The Metaphor of an Oceanic Disease

Sidney MacDonald Baker, MD

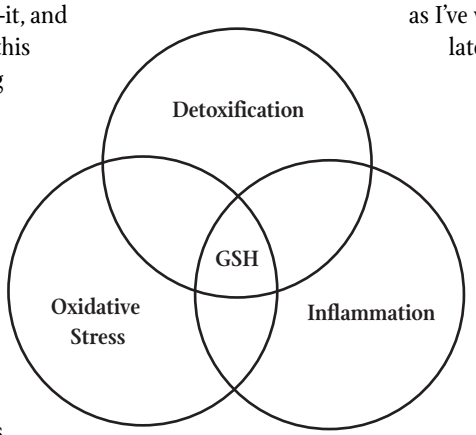
In 2006, the 13th Institute for Functional Medicine Symposium in Tampa, Florida, triggered in me a series of epiphanies that I think are most appropriately cataloged under what I call *oceanic disease* or, perhaps, *the systemic epidemic*. Or, it may be best to call my ideas *the oceanic metaphor* to make it clear that a disease is not a thing but a concept.

This metaphor states that we practitioners will do better if we believe that there are few diseases and many kinds of people rather than that there are few kinds of people and many diseases. Recognizing that the problems of our healthcare system cannot be solved without promoting health—rather than treating disease—depends on understanding that our problems are both ecological and logical. That is to say, not only based in our environment, but also logical in contrast to what I call the current nonsensical, "name-it, blame-it, and tame-it prescription-pad medicine." In this type of medicine, through our thinking and speaking, descriptions of disease are assigned causations of disease.

My idea can be expressed in the following self-created parable:

Numerous groups of independent expeditions have traversed a dense biochemical and immunological landscape to seek the fundamental causes of autoimmune problems, cancer, dementia, heart disease, and other afflictions of modern affluent societies. Some of the best teams were well financed with vast funds left over from more fashionable research that involved looking up to the stars for genetic causes and to the clouds for pharmacological solutions. The winning teams in my parable, however, have their eyes not on the sky but down on the ground of basic biochemistry. They are blazing a trail that at last breaks into a clearing overlooking an ocean. Arriving at the clearing, 1 team of cancer researchers realizes there are also cardiovascular researchers present and say, "Hey, what are you cardiovascular people doing here? You must be lost! This is the ocean from whose depths, currents, and winds comes the forces that cause cancer!" In response, the cardiovascular researchers say, "Why, no. This is the ocean of heart disease. We have traveled a long and complex path to arrive here." By the end of the day, however, all the various specialists conclude that they, emerging from different trails, have reached the same ocean from which come the same causative forces of disease.

The "forces" of my parable are problems of oxidative stress, detoxication, and inflammation, which are joined by their common feature, glutathione (GSH) attrition. Between them, they generate a map of the basic landscape in which affluent societies create common chronic illnesses, represented by the Venn diagram shown here.



This diagram was the first part of my Tampa epiphany, which began as I listened to Colin Campbell, PhD, tell the story behind his book *The China Study* (Benbella Books, 2005, which I'll describe in more detail later). My epiphanies continued through the summer of 2006 as I listened to all the Tampa speakers over and over again on my iPod. The biochemical setting they described, illustrated in the above diagram, was the same one that had emerged over the past several years for the causes of autism. I was stunned to realize that the very specialized problems of autism were not specialized at all, but part of a vast—therefore "oceanic"—puzzle. The intricacies of that puzzle have bothered me over the course of my 40 years in medicine as I've watched the increase in all sorts of "unrelated" and increasingly prevalent chronic diseases such as Alzheimer's, asthma and other allergic reactions, auto-immune troubles, breast cancer, cardiovascular issues, and developmental and attentional difficulties.

These problems, so prevalent in affluent societies, were conspicuously absent from the cultures of 2 of the world's poorest countries, Nepal and Chad, when I practiced medicine there in 1959 and from 1966–1968, respectively.

The Door Opens

What is the gist of what was said in Tampa?

Nutrition, environmental pollution, and other ecologic stressors have increased the incidence of many chronic diseases that the scientific community (represented by the speakers at the conference) now sees as varied expressions of the same underlying inflammatory processes.

