

How Hormesis Impacts Practice of Ecological Risk Assessment and Food Safety Assessment

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Abstract : Guidelines of ecological risk assessment (ERA) and food safety assessment (FSA) used nowadays, based on an S-shaped threshold dose-response curve (SDR), fail to consider hormesis, a reproducible biphasic dose-response model represented as a J-shaped or an inverted U-shaped curve, that occurs in the real-life environment across multitudinous compounds on cells, organisms, populations, and even the ecosystem. Specifically, in SDR-based ERA and FSA practice, predicted no effect concentration (PNEC) is calculated separately for individual substances from no observed effect concentration (NOEC, usually equivalent to 10% effect concentration (EC10) of a contaminant or food condiment) over an assessment coefficient that is bigger than 1. Experienced researchers doubted that hormesis in the real-life environment might lead to a waste of limited human and material resources in ERA and FSA practice, but related data are scarce. In this study, hormetic effects on bioluminescence of *Aliivibrio fischeri* (A. f) induced by sulfachloropyridazine (SCP) under 40 conditions to simulate the real-life scenario were investigated, and hormetic effects on growth of human MCF-7 cells caused by brown sugar and mascavado sugar were found likewise. After comparison of related parameters, it has for the first time been proved that there is a 50% probability for safe concentration (SC) of contaminants and food condiments to fall within the hormetic-stimulatory range (HSR) or left to HSR, revealing the unreliability of traditional parameters in standardized (eco)toxicological studies, and supporting qualitatively and quantitatively the over-strictness of ERA and FSA resulted from misuse of SDR. This study provides a novel perspective for ERA and FSA practitioners that hormesis should dominate and conditions where SDR works should only be singled out on a specific basis.

Keywords : dose-response relationship, food safety, ecological risk assessment, hormesis

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