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**T25:** the dose eliciting a 25% increase in the incidence of a specific tumour above the background level.

**TD50:** For any particular sex, strain, species and set of experimental conditions, the TD50 is the dose rate (in mg/kg body weight/day) that, if administered chronically for a standard period - the "standard lifespan" of the species - will halve the mortality-corrected estimate of the probability of remaining tumourless throughout the period

**TDI:** See 'Tolerable Daily Intake'.

**Teratogen:** A substance which, when administered to a pregnant woman or animal, can cause congenital malformations (structural defects) in the baby or offspring.

**Testicular Dysgenesis Syndrome (TDS):** The hypothesis that maldevelopment (dysgenesis) of the fetal testis results in hormonal or other malfunctions of the testicular somatic cells which in turn predispose a male to the disorders that comprise the TDS, i.e. congenital malformations (cryptorchidism and hypospadias) in babies and testis cancer and low sperm counts in young men.

**Threshold:** Dose or exposure concentration below which an effect is not expected.

**Threshold of toxicological concern (TTC):** a pragmatic, scientifically valid methodology to prioritise substances of unknown toxicity found in food for further evaluation. It is used when there are limited chemical-specific toxicity data and can be used for substances with or without structural alerts for genotoxicity and for cancer and non-cancer endpoints.

**Tolerable Daily Intake (TDI):** An estimate of the amount of contaminant, expressed on a body weight basis (e.g. mg/kg bodyweight), that can be ingested daily over a lifetime without appreciable health risk.

**Tolerable upper level (TUL):** The highest level of nutrient that is likely to pose no risk of adverse health effects for almost all individuals in the general

population. As intake increases above the TUL, the risk of adverse effects increases.

**Toxic Equivalency Factor (TEF):** A measure of relative toxicological potency of a chemical compared to a well characterised reference compound. TEFs can be used to sum the toxicological potency of a mixture of chemicals which are all members of the same chemical class, having common structural, toxicological and biochemical properties. TEF systems have been published for the chlorinated dibenzodioxins, dibenzofurans and dioxin-like polychlorinated biphenyls, and for polycyclic aromatic hydrocarbons.

**Total Toxic Equivalent (TEQ):** Is a method of comparing the total relative toxicological potency within a sample. It is calculated as the sum of the products of the concentration of each congener multiplied by the toxic equivalency factor (TEF).

**Toxicodynamics:** The process of interaction of chemical substances with target sites and the subsequent reactions leading to adverse effects.

**Toxicogenic:** producing or capable of producing toxins, e.g. a fungal strain.

**Toxicogenomics:** A new scientific subdiscipline that combines the emerging technologies of genomics and bioinformatics to identify and characterise mechanisms of action of known and suspected toxicants. Currently, the premier toxicogenomic tools are the DNA microarray and the DNA chip, which are used for the simultaneous monitoring of expression levels of hundreds to thousands of genes.

**Toxicokinetics:** The description of the fate of chemicals in the body, including a mathematical account of their absorption, distribution, metabolism and excretion. ([see pharmacokinetics](#))

**Transcription:** the process during which the information in a length of DNA (qv) is used to construct an mRNA (qv) molecule.

**Transcriptomics:** Techniques available to identify mRNA from actively transcribed genes.

**Transfer RNA (tRNA):** RNA molecules which bond with amino acids and transfer them to ribosome's, where protein synthesis is completed.

**Transfection:** A process by which the genetic material carried by an individual cell is altered by incorporation of exogenous DNA into its genome.

**Transgenic:** Genetically modified to contain genetic material from another species (see also genetically modified organism).

**Transgenic animal models:** Animals which have extra (exogenous) fragments of DNA incorporated into their genomes. This may include reporter genes to assess *in-vivo* effects such as mutagenicity in transgenic mice containing a recoverable bacterial gene (*lacZ* or *lac I*). Other transgenic animals may have alterations of specific genes believed to be involved in disease processes (e.g. cancer). For example strains of mice have been bred which carry an inactivated copy of the p53 tumour suppressor gene (*qv*), or an activated form of the *ras* oncogene which may enhance their susceptibility of the mice to certain types of carcinogenic chemicals.

**Translation:** In molecular biology, the process during which the information in mRNA molecules is used to construct proteins.

**Tumour (Synonym - neoplasm):** A mass of abnormal, disorganised cells, arising from pre-existing tissue, which are characterised by excessive and uncoordinated proliferation and by abnormal differentiation. **Benign** tumours show a close morphological resemblance to their tissue of origin; grow in a slow expansile fashion; and form circumscribed and (usually) encapsulated masses. They may stop growing and they may regress. Benign tumours do not infiltrate through local tissues and they do not metastasise (*qv*). They are rarely fatal. **Malignant tumours** (synonym - cancer) resemble their parent tissues less closely and are composed of increasingly abnormal cells in terms of their form and function. Well differentiated examples still retain recognisable features of their tissue of origin but these characteristics are progressively lost in moderately and poorly differentiated malignancies: undifferentiated or anaplastic tumours are composed of cells which resemble no known normal tissue. Most malignant tumours grow rapidly, spread progressively through adjacent tissues and metastasise to distant sites. Tumours are conventionally classified according to the anatomical site of the primary tumour and its microscopical appearance, rather than by cause. Some common examples of nomenclature are as follows:

- Tumours arising from epithelia (*qv*): benign - adenomas, papillomas; malignant - adenocarcinomas, papillary carcinomas.
- Tumours arising from connective tissues such as fat, cartilage or bone: benign - lipomas, chondromas, osteomas; malignant - fibrosarcomas, liposarcomas, chondrosarcomas, osteosarcomas.
- Tumours arising from lymphoid tissues are malignant and are called lymphomas (*qv*); they are often multifocal. Malignant proliferations of bone

marrow cells are called leukaemias.

*Benign tumours may evolve to the corresponding malignant tumours; examples involve the adenoma to carcinoma sequence in the large bowel in humans, and the papilloma to carcinoma sequence in mouse skin.*

**Tumour initiation:** A term originally used to describe and explain observations made in laboratory models of multistage carcinogenesis, principally involving repeated applications of chemicals to the skin of mice. Initiation, in such contexts, was the first step whereby small numbers of cells were irreversibly changed, or initiated. Subsequent, separate events (see tumour promotion) resulted in the development of tumours. It is now recognised that these early, irreversible heritable changes in initiated cells were due to genotoxic damage, usually in the form of somatic mutations and the initiators used in these experimental models can be regarded as genotoxic carcinogens (qv).

**Tumour microenvironment:** This is a complex system of many cell types, including cancer cells, fibroblasts, endothelial cells, leukocytes and antigen-presenting cells, together with connective tissue. The microenvironment is integral in determining the functionality, physiology and spread (metastasis) of cancer.

**Tumour promotion:** An increasingly confusing term, originally used, like 'tumour initiation' to describe events in multistage carcinogenesis in experimental animals. In that context, promotion is regarded as the protracted process whereby initiated cells undergo clonal expansion to form overt tumours. The mechanisms of clonal expansion are diverse, but include direct stimulation of cell proliferation, repeated cycles of cell damage and cell regeneration and release of cells from normal growth-controlling mechanisms. Initiating and promoting agents were originally regarded as separate categories, but the distinction between them is becoming increasingly hard to sustain. The various modes of promotion are non-genotoxic, but it is incorrect to conclude that 'non-genotoxic carcinogen' (qv) and 'promoter' are synonymous.