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When Sciences Fails Society: Toxicology's 20th Century Legacy

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This presentation provides an assessment of hormesis, a dose-response concept that is characterized by a low-dose stimulation and a high-dose inhibition. It will trace the historical foundations of hormesis, its quantitative features and mechanistic foundations, and its risk assessment implications. It will be argued that the hormetic dose response is the most fundamental dose response, significantly outcompeting other leading dose-response models in large-scale, head-to-head evaluations used by regulatory agencies such as the EPA and FDA. The hormetic dose response is highly generalizable, being independent of biological model, endpoint measured, chemical class, physical agent (e.g., radiation) and inter-individual variability. Hormesis also provides a framework for the study and assessment of chemical mixtures, incorporating the concept of additivity and synergism. Because the hormetic biphasic dose response represents a general pattern of biological responsiveness, it is expected that it will become progressively more significant within toxicological evaluation and chemical and radiation risk assessment practices as well as having numerous biomedical applications. Particular application will be directed towards how hormesis may affect the risk assessment process for chemicals and ionizing radiation.