

## Is there a 4<sup>th</sup> curve??

### Hormesis

a term coined to describe the behavior of an agent that is lethal at high doses but beneficial at low doses.

(e.g., nickel, chromium, hormones, ultraviolet light)

The radiation effects paradigm:

- Radiation exposure is harmful.
- Radiation exposure is harmful at all doses.
- There are no effects at low doses that cannot be predicted from the effects at high-dose levels.

BUT... the validity of this paradigm has been questioned by the following observations:

- There is a reduced risk of cancer in parts of India where there is an increased natural background radiation.
- Studies on people living in Guangdong Province, China, where the background radiation levels are three times that in the neighboring areas, did not demonstrate any significant differences between the high and low background populations.
- Epidemiological evidence in the USA shows cancer mortality rates that are lower, on average, in high natural background radiation areas.
- Genetic studies on survivors of the atomic bombings failed to produce any significant findings.
- Hormesis has been demonstrated in many plant and animal systems, raising the possibility that low doses of ionizing radiation may not be harmful, and may even have net benefits.

Possible mechanisms

- Immune response?
- Overcorrection?
- DNA repair?

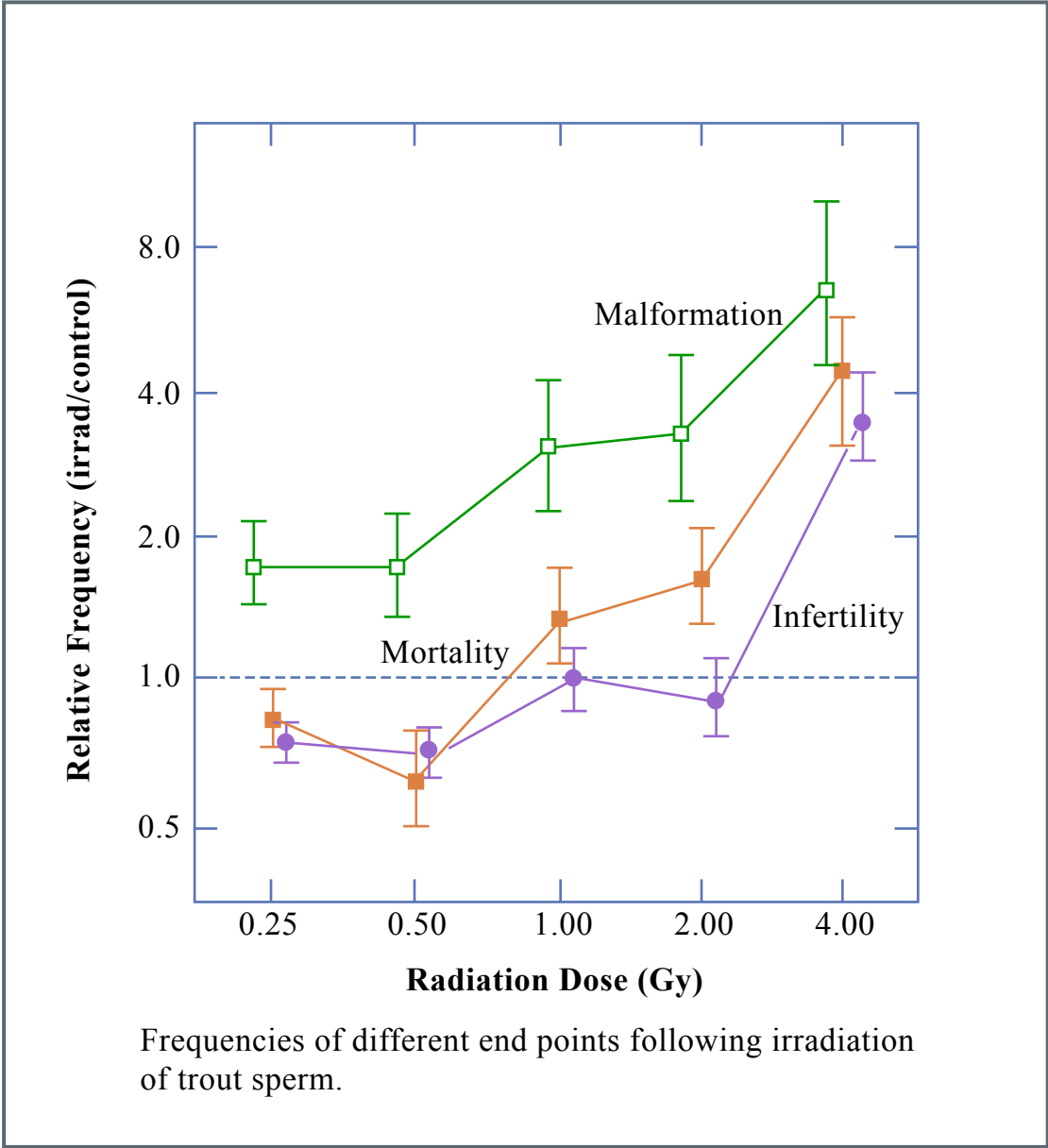


Figure by MIT OCW.

Image removed due to copyright restrictions.

See Sagan, Leonard A. "What is Hormesis and Why Haven't We Heard About It Before?" *Health Physics* 52 (1987): 521.

Image removed due to copyright restrictions.

See Luckey T. D. "Physiological Benefits from Low Levels of Ionizing Radiation." *Health Physics* 43 (1982): 771.

Image removed due to copyright restrictions.

See Planel, H., J. P. Soleilhavoup, R. Tixador, G. Richoilley, A. Conter, F. Croute, C. Caratero and Y Gaubin. "Influence on Cell Proliferation of Background Radiation or Exposure to Very Low, Chronic  $\gamma$  Radiation." *Health Physics* 52 (1987): 571.

## **Attitude of the General Public Towards "Risk"**

Image removed due to copyright restrictions.

Refer to Sandman, Peter. *Explaining Environmental Risk: "Important If True."* Originally published by EPA's Office of Toxic Substances, Nov. 1986. [updated 10 Nov 2001, cited 29 March 2004]. <http://www.psandman.com/articles/explain1.htm>