

Roundoc Rx

A Functional Approach to Environmental Toxins



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As a practicing clinician, my main interest in environmental toxins is determining the impact they could have on a patient's current state of health. That has been a direct result of attempting to go beyond a typical routine to help patients who present with conditions for which toxins are thought to play a major role, including Parkinson's disease, multiple sclerosis (MS), autoimmune disorders, cancers, diabetes, chronic fatigue, fibromyalgia, mood disorders, attention-deficit disorder (ADD), and various other chronic diseases.

My viewpoint about environmental toxins in such diseases has come directly from clinical experience. This is coupled with a desire to go beyond the standard explanations for chronic illnesses by examining other possible sources for them, knowing that identifying a role for a toxin in a patient's illness may dramatically change the way in which the illness is managed.

One example is the case of one of my patients, a man in his late 40s, who has had high blood pressure (BP), elevated low-density lipoprotein (LDL) cholesterol, and chronic hepatitis C for a number of years. He believes that the hepatitis was contracted when he was much younger, although he doesn't have the usual risk factors, such as having received a blood transfusion or having injected recreational drugs. Despite this issue, he seemed reasonably healthy, exercised regularly, was not overweight, and generally felt well. However, he recently called to tell me about the acute onset of a number of worrisome symptoms, including weakness, malaise, blurry vision, constant thirst, urinary urgency, and rapid weight loss.

Of course, these are all classic symptoms of uncontrolled diabetes mellitus, which was confirmed by finding his blood glucose level to be well over 400. Although the rapid onset of his condition appeared more like that of type-1 diabetes, further blood testing showed that his ability to secrete insulin was preserved, albeit significantly reduced. So what he had was acute onset of type 2 diabetes, which was unusual, given that he had not previously been found to have elevated fasting blood sugar, elevated triglycerides, low high-density lipoprotein (HDL), or any other evidence of metabolic syndrome or prediabetes. His condition is currently being successfully managed with a comprehensive program of nutritional supplements and oral hypoglycemic agents, a combination that has kept his blood sugar well-controlled.

Dioxin and Type 2 Diabetes

As it turns out, I knew from this patient's history that, for many years, he had spent his summers working as a crop duster in Louisiana, spraying fields of crops with a commercial pesticide preparation. After the diabetes was diagnosed, I asked him for details about his crop dusting, upon which he vividly recalled handling large canisters of the chemical mixture, reading on their labels that it was quite toxic and that one of the prominent ingredients was a substance called dioxin. He tried to be very careful when working with it, by wearing gloves and a mask and taking other precautions. However, it was impossible not to inhale the chemical when he was flying across the fields, so there was no doubt that he had nevertheless been exposed to a fair amount of it.

At the time of his initial visits, I had been following a study of Operation Ranch Hand, in which the United States armed forces sprayed approximately 11 million gallons of the defoliant Agent Orange, contaminated with dioxin, on the Vietnamese jungle between 1962 and 1971. Over a follow-up of about 15 years, a high incidence of type 2 diabetes was found

in personnel who had done the spraying compared with those who had not.¹⁻⁴ This situation presented a fairly convincing argument that dioxin, and possibly other substances in Agent Orange, were damaging to the β -cells of the pancreas, or to insulin sensitivity, or both.⁵⁻¹¹

Although he was a civilian, my patient had had a similar kind of exposure, and had developed fairly severe type 2 diabetes of sudden onset. This illustrates a number of principles relating to environmental toxins. First, is their long latency of effect: As many as 15 years may pass before the effects of exposure to an environmental toxin become manifest.

A number of studies of the relationship between dioxin and various diseases, including diabetes, have been conducted in Seveso, Italy, where an explosion in a factory in 1976 exposed a large population to dioxin. On the basis of soil samples, it was possible to identify the sector of the town and nearby area that had had the greatest exposure to 2,3,7,8-tetrachloro-p-benzo dioxin (TCDD), as well as a second sector in which there was moderate exposure and a third sector with minor exposure.¹²⁻¹⁶

At 10 years after the plant explosion, there was little evidence of any lasting effect of the exposure, although people in the area of major exposure did develop a number of acute illnesses, including chloracne among children exposed to dioxin. But after about 15 years, the incidence of gastrointestinal (GI), biliary, lymphatic, and hematopoietic cancers began to increase, and after 20 years, an increased risk of breast cancer was found in women with the highest level of exposure.¹⁷

Classically, front-line medicine has been very good at managing acute injury, such as broken wrists and acute ingestions of toxins, but it hasn't been very effective in tracing long-latency effects of toxic substances. What does that signify about the large numbers of people who have chronic illnesses such as diabetes, and about the epidemic obesity that now exists in the United States? Although the seemingly obvious cause-and-effect relationship underlying such obesity may be overeating accompanied by reduced exercise, environmental toxins may have a role.

