

OEL FOR THRESHOLD DOSE-RESPONSE SUBSTANCES

Where a substance is thought to exhibit a threshold in its dose-response curve, it becomes possible to derive an occupational exposure limit (OEL) that can protect most workers from adverse health effects without the need to reduce exposures to as low a level as reasonably practicable (ALARP). Simply controlling exposure to below this limit may be fully protective.

To derive an OEL for a substance that is believed to exhibit threshold toxicity mechanism, a number of animal toxicity data is pulled together to plot an exact dose-response curve that is often of a sigmoid pattern. A study with the Lowest Observed Effect Level (LOEL) or a No Observable Effect Level (NOEL) is typically selected as a Point of Departure (POD).

To extrapolate the dose-response curve derived from the animal toxicity data, an uncertainty factor (UF) for inter-species variability is applied (usually a 10-fold). Following the application of this UF, the dose-response curve is shifted to the left (response at a lower concentration) that provides some degree of conservatism.

Within the human population, there will be a range of sensitivities, reflected by a distribution of PODs (Gaussian curve). The factor for inter-individual sensitivity is used to determine the POD in a sensitive subject, which will lie towards the far left of the distribution curve. This POD has been termed a reference value (RV).

A number of additional UFs can be applied to this RV depending on the quality and completeness of original toxicological data. If this is required, the reference value is multiplied by additional UFs, and the resultant number becomes an OEL.

Source: Application of Key Events Analysis to Chemical Carcinogens and Noncarcinogens (Boobis et al. 2009)

OEL SETTING FOR THRESHOLD DOSE-RESPONSE SUBSTANCES

