

Concept of Thresholds for Toxic Effects

Pollutants? We're Soaking in Them

An article was published in the *USA Today* on March 22, 2001 running the title listed above. The article summarized data released by the federal government describing the results of tests recently made on U. S. citizens. Both environmentalists and public health advocates described the results as alarming. Tests revealed that most of the 3,800 people tested in 12 U. S. regions contained measurable levels of 27 environmental chemicals in their blood and urine. These chemicals included lead, mercury, tobacco smoke, pesticides, phthalates, and other toxic substances.

The report, however, shied away from saying whether or not the exposures were harmful. Of course, what more could one expect, because to implicate these toxic exposures to health problems might lead to the need for massive changes in U. S. government direction and also might prove financially disastrous for many industries and the U. S. government.

It's now well accepted that environmental pollution is pervasive and affects every living creature on the planet. The primary reason that there's not more discussion about the effects of these pollutants is that most toxicologists don't consider a pollutant toxic until the quantity of that pollutant in the environment reaches a certain threshold level. It's believed that pollutants pose little threat at doses below specifically defined levels.

Many researchers disagree with the concept of threshold levels of toxicity. They claim that we get into trouble when we fail to account for the full range of toxic effects created from exposure to pollutants. Cancer, a primary consideration when we discuss the toxic effects of pollutants, is only the endpoint in a decay process that began with a subtle symptom expressed by the body, such as congestion and inflammation, indicating that damage was beginning to occur as one became exposed to, and began to accumulate, low doses of toxins.

Researchers are becoming more aware that low dose exposure leads to more symptoms and diseases than previously believed. One of the disputes involving low-level water contamination is whether or not exposed individuals face any increased risk of cancer. Beyond the matter of increased cancer risk in an individual as a result of pollutant exposure is the notion that accumulation in the cell of smaller amounts of toxic chemicals may lead to changes in the cell and its genetic material (DNA), producing long-lasting damage that may affect future generations.

Just to test the most common 1,000 toxic chemicals in unique combinations of 3 will require at least 166 million different experiments. To

conduct 166 million experiments in 20 years would require the completion of 8.3 million tests each year. The United States has the capacity to conduct only a few hundred such tests each year at the present time.

A large-scale test of the no threshold theory provided good evidence that some cancer-causing agents continue to act at very low doses. The liver, which is the primary site of metabolism for environmental pollutants, receives a continuous exposure to both high and low doses. It shows no threshold. There's also no threshold for radiation in causing cancer. These facts are also complicated by the fact that in the real world one is exposed simultaneously to multiple toxic agents. At low doses, certain chemicals interact synergistically to enhance each other's toxicity.

An important consideration of low-dose toxicity is that substances that produce damaging toxic effects at high doses **induce subtle effects** at lower doses.

The subtle signs of symptoms, i.e., neurotoxicity in children, are an indication of the spectrum of damaging effects from chemical pollution. I can't state this too often: symptoms and functional deficits are the first signs of damage and always precede tissue damage.

New Paradigm: Sub-Clinical Toxic Exposure

Presently there's the growing inquiry about subtle, chronic, or long-term effects **where cause and effect relationships aren't obvious or may be sub-clinical**. This might include a level of effect that's within the generally regarded norm of human performance: for example, lower IQ and childhood lead exposure. Assigning responsibility for such toxicological effects is extremely difficult, indeed not always possible. This is particularly true when the end-point in question lacks specificity. It may be caused by several agents, or even combinations of agents, that increase each other's toxic effects.

A controversy about the dangers of toxic exposure begs the question: At what point do toxins begin to damage the body? This is the concept of "the threshold point of damage." Cancer is the typical threshold point used by most experts. But, can't it be a runny nose? Constipation? A lack of energy?

My conclusion is that it's these early harbingers (symptoms) that indicate toxic exposure. These body symptoms (or compromised functions) indicate the body's attempt to cleanse itself. I have embraced the idea that everyone has some degree -- more or less -- of toxicity. Therefore, everyone living today is toxic and requires assistance in eliminating the accumulated load of toxins.

Model of Toxic Exposure

Our fears of chemicals have typically centered on their end-point effects, such as cancer and other tissue destroying diseases. As one looks at the scientific literature, it becomes clear that severe physical disease or obvious birth defects may not be the most **immediate** danger. Long before synthetic chemicals reach sufficient levels to create observable “cause and effect” physical illness or abnormalities, they can impair learning ability and cause dramatic, permanent changes in behavior, such as hyperactivity.

In the U. S., an estimated 16-20% of children suffer from a suite of symptoms related to hyperactivity and attention deficit. Countless others experience learning difficulties, such as deficits in memory and impaired fine motor skills. Both chemicals and heavy metals can cause these changes, and they are further aggravated by the chemical assault of the pharmaceutical prescriptions, provided to medicate the kids in response to symptom pictures that arise as a result of their bodies’ defensive reaction against the accumulating toxins.

The thyroid is one of the most frequent target organs for synthetic chemicals. Hyperactivity in offspring is the most common result of exposure to PCBs. Low level effects become apparent not as changes in learning, but as dramatic changes in behavior from such stresses as negative events.

Several scientists agree that behavior is affected first, before any measurable impact on the child. It’ll never be possible to establish cause and effect from low dose chemical exposure. Everybody who has lived during the last 50 years carries a load of synthetic chemicals in his body. We don’t know what combination of chemicals the person has been exposed to or if he was exposed in a critical developmental period. This represents a major problem in trying to assess the delayed effects of environmental contamination.

Because of these effects, those wanting undeniable proof before acknowledging the dangers are sure to wait a long time: well defined cause and effect relationships will remain hidden. Currently, the use of cancer as an endpoint of toxic effects distorts our realization of other possible dangers. In 1950, public health officials using research generated before World War II, thought in terms of out and out poisoning and regarded chemicals safe if they didn’t cause death or diagnosable disease.

Right now, there are more questions than answers. It’s a serious problem and it requires an investment of deep thinking and dollars. Declining sperm counts, for example, are serious problem and indicate implies that toxins are implicated in of the issue of fertility itself.

The future is here and we’re avoiding building an appropriate roadmap. I, for one, have chosen not to wait for the so-called scientific proof that these

toxins impair health. Science believes that these chemicals and pharmaceuticals are safe. No young person alive today has been born without some level of chemical accumulation that they picked up while in the womb of their mother. These synthetic chemicals can disrupt development.