said to be acid, above, alkaline.

phagocytosis: process by which cells, in particular **macrophages**, capture, ingest and digest particles.

pharmacokinetics: study of the fate of a drug in the body. Its aim is to obtain the information necessary for dosages to be adapted in order to ensure those plasma concentrations of a drug that provide the greatest efficacy with the fewest adverse effects.

phenotype: apparent characters of a individual resulting from the **expression** of **genes**.

placental barrier: the semi-permeable membrane in the placenta that separates the mother's blood circulation from that of the fetus, and which acts as a filter, keeping out certain substances of high molecular weight, but letting through many others, in particular maternal antibodies and certain drugs.

polar: describes a **covalent** chemical bond in which the electrons between the atoms are not shared equally.

polarised: whose electric field vector describing an electro-magnetic vibration is situated in a defined plane.

post-genomic (approach)**:** that is supported by data from the **sequencing** of **genomes** for the purpose of producing and using **microarrays** (**biochips**), and analysing **transcriptomes**, **proteomes** and **metabolomes**.

precipitation: formation of a solid insoluble substance by the reaction between two liquids or two gases.

prevalence: number of existing cases of a disease (for example cancer) at a particular time in a given population. It depends on the **incidence** and duration of the disease.

protein: main macromolecular constituent of cells.

proteome: proteins expressed by the **genome** of a given species (a **gene** is said to "code" for a protein).

proteomics: the area of research and the methods that give direct access to the **proteome**. One aim of proteomics, based on the large-scale identification and quantification of **proteins**, is to draw up the inventory of those present in a given cell type at a particular time and in a particular environment. It also studies the distribution of proteins in different compartments or sub-structures of the cell, combining electrophoresis, **peptide** analysis by mass spectrometry, and the use of data bases.

radiation: see **Box F**.

radioactive (or **decay**) **chain** of an **element:** succession of different **elements** formed by spontaneous transformation over time of an unstable nucleus. This chain ends in a stable (non-radioactive) element.

radiocarcinoma: radio-induced cancer of **epithelial** cells.

radioelement: in the strict sense, an **element** of which all the **isotopes** are **radioactive**.

radioisotope: radioactive isotope of a chemical **element**.

radionuclide: radioactive isotope, sometimes also called **radioisotope**, of an **element**.

radioprotection: all the methods and means used to protect persons against ionising **radiation**.

radiotoxicity (**potential**) (in the sense of **radiotoxic inventory**)**:** product of the **activity** of a certain quantity of **radionuclides** and ingestion **dose factors**: it is therefore the **dose** received by a number of people who have **intaken** that quantity of matter.

radon: naturally-occurring **radioactive** element (Rn-220 and above all Rn-222) generated as a gas in rocks and building materials by the **decay** of uranium and radium in the earth's crust.

rare earths: see **lanthanides**.

receptor: protein molecule that interacts with a signal carried by specific molecules, which can be **endogenous** or **exogenous** (in particular drug ingredients), and can transcribe it into a message.

redox conditions: conditions of **reduction** (electron gain by an atom or ion) and **oxidation** (electron loss by an atom or ion).

redox potential: measure of the affinity of a chemical entity for electrons.

reducing agent: an entity that gives electrons to an atom or ion.

repression (of a gene)**:** action of a **protein** that bonds to a specific region of **DNA** to prevent the **transcription** of an adjoining **gene**.

RNA: see **nucleic acid**.

sarcoma: cancer of a conjunctive tissue or muscle cells.

scintigraphy: method of medical imaging that consists in administering to a patient a **radioactive isotope** of an **element** that is normally found in the body (for example iodine in the thyroid), which binds preferentially to the organ or tissue to be explored (in particular the lungs, bones and thyroid) and emits **radiation**, which when visualised provides information on the function of the organ or tissue.

sensitivity factor (or tissue **weighting factor**)**:** fraction of the total damage inflicted by irradiation of the body by different sorts of **radiation** that is incurred by a given organ, the highest value (0.2) being assigned to the gonads.

sequence: order in which the components of biological polymers (**DNA**, **RNA**, **proteins**) are linked together. **Sequencing** is the determination of this order.

sequestration: removal of ions from a solution by co-ordination with another type of ion or molecule to form **complexes** that do not have the same chemical behaviour as the original ions. A **sequestering agent** is a substance used to achieve this sequestration, often by **chelation**.

seric: of or pertaining to **serum**.

serum: clear liquid derived from blood after clotting.

sievert (Sv): unit used in **radioprotection** to determine, according to the case, the **dose** equivalent or effective **dose**.

soft tissues: extra-skeletal non-**epithelial** tissues other than glia (which groups several sorts of cells in the nervous system), **lymphoid** tissue, serous tissue and tissues supporting organs and viscera, which corresponds to common conjunctive tissue and its specialised varieties. Peripheral nerve sheaths are usually also included.

source term: in a mathematical model, expression of the nature, quantity and release kinetics of **radioactive** products in a nuclear plant, either in normal operating conditions, or after a real or hypothetical accident. It serves to evaluate the consequences of such a release into the environment.

speciation: the different physicochemical forms in which an **element** can be present in a particular medium.

stochastic (effects)**:** effects the occurrence of which depends on one or more random variables. The *probability* of their occurrence is proportional to **dose**.

surfactant: substance that modifies the surface tension of a liquid in which it is dissolved.

tellurium: metalloid of atomic number 52.

thrombosis: formation of clots (**thrombus**) in a blood vessel.

thyroid follicle: elementary component, spherical in shape, of the thyroid (a **follicle** is a structure made up of a clump of cells).

transcription: expression of **genes** initiated and controlled by **proteins** called **transcription factors**.

transcription factor: any **protein** involved in the initiation or control of the **expression** of the **genes**.

transcriptome: all the **genes expressed** (transcribed into **proteins**) from the **genome** in given conditions.

transfer factor: steady-state ratio of the concentrations of a **radionuclide** in two compartments of the **biosphere** or of an organism, for example between a plant (or part of a plant), and the surrounding soil, or between the digestive tract and the blood.

transfer routes: physicochemical, biochemical and biological routes by which the **radionuclides** present in the environment reach humans, in particular *via* the food chain.

transferrin: protein that carries iron in the blood, glycoprotein containing a poly**peptide** chain and two polysaccharide chains.

transgenic: describes a cell incorporating one or more foreign **genes**, or an organism whose cells contain such genes, and that can transmit them to its progeny.

transition metal: one of a family of **elements** situated between columns 2 and 13 of the periodic table. They include iron, manganese and platinum.

transuranics: those **elements** with atomic numbers greater than that of uranium. In a reactor, heavy elements derived from uranium by neutron capture or **radioactive decay** other than **fission**, and which form seven families of **isotopes**: uranium, neptunium, plutonium, americium, curium, berkelium and californium.

trivalent: see **valency**.

tubule: one of the main parts of the **nephron**, the elementary component of the kidney. A distinction is made between the **proximal tubule** and the **distal tubule**.

valency: the number of bonds that an atom can form. An atom is **monovalent** if it can form one bond, **divalent** if it can form two bonds, **trivalent** if it can form three bonds, etc.

weighting factor: see **sensitivity factor**.

whole-body: refers to the external measurement of the **activity** in the human body. The spectrum obtained makes it possible to identify over the whole body the **radionuclides** that are naturally present or that have been **intaken**.

wild (phenotype or line)**:** presenting no **mutation** in the **genes** considered.