Toxins and Obesity

There is an old saying in toxicology that "the solution to pollution is dilution," which involves the concept that, if the body begins to become loaded with toxins, it seeks to dampen their effect by retaining fluid or adding more body fat as diluents for those toxins. In contrast to fat-soluble toxins, water-soluble toxins may enter the body, do their damage, and then be flushed out. Ingestion of large quantities of water may therefore help eliminate them. However, lipophilic toxins, and particularly organochlorines (OCs) such as dioxin, parachlorobiphenyls (PCBs), dichlorodiphenyltrichloroethane (DDT), aldrin, and hexachlorophene, can remain in the body's fatty tissues for years.

*For additional background information, see: Baillie-Hamilton PF. Chemical toxins and obesity. *Altern Complement Ther* 2002;8:218-222.

Given that lipophilic toxins are stored in fat and fat constitutes an average of 25%–45% of the average person's body weight, it is readily apparent how weight can strongly influence an individual's toxic load or total toxic burden. Obesity may therefore be a natural physiologic response to a collectively high toxic load, and environmental toxicity may well be responsible for quite a few of the problems seen by the average primary-care practitioner.*

What happens, then, if I tell an overweight patient who has diabetes "the first thing you have to do is lose as much body fat as you can, because it will make your diabetes easier to control"? Losing that body fat means releasing all of the toxins it may contain into the bloodstream, with potential symptomatic effects. If the patient then calls back and says "I have a headache and I feel fatigued," my differential diagnosis for those symptoms should consider the possibility that newly liberated toxins are in this patient's circulation and having an effect on that patient's state of health.

A particularly disturbing aspect of this situation is that breast milk carries toxins stored in the fatty adipose tissue of the breast. In her body fat, a pregnant woman carries some quantity of organic lipophilic toxins, obtained in part from her

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own mother if she was breastfed. When she herself breastfeeds, the breast milk that she passes on to her infant can contain up to 20% of these toxins. Those toxins therefore enter her baby's system, and even though the mother may not have had any untoward effects from them, they may lead to an increased risk of cancer, allergies, neurologic diseases, and other illnesses in her child. It has been shown that the factor that correlates most strikingly with the number of toxins found in a 6-year-old child is whether or not she was breastfed. In one study, the researchers concluded:

Of the potential determinants analyzed, more of the variance of the OC concentration is accounted for by breastfeeding than by any other variable. Exclusive breast-feeding beyond 12 [weeks] was associated with a doubling of OC whole blood concentration compared with bottle-fed children. . . . The data indicate a statistically significant, strong, and dose response effect of breast-feeding on OC concentration in whole blood of children at 7 [years] of age.¹⁸

Heavy metals complicate the picture even further. Almost everyone is affected to some degree by environmental mercury, arsenic, and, to a lesser extent, cadmium. In the testing I do in my clinical practice, I frequently find evidence for heavy-metal toxicity—especially mercury toxicity—in a high percentage of patients. Among other things, mercury is a neurotoxin that can af-

fect brain function adversely. Furthermore, PCBs, which are fairly ubiquitous in the environment, are also neurotoxins—this creates a double burden in terms of environmental neurotoxicity.

Factors in the Body's Toxic Burden

A clear factor in one's toxic body burden is exposure. How many toxins are entering the body, and over how long a period of time is this occurring? An individual chemical may not be particularly toxic in super-low doses. However, if that chemical is entering the body every day for decades, and is doing so in combination with various mixtures of countless other chemicals, this can surpass a threshold beyond which toxicity can occur.

