Dr. Robin A. Bernhoft, MD
FOR CHRONIC ILLNESS & ALLERGY

1200 Maricopa Hwy • Suite A • Ojai, CA 93023 • 2128 Pico Blvd • Santa Monica, CA 90405 • Tel 805-640-0180 • Fax 805-640-0181

BODY BURDEN (THE "RAIN BARREL")

by Dr. Robin Bernhoft, MD, FACS, DABEM, FAAEM

Since 1980, the National Institutes of Environmental Health Sciences have been studying the effects of environmental pollutants on human health. Thousands of peer-reviewed articles have been published assessing the cumulative effects of chronic exposure to low doses of pollution. The results of these studies have led to a major revision of classic toxicology's dictum "the dose makes the poison." Classical toxicology has chiefly addressed the effects of sudden exposure to high doses of toxicity. But modern life involves constant, slow, low grade exposure to thousands of chemicals and a score of metals, with constant, slow accumulation. When critical mass is reached (sufficient body burden of toxins), symptoms begin.

We now know that there are hundreds of liver enzymes involved in processing and excreting chemicals, which come into our bodies. These enzymes can be classed into two stages: Phase I, in which the structure of the toxic chemical is changed slightly, to prepare it for Phase II, in which another chemical is tacked on to the toxic one, making the combination water soluble, and therefore able to be excreted in the urine or bile.

The products of Phase I detoxification are often more toxic than the parent chemical, and if they are not quickly shunted into Phase II (and out of the body) they can do more damage than the parent chemical. Hence, it is vitally important that Phase I and Phase II be in balance, so damage is minimized.

This can often be accomplished through nutrition: one can supply vitamin and mineral cofactors for specific enzymes, which will improve their ability to function and bring the system into balance.

That process is complicated in people who have genetic abnormalities (Single Nucleotide Polymorphisms, or SNPs), which alter the effectiveness of one or more detox enzymes. Often, though, these abnormalities can be over-ridden by supplying larger than usual doses of the relevant cofactors.

People in whom Phase I and II are functioning well can tolerate higher doses of xenobiotic chemicals or metals than people whose enzymes are not as efficient. This is why some people can smoke for 80 years and never get serious disease, while others can't. Or why some farm workers with low levels of an enzyme called PON1 get very sick from pesticide exposures, while others with high levels do not. (At least not right away.....)

If your body can clear whatever you take in, you never build up a significant body burden. (In the modern world, this almost never happens. We are exposed to at least 84,000 toxic chemicals on a regular basis, and 600 times as much metal as a century ago; rare is the person who can tolerate modern pollution without some type of illness.) (Even Inuit women in the far North have high levels of PCBs in their breast milk, even though PCBs are not found in their immediate environment.)

1200 Maricopa Hwy • Suite A • Ojai, CA 93023 • 2128 Pico Blvd • Santa Monica, CA 90405 • Tel 805-640-0180 • Fax 805-640-0181

If a person takes in more pollution than he or she can excrete, the excess builds up over time. Most toxins are fat soluble, and deposit in fat or in fatty tissues. They are often released into the blood stream slowly over time, like time-release capsules, and interfere with any number of bodily functions.

Studies of toxicity of chemicals and metals usually are done in isolation, without considering synergy between toxins. Such studies that have been done are sobering: for example, Boyd Haley at the University of Kentucky found that doses of lead or mercury which were strong enough to kill 1% of cultured cells when mixed killed 100%. 1 lead + 1 mercury = 100 of either in isolation. That is toxic synergy.

Unfortunately, the EPA's toxic threshold studies are generally done in isolation, but in the real world we are exposed to everything all at once. So the EPA toxic dose numbers do not reflect reality very accurately.

Dr Bill Rea, medical director of the Environmental Health Center, Dallas, explains body burden by comparing it to a rain barrel. Xenobiotic chemicals accumulate in the body like rain in a barrel. The last chemical in causes the barrel to overflow (producing symptoms), so patients usually consider their problem to have been caused by that chemical. But if the barrel hadn't already been filled with other chemicals, it wouldn't have overflowed (they wouldn't have developed symptoms). So the problem isn't just the last chemical in, it's the entire barrel full of accumulated toxins. Symptom relief usually requires lowering the level of toxins in the barrel (diminishing body burden through detoxification).

Total body burden of chemicals matters.

Selected References:

1. Second National Report on Human Exposure to Environmental Chemicals, Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Environmental Health, Division of Laboratory Sciences, Atlanta, Georgia, March, 2003.
2. Kolaczinski JH et al. Chronic illness as a result of low-level exposure to synthetic pyrethroid insecticides: a review of the debate. Food Chem Toxicol. 2004: 42(5):697-706
3. Weis BK, et al. Personalized exposure assessment: promising approaches for human environmental health research. Environmental Health Perspectives 2005; 113(7):840-8.
4. Paustenback D, et al. Biomonitoring: is body burden relevant to public health? Regul Toxicol Pharmacol 2006; 44(3):249-61.
5. Munoz-de-Toro M, et al. Estrogenic microenvironment generated by organochlorine residues in adipose mammary tissue modulates biomarker expression in ERalpha-positive breast carcinomas. Breast Cancer Res. 2006; 8(4): R47.

Virtually every issue of Environmental Health Perspectives, a free online journal published by NIEHS, contains articles illuminating this subject.