How does it work? And how does understanding how it works give us a better handle on prevention and cure than merely tweaking the biochemistry of individuals with drugs or supplements or dodging toxins and allergens?

In my past efforts to help patients set priorities among their options for solving the problems of chronic illness, I have focused on identifying ways the genetic arrow is deflected from health to disease by layers of their individual physiology. I've continually tried to see how each patient's constitution—however genetics and environment have conspired to shape it—might benefit from corrections to those layers of physiology.

In my 35 years as an integrative medicine doctor concerned with restoring balance to those layers, I have struggled in the gap between general and specific remedies. Should I begin

by asking all my patients to adopt a "healthy lifestyle" and build a one-size-fits-all approach to physiologic balance? Or should I find and fix a patient's special unmet need(s) for some necessary therapy or help him or her avoid and/or rid some noxious toxin(s) or allergen(s)? I would never argue an either-or case. I am drawing the distinction here merely to frame the impact that my oceanic metaphor has had on the weight I've assigned to the general versus specific strategy in my clinical repertoire.

Before Tampa I did not really understand the general problem of oceanic disease. Moreover, my understanding of illness as a signal to change led me up a duel path for assessing balance in individuals: Maybe this person is lacking something that would be good or getting something that is bad. My own grasp focused on specific individual quirks in my patients' webs of capacities to take in, process, and express the effects of nutrients, light, rhythmic integration, and love, and to avoid or detoxify allergens and toxins. Early in my career I thought that this simple "get and avoid" approach would be a long shot both for patients with well-characterized diseases like lupus or juvenile rheumatoid arthritis and others whose problems had not been dignified with an acronym or an eponym. But over time, experience reassured me of the clinical results achieved by taking a systems approach—as opposed to linear thinking—that explored the webs of causation in a leisurely conversation and respected the patient's intelligence and intuition.

Chain smokers, alcoholics, and junk-food junkies with heavy environmental exposures don't come to see me very often, and those who do have anticipated that their illness is a signal to change. Thus, when my more circumspect patient's ecological problem does not appear to be a candidate for some sort of general cleanup, I have found individualized "eco-analysis" a more inviting path of discovery than a prescription of some generic version of a Baker protocol for healing. My instinct in addressing patients with chronic illness has always been to begin with the specifics and later work toward the universal.

This changed in Tampa. Each of us has had both good and bad moments in our lives after which nothing was ever the same. For me, Tampa was one of the best in my life as a physician. Viewed from my patient-oriented perch, I may have an accurate impression that, down the road, the Tampa symposium will appear in the historical rearview mirror as the time when serious, mainstream scientists gathered to talk about detoxication and found themselves in the metaphor I have described—a common ground that lies beneath the pathology of most of our society's chronic illnesses. If the Venn diagram above is an accurate portrayal of that common ground, the implications for healthcare are whopping.

The Example of Autism

My interest in the biochemistry of autism had led me to understand the centrality of thiol chemistry—from methionine to GSH—with its implication that autism is a chronic inflammatory illness that involves problems of oxidative stress and detoxication.

The first part of my multi-part Tampa epiphany was understanding that the Venn diagram is the shared landscape of *all* of the chronic illnesses under discussion at the symposium.

The second part of my epiphany was to realize that, due to this, my particular interest, autism, is not a special case. As such, autism is basically one manifestation of that common ground in a growing number of children in our culture.

The third part of my epiphany was the realization that currently accessible, well-funded, high-level, published research on the cause and prevention of major diseases that "have nothing to do with autism" can and should inform both private and public policy concerned with the prevention and cure of autism.

Specifically, this research tells us that the autism epidemic is a manifestation of the same forces driving the other major chronic health problems of our society. Sadly, far from being a special case, autism just may be the worst-case expression of a shift in public health. Why worst case? First is that the historical response to autism on the part of professionals has been to tell parents, "Don't look for answers"—advice that is nearly unique in a world where "heroic" measures are the norm. Second, public dialog has been especially polarized as to the incidence, temporal trends, and environmental factors that could bear upon the condition. Third, in my opinion, autism has affected some of the best and brightest of our children.