Apart from inhalational and transdermal exposure, this relates directly to the foods we eat and the water we drink. It is reasonable to assume that if a person is eating food not certified as organic, that person is ingesting a wide range of pesticides on a daily basis. In North America, many of these chemicals are organophosphates or carbamates, which can have toxic effects resulting from constant exposure, even though they do not accumulate in body fat like OCs such as dioxin or DDT.

The Environmental Working Group (EWG), in its Shopper's Guide to Pesticides, has designated as the "dirty dozen" of vegetables a group of foods that are more likely than average to be contaminated by pesticides, and the EWG advises eating these foods only if they are organically grown.¹⁹ The EWG notes that some of the most-contaminated foods include peaches, bell peppers, apples, celery, nectarines, strawberries, cherries, kale, lettuce, grapes (imported), carrots, and pears.²⁰ So, it's important to caution patients about making sure that such foods are indeed organic. OCs and other toxins also accumulate in the food chain as smaller creatures eat contaminated vegetation and other material, and larger animals eat the smaller ones, leading to ever-greater concentrations of these toxins in the bodies of food animals.

The body burden of toxins is therefore really the net result of what comes in over time, how it is processed or "biotransformed," and to what extent it is eliminated. A practitioner might then look at every patient who walks into the office and evaluate these patients in terms of their total toxic burden. It isn't really essential to do a laboratory test to accomplish that, although this will become more desirable in the future when testing for total toxic load becomes less expensive and easier to perform.

The Functional Medicine Approach

In the Functional Medicine approach to a patient, the two most important measures for estimating the patient's toxic burden are a thorough history and physical examination. If appropriate, this can be followed by detailed testing for specific toxins in the body fat, blood, or urine; testing for heavy metals

in hair, blood and urine; and testing for functionality of the enzymes that metabolize and detoxify organic toxins.

The first thing I do in examining a patient is to look at potential ongoing sources of toxic exposure. A good part of that is simply being aware of what is going on in the person's environment, especially if the patient is in a category of increased genetic susceptibility to a particular condition. Thus, although my patient with diabetes is no longer flying a crop-dusting plane, he has horses and a big garden, and lives in the foothills of the Rocky Mountains. It turns out that pesticides are being sprayed regularly to control a pine-beetle epidemic in a forest near where he lives. These are all potential sources of toxins, and a functional medical examination can point to whether that's affecting a patient.

Further measures in the functional examination for toxicity include bioimpedance analysis to evaluate a patient's body fat-and-water content; and, if the patient has seriously high body levels of heavy metals, as established through flame-photometric hair analysis or other laboratory methods, I recommend oral or intravenous (IV) chelation therapy, which can be very effective for reducing the body's heavy-metal burden. Such therapy should be done only under the supervision of a trained professional, because the chelating drugs that are used in it, such as 2,3-dimercapto-1-propanesulfonic acid (DMPS) or meso-dimercaptosuccinic acid (DMSA), are not without side-effects and require monitoring of liver and kidney function to prevent such effects. The American College for Advancement in Medicine offers an excellent course in such therapy.

By contrast, I recommend *caveat emptor* with regard to a range of products sold on the internet that claim to rid the body of mercury, cadmium, lead, or other such metals. Some of these products may be proven to work, but good clinical trials are needed to determine that, and, so far, there haven't been any. For this reason, people with significant heavy-metal toxicity should stick to proven protocols with agents supported by published research.

In addition, because many environmental toxins, especially OCs and polycyclic aromatic hydrocarbons, are known inducing agents of the phase-I enzymes that metabolize toxins, drugs, and other organic molecules, I often order genetic testing to determine individual susceptibility to this induction. These toxins exert their enzyme-inducing effect by binding to transcription factors for xenobiotic response-element genes that encode phase I enzymes in hepatic, intestinal, and other cells. The resulting increase in enzymatic activity is a homeodynamic attempt by the body to eliminate the responsible toxins.

Testing for this is commercially available (Detoxi-Genomic Profile; Genova Diagnostics, Inc., Asheville, NC) and can, for example, be extremely useful for revealing genetic polymorphisms or deficiencies in a phase-II enzyme that normally conjugates toxins with glutathione. That finding tells me that I may be able to improve the patient's ability to eliminate toxins handled by that enzyme. I would do this with dietary supplements that either supply precursors to glutathione—such as N-acetylcysteine (NAC) or whey protein—or in-

crease glutathione stores in the liver—such as sulforaphane, α -lipoic acid (GLA), milk thistle or curcumin.

