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Lauding low doses



LAWRENCE SOLOMON | June 4, 2010 7:03 PM ET
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A revolutionary field called hormesis shows that dangerous substances can be beneficial at low levels

To the greatest extent possible, remove all carcinogens from our air, food, and drinking water. Because there is no safe dose of radiation, avoid medical X-rays and CT scans whenever you have a practical alternative. Cut back on energy consumption where practical to reduce harmful emissions from smokestacks and tailpipes.

These simple strictures for leading a good and responsible life in a good and responsible society are too obvious to mention. Except that they are wrong — even dangerously so — according to a fast-growing branch of science called hormesis.

The conventional wisdom on health and the environment is not only ruinously expensive, hormesis exponents say, it is also killing us.

Hormesis, a term coined only 70 years ago, refers to the different properties that chemicals and other substances have at high and low doses. Take radiation, a known killer at very high doses. The more you reduce the dose of radiation to which people are exposed, the fewer the number of deaths that will result. But at a certain point of exposure, the relationship changes, hormesis proponents state. At low doses — what you might get at your dentist's office, for example — radiation becomes therapeutic, promoting health rather than risking it.

Likewise with DDT, a pesticide that research shows to be a known carcinogen in



The dose makes the poison, toxicology pioneer Paracelsus noted.

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rodents. The higher the dose, the more liver cancers that DDT inflicts on rats, leading authorities such as the Environmental Protection Agency to ban its use. But at low doses, the same research shows that DDT protects rats from liver cancer.

Hormesis: A Revolution in Biology, Toxicology and Medicine, a new book edited by two leading exponents of hormesis, turns conventional science on its head with these and other examples that will doubtless rile the environmental and medical establishments. But the editors, who also authored several of the scholarly papers in this book, cannot be easily dismissed.

Mark Mattson is chief of the Laboratory of Neurosciences at the National Institute on Aging and a professor in the Department of Neuroscience at Johns Hopkins University School of Medicine. With 450-plus original research articles, numerous review articles, and 10 books to his credit, he is the most highly cited neuroscientist in the world. Co-editor Edward Calabrese is a professor and program director of Environmental Health Science at the University of Massachusetts, the author of 300-plus papers and 24 books in the field of toxicology and environmental pollution, and the winner of the prestigious Marie Curie Prize. Other hormesis proponents have equally impressive credentials.

If you haven't heard of hormesis, you aren't alone. Hormesis, a subject I've been tracking over the last year, is almost never mentioned in the mainstream media. Nor are laymen alone in their ignorance of this field. Many medical practitioners and environmental professionals, working in their own professional silos, remain unaware of hormesis, despite an exponential growth in the number of peer-reviewed papers that refer to hormesis in recent years and despite the acceptability of books like *Hormesis* to prestigious academic publishers. A search of Google Scholar shows 4,000 references to hormesis in the last five years, twice as many as in the previous five years, and four times as many as in the five-year period before that.



the only way to avoid looking weak.' Name one person who thinks that.

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In many ways, the principle of hormesis may seem much more radical today than it would have in the past. “All things are poison and nothing is without poison, only the dose permits something not to be poisonous,” stated Paracelsus, the 16th-century Swiss physician and father of pharmacology and toxicology. Paracelsus recognized that the dose determined whether a chemical was therapeutic or toxic and for hundreds of years his outlook held sway, and understandably so. Hormetic relationships, in fact, have always been ubiquitous, even if they weren’t named as such. We have long known that iron is toxic at high doses, but needed in low doses for the proper functioning of the body. Likewise many other minerals and vitamins, and radiation as well, were seen as desirable at the right doses.

Then about 100 years ago, the notion that what harms us in large doses could help us in small doses got sidetracked, largely because the science in the area became politicized in a war between competing medical camps. The hormesis relationship effectively became outlawed from the scientific literature, to be replaced by a simple linear model that shows a substance that is toxic at a high dose remains toxic, only less so, at low doses. Over the years, as technology has gotten better and better at removing substances from the environment, regulation has followed. In some cases, the permitted emissions are measured in parts per billion, at great financial cost to society and, says the hormesis school, often at great cost to public health.

Ironically, the technological improvements that allow us to remove trace minerals from the environment haven’t been matched by advances in science that can demonstrate any benefit from doing so. As the hormesis authors explain, much of the establishment’s toxicity science is based on faith and necessarily so, because there is often no statistically valid way to determine harm from low doses of substances that are harmful at high levels.

What exactly is at stake in the science over hormesis, aside from the financial costs of

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needless regulation? Hormesis is not some side issue but a fundamental biological process, a consequence of evolution that applies to all organisms on Earth. Without understanding this basic science, we are barking up the wrong tree in attempts to cure or treat cancers, Alzheimer's and other age-related ailments, and diseases of all manner. At the same time, we are mis-prescribing drugs of all kinds, not realizing that at low doses drugs can act in the opposite way intended. Lastly, because environmental agencies demand that the environment be cleansed of certain substances without understanding the broad harm of their policies to the general public health, people are needlessly being sickened and killed.

