The Effects of Persistent Organic Pollutants (POPs) in Weight Loss and How to Mitigate Them

- Chlorinated Pesticides Profile - Serum
- PCBs Profile - Serum
- Phthalates & Parabens Profile - Urine

Summary
Research now indicates that a patient's levels of persistent organic pollutants (POPs) should be evaluated prior to weight loss. Because POPs are stored in body fat, weight loss can generate significant releases of toxicants into the body. Elizabeth Redmond, PhD, MMSc, RD and Terry Pollock, MS

Details
A 40-year-old overweight patient goes to the doctor before she starts a weight loss program. What should the doctor check?

Adipose Tissue: A Storage Site for Persistent Organic Pollutants (POPs)
Research now indicates that the doctor should evaluate the patient’s levels of POPs prior to weight loss. This evaluation is especially important in middle-aged and older adults since toxins accumulate with age. Persistent organic pollutants, such as polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), and p,p'-dichlorophenyldichloroethylene (DDE) are ubiquitous microcontaminants that are lipid soluble and accumulate in stored fat. A type of fat known as white adipose tissue (WAT) constitutes 15 to 25% of body weight and can increase greatly in the morbidly obese. This tissue serves as a depot for lipophilic contaminants like POPs. Weight loss can facilitate significant releases of these toxicants, often leading to an increase of symptoms which may prevent further or optimal loss of fat. Though banned, these POPs are an ever-increasing problem that may affect the endocrine, nervous and immune systems; storing them in adipose tissue may be a defense mechanism. Due to these issues the CDC has expanded their evaluation of these toxic compounds in the National Health and Nutrition Examination Survey (NHANES). The NHANES is a program of studies designed to assess the health and nutritional status of adults and children in the United States. Physicians need to be aware of their patient’s levels of POPs, how these toxic compounds are released during weight loss, the possible effects they can have, and ways to ameliorate their release. Answering these questions and treating these issues may help patients complete weight loss programs and avoid regaining weight, with the significant advantage of reduced toxic burden.

Testing Toxin Levels
The measurement of chemicals and biomarkers has revolutionized the field of exposure assessment. The Centers for Disease Control and Prevention (CDC) published the The National Report on Human Exposure to Environmental Chemicals, which provides an ongoing assessment of 148 chemicals found at detectable levels in the U.S. population using biomonitoring. The blood and urine samples were collected from a statistically representative sample of the U.S. population during NHANES.5 The CDC has therefore established 95th percentile reference limits for many of these organic pollutants, allowing physicians to compare their patients’ levels against a national standard.4,6 Certain of these organotoxins can now be analyzed using private laboratories. Current, and anticipated, scientific advances can permit broader toxicity testing coverage of the universe of potentially toxic chemicals to which humans may be exposed. By 2010, it has been predicted that the CDC will be monitoring nearly 1000 chemicals, a significant advance, yet small considering the estimated 80,000 chemicals in use.

Main Sources of POPs
Contrary to common belief, there is still a body burden of banned chemicals due to the persistence of these compounds in the environment, to their continued use in other countries and to the fact that

animal feeds are the main source of POPs in the human food chain. Studies by LaRocca have shown that the majority of human exposure to PCBs, for example, is derived from foods of animal origin. Storage of these compounds can result in increased concentrations in fatty tissues, muscles and organs, which can induce various adverse health effects. In addition to foods of animal origin, POP's are also found in pesticides, building materials, plastics, cosmetics and perfumes. In other words, most sources surround us in our homes, offices and schools.

Toxic Effects of Exposure to POPs

The potential of these pollutants to impair immune responses and trigger autoimmune disease is of growing concern. POPs show structural similarity to thyroid hormones. Some effects of exposure include developmental and reproductive toxicity, dermal toxicity, endocrine effects, hepatotoxicity, carcinogenesis, and the induction of diverse phase I and phase II drug-metabolizing enzymes. Endocrine effects of organic pollutants seem to occur through mimicking the body's natural steroid hormones, and by interfering with the adipocyte phenotype. Mullerova and Kopecky have described plausible mechanisms for POP interference in fat metabolism via modulation of estrogen-regulated genes, disordered estrogen biosynthesis in WAT, inhibition of peroxisome proliferator-activating receptors (PPARs) and disruption of other aspects of the fat cell transcription machinery.

Emerging evidence has also demonstrated that polyhalogenated aromatic hydrocarbons (PHAH), particularly polybrominated diphenyl ethers (PBDE), alter thyroid hormone homeostasis and cause thyroid dysfunction. Release of organochlorines were found to impair thyroid status, which may reduce resting metabolic rate (RMR) and decrease in serum T, further exacerbating weight loss issues.

Toxicants and Weight Loss

Weight loss has been shown to mobilize PCBs and other POPs from lipid stores producing an increase in blood concentrations of these potentially toxic organochlorines. The level of plasma organochlorine and pesticide compounds is related to total weight lost. Thus weight loss strategies that produce significant or quick decreases in weight have been shown to lead to greater increases in plasma organotoxin levels. There is a measured and persistent release of toxins shown in plasma up until a change in BMI greater than 14 kg/m2, when blood concentrations jump sharply. It is therefore advisable to calculate a patient's anticipated change in BMI. An increase in organotoxins may explain why some patients begin to feel like they are being poisoned during the first part of a weight loss program, possibly contributing to the difficulty of sticking with a program or why patients regain weight so quickly. Clinicians working in the field of bariatrics encountering weight loss resistance in their patients have speculated that it may be the result of a toxic interference.

Minimizing Exposure to POPs

Mitigating the toxic effects of exposures to POPs (or to any toxic substance) necessitates avoiding or minimizing overall exposure to such compounds. Minimizing exposure to POPs is more efficient, effective and economical than eating/storing/eliminating them from our bodies. High fat animal products are a primary contributor to POP intakes. Dairy products, processed foods, and meat are major contributors of PCB and dioxin accumulation. Consuming fewer animal products and cleaner sources are prudent measures. Industrial, toxicant-promoting agricultural practices such as CAFOs contribute significantly to the increase of toxins in our food supply. Lower toxin levels are found in vegans and vegetarians, as well as those who consume greater quantities of vegetables, fruits, whole grains, nuts, seeds, beans and wild caught young fish. Epidemiological research has consistently shown this diet to be healthier in many catagories.

Detoxification Approaches

With regard to established detoxification programs, the Ayurvedic approach has been investigated by more than 600 studies. Most programs include saunas, supplements, massages, and dietary inclusions and restrictions. Research has evaluated the levels of PCBs in patients before and after such a detoxification program, and compared levels to controls. Some techniques have been found very successful at increasing excretion of organotoxins. Many of these steps can be easily included

into weight loss programs and provide significant reductions of toxins. Thus it is important that clinicians advising their patients on weight loss assess serum toxin levels prior to beginning a program. Patients with higher levels of these toxins could be advised to add more detoxification protocols to their weight loss program to promote their increased elimination during weight loss.

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