www.iehconsulting.co.uk
enquiries@iehconsulting.co.uk
07769 264410 | 07711 475532

Glossary of Toxicological Terms

A compendium of terms for the concepts and abbreviations/acronyms used in toxicological risk assessment.

Acceptable and Tolerable Risk	For threshold effects, a risk is usually considered acceptable if the ratio DNEL: exposure (the risk characterisation ratio) is less than 1. For non-threshold substances such as genotoxic carcinogens, risk levels ranging between 10^{-3} and 10^{-6} for workers and/or the general public may be considered 'tolerable'.
Adverse Effect	Any biochemical change, functional impairment or pathologic lesion which impairs performance and reduces the ability of an organism to respond to additional challenge. An adverse effect may have different degrees of severity and should be distinguished from adaptive (beneficial) effects and compensatory (neutral) effects.
As Low as Reasonably Achievable (ALARA)	An approach to reduce exposure to hazardous substances, notably, genotoxic carcinogens.
Benchmark Dose (BMD)	The dose at which a defined level of response occurs (by convention 5 or 10%, depending on the nature of the effect). It is an alternative to the use of a NOAEL/LOAEL as a POD.
Binding Occupational Exposure Limit Value (BOELV)	A binding occupational exposure limit value may be formally established by the EU Council and European Parliament in cases where an appropriate limit of exposure can be identified based on risk as well as socio-economic impact assessment. BOELVs primarily apply to non-threshold substances covered by the EC Carcinogens and Mutagens Directive (CMD). [*see also IOELV*]
Control of Substances Hazardous to Health (COSHH)	Regulations enacted in 2002 to protect workers in the UK from exposure to hazardous substances.
Critical Effect	The critical effect is the first adverse effect that occurs as the dose rate increases. It relates to the assumption that for some toxic responses, a threshold of effect exists, below which no adverse effects will occur. It is often the basis for non-genotoxic risk values as it assumes that if the critical effect is prevented then all subsequent adverse effects are prevented.
Derived Minimal Effect Level (DMEL)	The derived minimal effect level is similar in principle to a DNEL but is calculated differently and applied to substances with non-threshold effects, such as genotoxic carcinogens. A DMEL for workers may be taken as equivalent to an OEL.
Derived No-Effect Level (DNEL)	The derived no-effect level for threshold substances is calculated for REACH purposes according to ECHA guidance (Chapter R.8). This guidance gives various default values for the assessment factors that are to be applied, differentiating between workers and the general public and for different routes of exposure. An airborne DNEL for workers may be taken as equivalent to an OEL.
European Chemicals Agency (ECHA)	The Regulatory Body in Europe governing chemical regulation.

Exposure Assessment	The quantitative or semi-quantitative evaluation (from existing literature, from actual monitoring, via self-assessment or mathematically modelled using Monte Carlo probabilistic techniques) of the exposure of humans and/or the environment to risk sources from one or more media. Exposure assessment includes the direct exposure of workers and consumers and/or indirect exposure of the general public via the environment.
Good Laboratory Practice (GLP)	A quality system of management controls for research laboratories and organisations to ensure the uniformity, consistency, reliability, reproducibility, quality, and integrity of non-clinical chemical (including pharmaceuticals) safety tests and experiments.
Globally Harmonised System (GHS)	A globally recognised classification system for the classification of chemical hazards.
Hazard	The intrinsic harmful property of a substance – for a chemical this will be its inherent toxicity.
Hazard Identification	The process whereby a chemical is identified for its toxicity to humans, irrespective of the dose or mechanism. It is the initial step in the risk assessment process and usually uses *in vitro* or animal-based toxicology.
Hazard Characterisation	A step in the risk assessment process following hazard identification in which toxic effects are quantified in order to determine dose-response relationships. Other features of risk characterisation include the assessment of internal versus external dose, recognition of interspecies differences (since various test species may have been used to identify a hazardous chemical) and lastly, the characterisation of the underlying mechanism(s).
International Agency for Research on Cancer (IARC)	The International Agency for Research on Cancer is a specialised branch of the World Health Organisation (WHO) established in May 1965 by a resolution of the World Health Assembly; it assesses and classifies the carcinogenicity of substances .
Indicative Occupational Exposure Limit Value (IOELV)	This is a health-based limit conventionally established only for substances for which it is possible to establish a threshold or a no-effect level considered to be protective of health. [*see also BOELV*]
Lowest Concentration of Interest (LCI)	EU-LCI values are health-based reference concentrations of volatile organic compounds used to assess emissions after 28 days from a single product during a standardised laboratory test chamber procedure. They are applied within health-related evaluation schemes to assess health risks from inhalation exposure to indoor product emissions on the basis of life-long exposure.
Lowest Observed Adverse Effect Level (LOAEL)	The lowest-observed-adverse-effect-level is the lowest exposure level at which there are statistically or biologically significant increases in frequency or severity of adverse effects between the exposed population and its appropriate control group.
Lowest Observed Effect Level (LOEL)	The lowest-observed-effect-level is the lowest exposure level at which there are statistically or biologically significant increases in frequency or severity of effect between the exposed population and its appropriate control group.