This shift in public health to ever-more increases in chronic disease has given rise to manifestations of childhood problems in immune and cognitive perception, ranging from peanut allergies to various problems in regulation of mood, attention, and behavior. Keep in mind that the immune and central nervous systems are functionally unitary: memory and perception. The vulnerability of young immune and central nervous systems puts our children in the role of canaries in our ecological coalmine.

The biochemistry of autism—as described by Boyd Haley, Chairman of Biochemistry at the University of Kentucky—is a biochemical train wreck. In that mess, what are the central faults that correspond to a break in the tracks? And what is the collateral damage? One way to think about the differences between the primary and secondary aspects of autism's biochemical web is to look at measures that show very large differences between autistic and normal children.

Differences of several-fold (200% or more) are infrequent in medical studies, in which a 15% difference can, with robust numbers of subjects, indicate a statistically significant margin that "proves" we can bank on the difference to drive clinical decisions. The following autism studies, however, show differences of several-fold. First is the study by Holmes, Blaxill, and Haley, documenting low levels of hair mercury in infants who later became autistic as compared to those with higher hair levels of mercury who did not.[1] These results were replicated by Adams.[2] The differences were 7-fold in the first study and 5-fold in the latter.

These 2 studies demonstrate a severe detoxication impairment in children on their way to becoming autistic because lower hair mercury indicates lower capacity to rid the body of mercury. Moreover, the Adams study shows a dose-response effect of lower hair mercury in children with more severe autism, which provides the second of the 4 criteria generally accepted as necessary for scientific proof: temporal priority, dose-response effect, lack of spurious factors, and biological plausibility. These studies are published in the peer-reviewed literature, and they have not been challenged

by any study with contrary results.

Other findings of many-fold differences concern pro-inflammatory lymphocyte counts[3] and cytokine levels[4] in the gut-associated lymphoid tissue (GALT) of autistic children versus normal controls and another group of non-autistic children with inflammatory bowel disease. The differences in intraepithelial CD3 and CD8 lymphocytes were several-fold, and the differences in the pro-inflammatory cytokine tumor necrosis factor-alpha were more than an order of magnitude. These measurements not only give credibility to parents' descriptions of inflammatory bowel symptoms in autistic children, but stress inflammation as a primary feature of autism. The studies showed that the lymphocyte profiles and cytokine levels found in the GALT of autistic children not only distinguished them from normal controls but also were also far more abnormal than those of children with Crohn's disease and ulcerative colitis. Furthermore, there is evidence of inflammation in the brains of autistic children, as shown in the studies of Pardo, Vargas, and Zimmerman from Johns Hopkins University.[5]

Oxidative stress, the third component in the Venn diagram, is documented in autism by the work of Jill James, PhD. She has shown dramatic differences ($P<.0001$) between autistic children and normal controls in serum levels of reduced GSH, glutathione disulfide (GSSG), cysteine, and GSH/GSSG in their precursor thiols.[6] The 3 common breaks in the tracks of autistic children's biochemistry include: oxidative stress, problems with detoxication, and inflammation. Low GSH is the link that joins the 3. The many other biochemical and immunological problems that we document in our autistic children are nothing more than collateral damage from the train wreck.

The Role of GSH

A fourth part of my epiphany was the realization that the chemistry of oxidative stress, detoxication, and inflammation constitutes an arrangement of nested vicious cycles. The bad thing about vicious cycles is that they are self-perpetuating. The good thing about them is their capacity for restoration of the vicious to the virtuous cycles from which they came: Lack of GSH causes oxidative stress, which then poisons thiol chemistry, which impairs detoxication, which provokes inflammation—which further lowers GSH production, which causes more oxidative stress, which impairs detoxication, which poisons thiol chemistry, which again provokes inflammation, and so on. Lowering oxidative stress by restoring GSH and removing toxins (such as heavy metals) that impair key thiol enzymes can restore virtuous cycles. Nature's strong impulse toward healing is embodied in the restoration of virtuous cycles.

The fifth part of my epiphany was learning about the dietary induction of GSH. Instead of fretting over the question of whether GSH levels can be raised by any route of administration (or by pushing its precursor, *N*-acetylcysteine), does it not make more sense to induce increased formation of GSH? In Tampa, Albena T. Dinkova-Kostova, PhD, of Johns Hopkins presented the case for broccoli sprouts as the best among a whole series of foods with GSH-inducing effects. Dr Jim Slaga presented the case for his list of super foods (some of which are listed below) that share a capacity for GSH induction. Foods, it turns out, are more powerful in achieving the goal of modulating oxidative stress than supplements, precursors, or drugs (although, under special circumstances, targeted intervention in thiol chemistry is very effective.)

