



The linear no-threshold model is less realistic than threshold or hormesis-based models: An evolutionary perspective

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Highlights

- The LNT model is biologically unrealistic compared to threshold and hormetic models.
- If LNT were correct, the evolution of life on Earth would not have been possible.
- We propose simulation models to explore the evolutionary implications of hormesis.

Abstract

The linear no-threshold (LNT) risk model is the current human health risk assessment paradigm. This model states that adverse stochastic biological responses to high levels of a stressor can be used to estimate the response to low or moderate levels of that stressor. In recent years the validity of the LNT risk model has increasingly been questioned because of the recurring observation that an organism's response to high stressor doses differs from that to low doses. This raises important questions about the biological and evolutionary validity of the LNT model. In this review we reiterate that the LNT model as applied to stochastic biological effects of low and moderate stressor levels has less biological validity than threshold or, particularly, hormetic models. In so doing, we rely heavily on literature from disciplines like ecophysiology or evolutionary ecology showing how exposure to moderate amounts of stress can have severe impacts on phenotype and organism reproductive fitness. We present a mathematical model that illustrates and explores the hypothetical conditions that make a particular kind of hormesis (conditioning hormesis) ecologically and evolutionarily plausible.

Keywords