Margin of Safety (MoS)	The relationship (ratio) between the POD value (e.g. NOAEL/ LOAEL) for the relevant effect(s) and the dose or concentration to which humans are exposed. Values below 100 (where the POD is based on animal data) are usually taken to indicate a need for a more comprehensive risk evaluation.
Minimal Risk Level (MRL)	Chronic MRL: An estimate of daily human exposure to a dose of a chemical that is likely to be without an appreciable risk of adverse noncancerous effects over a lifetime of exposure (based on studies of 365 or more days). Expressed in mg/kg/day. Used by ATSDR. Intermediate MRL: An estimate of the daily human exposure to a dose of a chemical that is likely to be without an appreciable risk of adverse noncancerous effects over less than a lifetime of exposure (based on studies of 15-364 days). Expressed in mg/kg/day. Used by ATSDR.
Mode of Action (MoA)	The toxicological mode of action of a substance helps establish whether a threshold or non-threshold approach should be used in setting the DNEL/DMEL and/or OEL.
No Observed Adverse Effect Level (NOAEL)	The-no-observed-adverse-effect-level is an exposure level at which there are no statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its appropriate control. In an experimental study with more than one NOAEL, the regulatory process focuses on the highest exposure without adverse effect.
No Observed Effect Level (NOEL)	The no-observed-effect-level is an exposure level at which there are no statistically or biologically significant increases in the frequency or severity of effects between the exposed population and its appropriate control.
Occupational Exposure Level (OEL)	OELs are used to provide standards or criteria against which measured exposure levels may be compared in order to ensure that, as far as the current state of knowledge permits, control is adequate to protect health, or for designing new plants and processes to ensure that they are engineered in such a way that exposures can be controlled at levels that will not damage health. For non-threshold substances a so-called 'risk-based' OEL is set.
Permissible Exposure Limit (PELs)	A permissible exposure limit (PEL or OSHA PEL) is a United States legal limit for exposure of an employee to a chemical substance or physical agent. Permissible exposure limits are established by the US Occupational Safety and Health Administration (OSHA).
Point of Departure (POD)	The critical dose level, usually a NOAEL or LOAEL, derived from the key (most relevant/authoritative) study in a toxicological risk assessment.
P-value	The probability (ranging from 0 to 1) that the result in a study could have occurred by chance.
The Precautionary Principle (PP)	Reflecting the idea that society should seek to avoid environmental damage or other adverse impacts by careful forward planning and preventing potentially harmful activities or actions.
Qualitative data	Measures of non-numerical, descriptive forms of data.
Quantitative data	Measures of quantities or counts of data that are numerical in form.