The Role of Phytonutrients

The sixth part of my epiphany was a new understanding of what we call phytonutrients. The total number of plant species on earth may be in the range of 310 000[7] to 422 000.[8] However, even the most varied human diet—as, for example, that of hunter-gatherers whose food sources may consist of more than 100 different plant species made up of seeds, roots, stems, flowers, and fruits—is only a tiny fraction all the earth's plants. The modern supermarket displays only a fraction of that fraction and mostly consists of starch, sugar, animal protein and fat, and some refined vegetable oils.

Most phytonutrients are plant toxins. We do not see a lot of living plants that are overwhelmed by mammals, birds, reptiles, amphibians, insects, worms, fungi, and bacteria. Why? Plants defend themselves. They may offer certain parts for consumption, for the sake of reproduction and the distribution of their seeds, but for the most part plants defend against being eaten by producing an array of bad-tasting substances that render them toxic and inedible to us and most other creatures, as well as resistant to a myriad of diseases, fungi, and bacteria.

The portions of the few plants to which we humans are adapted and that form the basis for agriculture contain toxins that impart interesting bitter or otherwise complex tastes that we enjoy. Dr Slaga identified such phytonutrient rich super foods as black currants, blueberries, chocolate, coffee, garlic, ginger, onions, pomegranates, rosemary, spinach, teas, turmeric, and the whole range of the cabbage family (*Brassicaceae*) of plants, which includes arugula, bok choy, broccoli, Brussels sprouts, cabbage, cauliflower, collard greens, horseradish, kale, kohlrabi, mustard, radish, rutabaga, turnips, wasabi, and watercress.

The toxins in these and other plants go by many different names and vary in the ways in which they speak to our biochemistry. One of their basic messages to our body, however, is to upregulate production of certain molecules such as GSH that are needed for their detoxication. A side benefit is further detoxication of used hormones and other endogenously produced substances, as well as environmental toxins. As such, these plants constitute a nutritional influence in our diets that only recently has been understood. That influence deserves growing importance among our dietary choices based on the known nutritional importance of vitamins, minerals, and essential fatty and amino acids, which have been the backbone of micronutrient education during my career as a nutritionally oriented physician.

The seventh part of my epiphany was an understanding of why we should eat organic foods. I thought it was because organically grown foods were free of pesticides and richer in nutrients. Right? Right! But even more right is that organically grown foods are more abundant in *phyto*nutrients—substances that the plant will curtail if they are not being bothered by the pests that have been banished by pesticides.

The China Study

The eighth part of my epiphany was *The China Study*.[9] If everyone were to read and heed the research of T. Colin Campbell, our society would be able to re-allocate the enormous resources we are wasting on the cost of illness. Dr Campbell's popularization of years of collaborative research by representatives of his department at Cornell University, Oxford University, and the Chinese government is credited as the best study of the relationship between diet and chronic illness. Pundits representing commercial interests are critical of his conclusion that a plant-based diet would have profound benefits to the health and prosperity of cultures such as ours that consume meat and dairy products.

In a long evening over dinner last fall, I asked Dr Campbell about the mechanism by which animal protein up-regulates phase I detoxication, in which various enzymes make the toxin "sticky," thus ever-more toxic without the matching agency of a second phase in which the toxin is conjugated with one of several usher molecules that quench and export it. If phase I mechanisms are unmatched by their phase II counterpart, the resulting excess of sticky (activated) toxins are mischievously adhesive to vital molecules—such as DNA—throughout body chemistry.