Financial Post

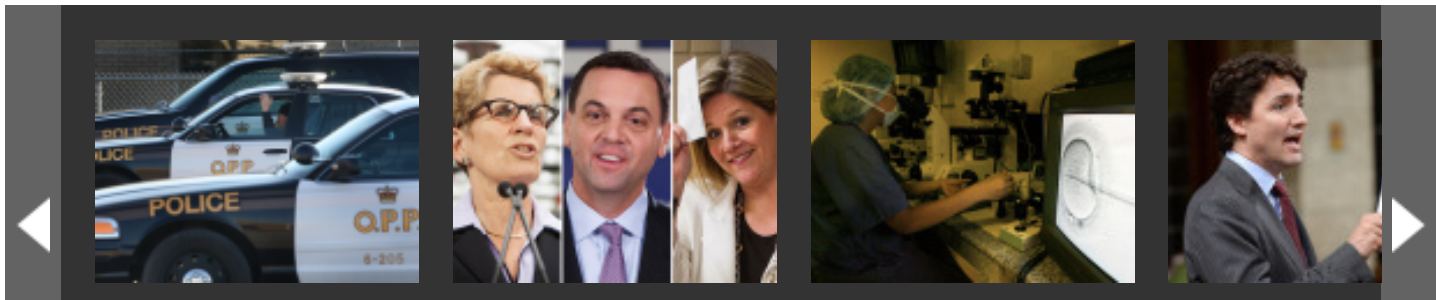
*Lawrence Solomon is executive director of [Energy Probe](#) and its [hormesis library](#), and the author of *The Deniers*. This is the first in a series.*

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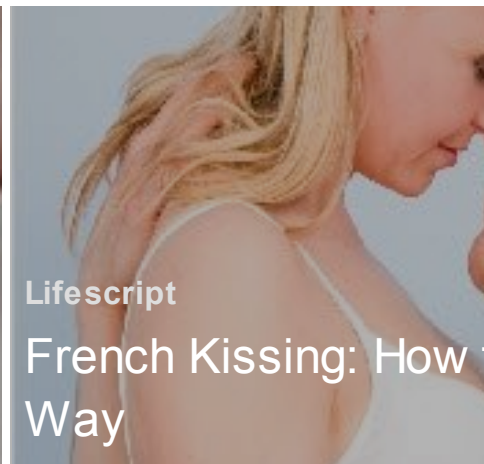
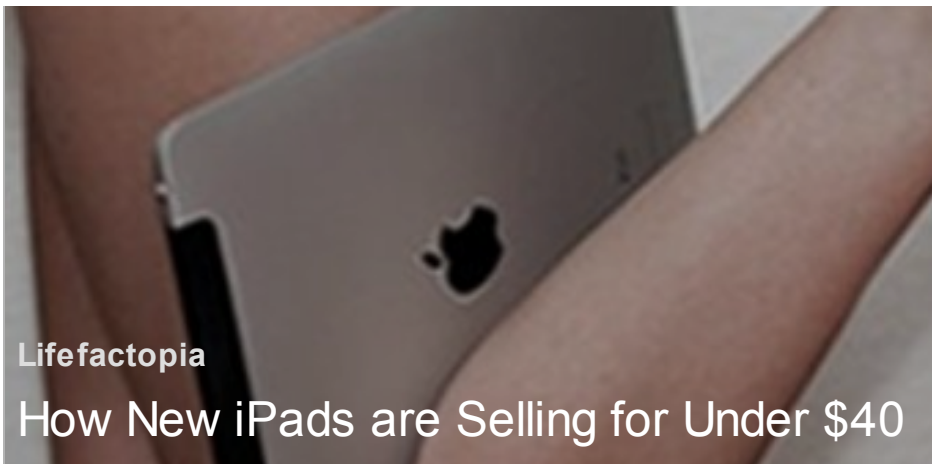
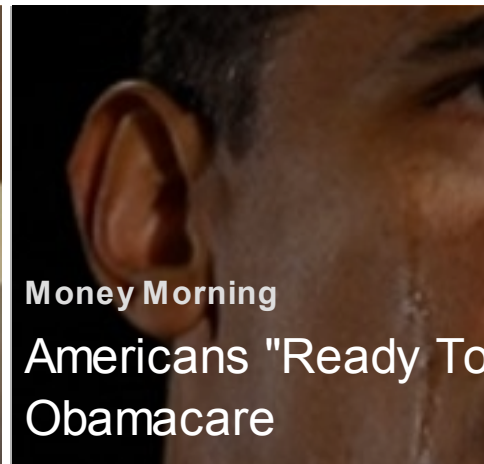
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