Quantitative Structure Activity Relationships (QSARs)	Where a chemical structure can be used to predict its physicochemical properties and reactivities, leading to an understanding of potential toxicity.
Registration, Evaluation, Authorisation & restriction of Chemicals (REACH)	The principal Regulation pertaining to the safe manufacture and use of chemicals (and certain other substances) in the European Union.
Read-Across	The process whereby the structural elements of the chemical being assessed are compared with those of another chemical having a similar structure and an established hazard profile, providing insight into the toxic potential of the new (unassessed) chemical.
Recommended Exposure Levels (RELs)	A Recommended Exposure Limit is an occupational exposure limit recommended by US NIOSH to OSHA as a new PEL (see Permissible Exposure Limit). It is a level that NIOSH believes would be protective of workplace safety and employee health over a working lifetime.
Reference Dose (RfD)	An estimate of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. RfDs are based on non-carcinogenic effects and are usually calculated by applying uncertainty factors to a NOAEL or LOAEL. Expressed as mg/kg/day.
Reference Concentration (RfC)	An estimate of a continuous inhalation exposure to the human population that is likely to be without an appreciable risk of deleterious non-cancerous effects during a lifetime. RfCs are usually calculated by applying uncertainty factors to a NOAEL or LOAEL. Expressed in units of mg/m^3.
Risk Characterisation	A process of evaluation including the identification of the attendant uncertainties, of the likelihood and severity of adverse effect(s) occurring to humans or the environment following exposure under defined conditions to a risk source(s). This final step in the risk assessment process uses the information identified from the hazard identification and characterisation and exposure assessments that are integral parts of the risk assessment process.
Risk	A function of the nature of the hazard posed by any agent and the degree of exposure. The degree of risk is determined by the potency of the hazard and the extent of exposure. In quantitative terms, risk is expressed in values from zero (representing the probability that harm will not occur) to one (the probability that harm will occur).
Risk Management Measures (RMM)	Measures that are implemented to ensure safe use of a chemical or mixture.
Scientific Committee on Occupational Exposure Levels (SCOEL)	The Scientific Committee on Occupational Exposure Levels, set up in 1995 by the European Commission to evaluate the potential health effects of occupational exposure to chemicals.
Threshold of Effect (ToE)	This term refers to the concept that there is a threshold above which adverse effects may occur from a toxicological agent.

Tolerable Concentration (TC)	The Tolerable Concentration (or Tolerable Concentration in Air), generally expressed in mg/m^3, is an airborne concentration to which it is believed that a person can be exposed continuously over a lifetime without deleterious effect. The TCs (or TCAs) are based on non-carcinogenic effects and are usually calculated by applying uncertainty factors to a NOAEL or LOAEL. Absolute values of maximum intakes per day for various age groups can be developed by multiplying the TC (or TCA) by the average ventilation rate and dividing by the average body weight of the age group under consideration. It should be noted, however, that exceedance of such a calculated intake by a particular age group for a small proportion of the lifespan does not necessarily imply that exposure constitutes an undue risk to health. Used by Health Canada and RIVM.
Tolerable Daily Intake (TDI) and Acceptable Daily Intake (ADI)	Tolerable Daily Intake refers to the daily amount of a chemical that has been assessed as safe for human beings on a long-term basis (usually whole lifetime). Acceptable daily intake (ADI) was introduced in 1961 to define the daily intake of a food additive which, during the entire lifetime, appears to be without appreciable risk.
Toxicodynamic(s) (TD)	Toxicodynamics (termed pharmacodynamics in pharmacology) describes the dynamic interactions of a toxicant with a biological target and its biological effects. It indicates how toxicants can cause tissue damage, and under what conditions, in terms of tissue concentrations and time of tissue exposure/dose, adverse effects may occur.
Toxicokinetic(s) (TK)	Toxicokinetics (termed pharmacokinetics in pharmacology) is the description of the time course of disposition (absorption, distribution, metabolism/biotransformation, and excretion: ADME) of xenobiotics in the whole organism.
Uncertainty Factors (UFs)/Assessment Factors (AFs)	The risk assessment process uses default 'uncertainty' (UFs) or 'assessment' factors (AFs), which account for uncertainties in the data used to derive reference doses. Most notable are those that are applied to various extrapolation assumptions that need to be made, for example in using animal data to predict human risk or to allow for inter-individuality in humans (extrapolation from an 'average human' to the 'most sensitive human').
Weight of Evidence (WoE)	Weight of evidence is an approach involving the assessment of the strengths, weaknesses and relative weights of different pieces of information. It requires expert judgement and is influenced by a variety of factors, including data quality and consistency, nature and severity of effects, and relevance. Reliability, relevance and adequacy for purpose must always be considered in the WoE approach.
Workplace Exposure Limits (WELs)	Under the UK COSHH regulations, Workplace Exposure Limits, which must not be exceeded, have been assigned to a large number of hazardous substances, including chemicals, fumes, dusts and fibres.