When coupled with proper awareness, such tools can reveal a great deal about the role of toxins in a patient's overall health. These tools give the practitioner specific guidance for detoxifying a patient's body, and, over the past 25 years, I have used them increasingly with the growing numbers of patients who have come to me with chronic diseases of potentially toxic origin.

Managing Environmental Toxicity

In Functional Medicine, patients play an important role in their own management. In the case of environmental toxicity, an important aspect of this is using clean, good-quality drinking water, which helps chiefly in eliminating hydrophilic toxins from the body but also in ridding the body of lipophilic toxins that are biotransformed by the liver and excreted as water-soluble conjugates or breakdown products. I also recommend the use of alkalinizing ionic water filters, because drinking water that has a slightly high, alkaline pH can enhance the movement of toxins out of the body.

In addition to this, I recommend infrared saunas, on the basis of good evidence that the body excretes toxins in sweat, and I add items to the diet that help rid the body of toxins. Naturopathic doctors have long advised mainstream physicians about the importance of good elimination to good general health, and I subscribe to that. Having a bowel movement twice a week does not adequately eliminate organic toxins from the body, and if toxin-containing fecal waste remains in the colon for any sustained time, the possibility grows of the feces' toxic contents being reabsorbed and recirculated. I therefore advise patients to begin a high-fiber diet, which can markedly enhance detoxification. I especially recommend flax for this because of its low cost and because it helps to bind toxins in the gut so that they're excreted and because this herb has phytoestrogenic lignans, which produce inhibitory effects on cellular hormone receptors and limit the endocrine-disruptive effects of OCs and many other organic toxins.

For the reasons described earlier, I also advise patients—especially those who are carrying a noteworthy toxic burden—to eat organic foods, even though these foods are often harder to find and can be more expensive, although it has been argued that they are actually less-expensive from a global, environmental perspective.

As part of this, it's important to raise patients' awareness of the role toxins play in chronic disease by recommending books and other reading materials that inform patients directly about such hazards and the alternatives to them, so that these patients can limit their own exposure to toxins. An excellent book in this regard is *The Body Toxic: How the Hazardous Chemistry of Everyday Things Threatens Our Health and Wellbeing*, by Nena Baker.[†] It makes one highly aware of the consequences of regular exposure to chemicals such as bisphenol A, an endocrine-

disruptive plasticizer present in many water bottles and even in baby bottles, as well as in the polymer linings of most food cans in the United States.

A Difference in Strategies

The bottom line in the Functional Medicine approach to long-term environmental toxicity is that the total body burden of toxins should be given careful consideration in anyone who has a chronic illness. That requires understanding the overall picture of the patient as a person, the molecular dysfunction underlying that patient's specific illness or syndrome, and the probability of toxins having a role in that dysfunction. This, in turn, requires knowing what that particular patient's body does with those toxins. Does it store them in body fat? Does it excrete them? What is the extent of liver and other enzyme activity for eliminating those toxins? And what are the pathophysiologic mechanisms by which they may trigger disease?

It is in responding to these questions that Functional Medicine differs from mainstream medicine, in which the important goals are typically to first establish a diagnosis and base a treatment on that diagnosis. Mainstream medicine would have responded to my patient who had diabetes by saying: "You have type 2 diabetes, and it does not really matter how you got it. Take the prescribed drugs and monitor your blood sugar and get your vision checked regularly; make sure you don't develop a neuropathy; and make sure that your arteries are in good shape, because you're at greater than average risk of developing cardiovascular disease." There is no question that all of these things are important, but what about asking the further questions concerning whether the patient's illness came from toxins and whether they are still in the patient's body, and what can be done if they are?

I strongly believe that primary-care doctors need to pay much more attention to this. It is not an esoteric topic meant only for toxicologists, but an immediate and potentially serious concern in public health. We need to do more than tell someone such as my patient with diabetes to "stop doing crop dusting and take your medications." We need to know about the causes and effects of environmental toxins and a patient's toxic load, so that we can take steps toward the more effective management and prevention of chronic disease. We also need to develop better methodologies for determining who is affected by toxins and what can be done about it, always keeping in mind Louis Pasteur's saying that in the game of observation, "fortune favors the prepared mind." ■

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