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Retrieval and scientific interpretation of ecotoxicological information

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Analytical Detection Limits and Human Health Risks

Human health risk assessment involves the assessment of potential exposure on the basis of environmental concentrations of chemical substances. Analytical results reported as *below detection limits* may present problems in this regard. The term *minimum detection limit* is used rather loosely in the analytical profession, but it should refer to the smallest amount of a substance that can be quantified at a specified level of confidence. If an instrument signal is not observed, the concentration is not reported as *zero*, but as *below the limit of detection* (a "non-detect"). There is a concentration range at the lower end of the analytical capability of the detection system in which it may be confirmed that the substance is present, but the concentration may be too low to quantify at any level of confidence. Such cases are reported as below the method detection limit, but the preferred term to use is *below the limit of quantification* (QL). If evidence of the compound is not observed, it is fair to report it as *not detected*. However, the possibility remains that the compound may be present at a concentration lower than the detection limit.

In risk assessment it is not permitted to use a zero concentration if a substance that is of interest in a particular scenario has not been detected, or if the concentration was reported as below the QL. These non-detected data points are assessed according to different conventions. The substitute values used most often are QL, QL/2, and $(QL/2)^{½}$. Different regulatory bodies may prefer different values, but QL/2 has been recommended as the preferred approach, especially if several non-detects are observed.

The principal problem arises when methods with relatively high detection limits are used to analyse substances that are toxic at low concentrations. In such cases the QL/2 value may be of sufficient magnitude to indicate a potential health risk, while the possibility that the substance is not present at all cannot be ruled out. In such cases the utility of the health risk assessment for informed decisions on further actions is limited because of the associated high level of uncertainty and low level of confidence in the assessment results.

This problem may be avoided by involvement of the health risk assessment specialist in the planning phase of a project. For this reason, INFOTOX follows international guidance and prepares Data Quality Objectives for sampling and analysis activities, adding considerable value to the analytical and risk assessment phases.