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Standard Terminology Relating to Biological Effects and Environmental Fate[1]

This standard is issued under the fixed designation E943; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This terminology document defines terms commonly used in standards developed by ASTM Subcommittee E50.47 on Biological Effects and Environmental Fate. This terminology document is intended to be consistent with the use of terms in ASTM standards related to this field and, to the extent possible, with use by other organizations.

1.1.1 If a specific Subcommittee E50.47 standard uses one of these terms in a different context, then the term should be defined in that standard. A term used only in a specific ASTM standard need not be included in this terminology document.

1.2 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Terminology

2.1 *Definitions:*

acute test, *n*—a comparative study in which organisms, that are subjected to different treatments, are observed for a single relatively short period usually less than a 24-hours.

DISCUSSION—Definitions of acute, sub-acute, sub-chronic and chronic test durations vary and are typically defined relative to the life span of the test organism.

DISCUSSION—Acute tests often utilize mortality as the primary effect metric; other test durations involve repetitive daily exposures and include sublethal endpoints such as growth or reproduction.

attraction, *n*—a response towards or to facilitate contact with a material or condition.

avoidance, *n*—a response away from or to limit contact with a material or condition.

BAF (bioaccumulation factor), *n*—the quotient obtained by dividing the concentration of a substance in an organism (or specified tissue) by its concentration in a specified exposure medium, for example, air, food, sediment, soil, water, when several media are possible sources (see **bioaccumalation**).

behavior, *n*—observable, recordable, or measurable actions or activity of an organism.

DISCUSSION—This definition conveys the idea of motion whether motility is involved or not, and excludes physiological responses, death, and so forth, from the concept. It avoids the issue of internal versus external stimuli.

bioaccumulation, *n*—the net accumulation of a substance by an organism as a result of uptake from all environmental sources.

bioassay, *n*—an experiment that uses living whole organisms, tissues or cells to measure the presence, the concentration, or the relative potency of one or more chemicals.

DISCUSSION—A bioassay must include the appropriate controls(s). There is no intended stipulation of endpoint for such a test; the response may be positive of negative. This term defines a subset of the protocols (methods) referred by the term "biological assay." [2]

bioconcentration, *n*—the net accumulation of a substance by an aquatic organism as a result of uptake directly from aqueous solution.

biomagnification, *n*—the increased accumulation and concentration of a chemical in tissues so that organisms in higher trophic levels have greater concentrations of the chemical than those in lower trophic levels.

DISCUSSION—Chemicals that are not eliminated or broken down will accumulate from producer or detritivore to consumer and from prey to predator, primarily through the mechanism of dietary accumulation.

biomarker, *n*—a biological measure (within organisms) of exposure to, effects of, or susceptibility to, environmental stress using molecular, genetic, biochemical, histological, or physiological techniques.

biomarker assay, *n*—an experiment that uses a molecular, genetic, biochemical, histological, anatomical, or physiological technique to assess exposure, response, or susceptibility of an organisms tissue or cells to environmental stress.

[1] This terminology is under the jurisdiction of ASTM Committee E50 on Environmental Assessment, Risk Management and Corrective Action and is the direct responsibility of Subcommittee E50.47 on Biological Effects and Environmental Fate.

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[2] Finney, D.J. 1947. The Principles of Biological Assay. *Supplement to the Journal of the Royal Statistical Society*. 9(1):46-91 https://doi.org/10.2307/2983571.

chronic test, *n*—a comparative study in which organisms are exposed for a relatively long period typically exceeding 10 % of their life span.

DISCUSSION—see **acute test** discussion.

control sediment, *n*—a sediment that is essentially free of contaminants and is used routinely to assess the acceptability of a test.

depuration, *n*—loss of a substance from an organism as a result of any active or passive process.

dietary accumulation, *n*—the net accumulation of a substance by an organism as a result of ingestion in the diet.

dilution water, *n*—non-toxic aqueous exposure media (that is, water) used to reduce the concentration of a test substance in aquatic toxicity tests and is used as the control water.

