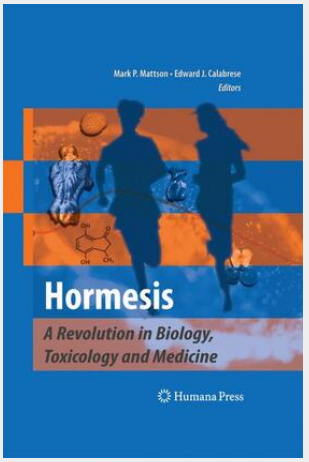
Calabrese / Mattson

Hormesis

A Revolution in Biology, Toxicology and Medicine



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The term hormesis is de?ned as “a process in which exposure to a low dose of a chemical agent or environmental factor that is damaging at higher doses induces an adaptive bene?cial effect on the cell or organism” (Calabrese et al., 2007; Mattson, 2008). To survive and reproduce in harsh competitive environments, organisms and their cellular components have, through evolution, developed molecular mec- nisms to respond adaptively to various hazards or “stressors” that they encounter. Examples of such stressors include chemicals ingested in food and water (metals, phytochemicals, etc.), increased energy expenditure (running, ?ghting, cognitive challenges, etc.), and reduced energy availability (food scarcity), among others. In most cases, the response of the cell or organism to the stressor exhibits a biphasic dose response, with bene? cial/adaptive responses at low doses (improved fu- tion, increased resistance to damage and disease) and adverse/destructive effects (dysfunction, molecular damage, or even death) at high doses. The prevalence of the biphasic (hormetic) dose response characteristic of biological systems merits consideration of hormesis as a fundamental principle of biology.

Hormesis is defined as any circumstance in which exposure of a cell or organism to a low dose of a substance or condition results in an adaptive stimulatory/beneficial outcome, while exposure to a high dose results in an inhibitory / detrimental outcome. When plotted on a graph the shape of the dose response curve is biphasic, the hallmark of hormesis. This groundbreaking book "Hormesis: A Revolution in Biology, Toxicology and Medicine" describes why and how hormesis is a fundamental feature of all living systems and is based on the evolutionary principle of selection for genetic traits that confer the ability to respond adaptively to adverse environmental conditions. Using numerous specific examples the authors explain why knowledge of hormesis is important for our health, our environment, and the future of our planet. Several chapters of the book describe emerging research findings that elucidate the molecular and cellular underpinnings of the biphasic dose response/hormesis. The implications of the tapping of cellular systems that underlie hormesis for the discovery and optimization of new drugs and dietary formulations are described. From environmental protection policy to medical practice, it is critical that leaders recognize and understand hormesis, and incorporate it into their decision making process. The authors propose that the prevention of major diseases, including diabetes, obesity and cardiovascular disease can be achieved using hormetic approaches. Scientists, physicians, environmental gurus and anyone interested in the science underlying biology and medicine will benefit from reading this book. Features - Groundbreaking coverage of an oft experienced, but poorly understood phenomenon that affects all forms of life on earth. - Explains why the principle of hormesis is important to our health, our environment, and the future of our planet. - Provides specific examples of biphasicdose responses and their importance for the fields of biology, medicine and environmental safety. - Discusses how knowledge of hormesis is being applied to research aimed understanding the organization and function of biological systems. - Illustrates how disorders such as diabetes, obesity and cardiovascular disease result from the lack of exposure to beneficial environmental stresses. - Considers the implications of the cellular systems that underlie hormesis for the discovery and optimization of new drugs and dietary formulations.

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