EC50, *n*—a statistically or graphically estimated concentration that is expected to cause one or more specified effects in 50 % of a group of organisms under specified conditions.

ED50, *n*—a statistically or graphically estimated dose that is expected to cause one or more specified effects in 50 % of a group of organisms under specified conditions.

exposure, *n*—contact with a chemical or physical agent.

fate, environmental, *n*—the form and location of a material resulting from transport and transformation.

hazard, *n*—the adverse effect(s) that may result from exposure(s).

hydric soil, *n*—soil that is formed under conditions of saturation, flooding, or ponding long enough to develop anaerobic conditions in the upper part, thereby influencing the growth, survival, and reproduction of plants, microorganisms, and invertebrates.

IC50, *n*—a statistically or graphically estimated concentration of test material that, under specified conditions, is expected to cause a 50 % inhibition of a biological process (such as growth or reproduction) for which the data are not dichotomous.

indigenous species, *n*—a species that is likely, due to historical presence, to occur at a specified site for some portion of its life span.

DISCUSSION—This definition is intended to remove the requirement that the species occur presently at a site. This definition excludes species that have been introduced either intentionally or unintentionally by man whether recently or in the remote past. The terms "indigenous" and "native" are synonymous in this context.

interstitial water, *n*—water occupying space between sediment or soil particles (syn. **pore water**).

key species, *n*—a species of special concern for ecological reasons, also known as keystone species.

LC50, *n*—a statistically or graphically estimated concentration that is expected to be lethal to 50 % of a group of organisms under specified conditions.

LD50, *n*—a statistically or graphically estimated oral dose that is expected to be lethal to 50 % of a group of organisms under specified conditions.

life-cycle test, *n*—a comparative study in which organisms, that are subjected to different treatments, are observed at least from a life stage in one generation to the same life stage in the next generation.

lowest-observed-effect concentration (LOEC), *n*—in a toxicity test, the tested concentration of one or more chemicals immediately above the highest tested concentration that did not result in a statistically significant change in the particular toxicological variable compared to that value in the control (s).

DISCUSSION—Within a concentration-effect curve at concentrations near the NOEC and LOEC, the following situation can occur: one concentration might induce an effect that is significantly greater than the control or background, while the next higher concentration induces an effect that is not significantly greater than control or background, and all the higher concentrations induce effects that are significantly greater than control or background. In this region of uncertainty, the concentration inducing a significant effect may be inverted one or more times. In order to avoid a situation where the LOEC is less than the NOEC, the NOEC is defined as the concentration immediately below the region of uncertainty, and the LOEC is defined as the concentration immediately above this region. If the region of uncertainty is large, the investigator may not choose to define a NOEC or LOEC.

no-observed-effect concentration (NOEC), *n*— in a toxicity test, the tested concentration of one or more chemicals immediately below the lowest tested concentration that resulted in a statistically significant change in a particular toxicological variable compared to that value in the control (s).

DISCUSSION—Within a concentration-effect curve at concentrations near the NOEC and LOEC, the following situation can occur: one concentration might induce an effect that is significantly greater than the control or background, while the next higher concentration induces an effect that is not significantly greater than control or background, and all the higher concentrations induce effects that are significantly greater than control or background. In this region of uncertainty, the concentration inducing a significant effect may be inverted one or more times. In order to avoid a situation where the LOEC is less than the NOEC, the NOEC is defined as the concentration immediately below the region of uncertainty, and the LOEC is defined as the concentration immediately above this region. If the region of uncertainty is large, the investigator may not choose to define a NOEC or LOEC.

pore water, *n*—water occupying space between sediment or soil particles (syn. **interstitial water**).

reconstituted water, *n*—a dilution water that is prepared by adding sea salt or appropriate amounts of reagent-grade salts and other selected chemicals to water, which is usually prepared using deionization, distillation, or reverse osmosis, so that the concentrations and ratios of the major ions in the dilution water are similar to those in comparable natural surface waters.

reference sediment, *n*—a whole sediment near an area of concern used to assess sediment conditions exclusive of material(s) of interest.

renewal, *n*—e periodic replacement of exposure medium at an interval described by the test method.