Dr Campbell said the mechanism had not yet been determined but that nitrogen load on the urea cycle might be part of it. I thought that the very names of the known products resulting from the gut flora's metabolism of animal proteins—cadaverine and putrescene—suggested that they and other unknown, but recognizably malodorous, products of fecal fermentation could create a toxic load that induces phase I. Such a notion is fully consistent with what I know about autism, in which the toxic load from the gut is of paramount importance to understanding encephalopathy. Normal gut flora plays important roles in detoxication. Abnormal gut flora places a burden on detoxication chemistry in ways that constitute the full equivalent of organ failure, with the understanding that our gut flora is, functionally speaking, one of the most vital of our organs. If our autistic children are the canaries in our ecological coalmine, then what we have learned from them sheds light on our approaches to individuals who express other symptoms of the same oceanic disease.[10]

The ninth part of my epiphany was to understand University of Nebraska presenter Eleanor Rogan's successful challenge to the prevailing view of breast cancer as a disease resulting from breast tissue being stimulated by estrogen. Rogan purports that, instead, breast cancer results from DNA apurinic site mutations caused by estrogen quinones created from the imperfect detoxication of estrogens.[11] This idea fits perfectly with everything else we understand within the framework of the oceanic disease but stands completely on its own base of impeccable research, confirmation by others, and refutation of its critics.

Ecotypic Principles

My tenth epiphany has involved the more-uplifting realization that individuality may be less of a clinical burden than I had come to believe, after 40 years of growing respect for the challenges it poses when one is attempting to sort out the best options for patients with chronic illness. Just as we can speak of chronotypic principles in the realm of chronobiology,[12] perhaps we can think of ecotypic principles in the realm of human ecology. With our present ecosystem, it appears that the following principles approach a one-size-fits-all remedy for individuals as well as for whole populations, except for those who can simply escape to a more benign ecosystem than we find in modern industrialized societies. The principles a clinician should try to follow, translated into clinical options, are:

- to normalize gut flora to combat the effects of antibiotics and former starchy, sugary diets;
- to promote to their patients plant-based, organic diets emphasizing phytonutrient-dense foods as listed above; and
- to emphasize the intake of foods that up-regulate detoxication in ways that meet the individual's specific needs.

Surely there are complexities in detoxification chemistry that demand individual attention—witness the explosion of genetic research aimed at helping patients avoid or improve mixtures of drugs for which they have impaired detoxification. My point here is that up-regulation of GSH is a general answer to the oceanic disease crisis because impaired thiol chemistry is its common feature.

For us clinicians, the proof of such a pudding of principles comes with finding solutions for patients threatened with chronic illness. The question I first posed now has an answer. Where should I start when my patient comes to me with a need to prevent or reverse autism, autoimmune and other chronic inflammatory diseases, cancer, dementia, depression, heart disease, or mood swings? It seems best to have a one-size-fits-all remedy for oceanic disease, with its problems of inflammation, detoxification, and oxidative stress.

Before last year, my set point was to the left on a continuum stretching from individualized lab work and diagnostic trials on the one hand to generic dietary and environmental cleanup on the other. Once assured that my patient was getting prudent nutrition and avoiding conspicuous toxins and allergens, I would focus on finding special unmet needs, as opposed to general needs. Now I've changed. A recent experience demonstrates my belated reversal of the individual versus generic approach and illustrates how my epiphanies have entered my daily life as a clinician.

A bright, fit, lean 50-year-old mother of 2 has consulted me over the past 15 years for a variety of problems, some of which fell under the diagnostic labels of mitral valve prolapse (MVP), irritable bowel (IBS), anterior basement membrane dystrophy (recurrent corneal erosions), and nummular eczema. Her MVP and its dysautonomic features resolved with magnesium supplementation, and her IBS resolved with antifungal medications. But her eye and skin inflammation continued to recur, and my efforts failed to discover causative antigens or any underlying reasons for her constitutional sensitivity. She remained basically healthy, but lived in the deep shadows of a very strong family history featuring breast cancer, Alzheimer's disease, cardiovascular disease, and diabetes.

In recent years, her HbA1c (a test that measures the amount of glycosylated hemoglobin in the blood) rose, her fasting blood sugar crept past 100 mg, and her serum insulin remained unusu-

ally low. As she passed 50, her concerns about diabetes mounted as dietary restriction of sugars and starches failed to modify the trend in her blood sugars. Years of assessment of her gastrointestinal, metabolic, detoxification, and hormonal status left me with no new ideas about how to guide her safe navigation through her menacing genetic landscape. We needed another route.

After the Tampa conference I, then she, read *The China Study*. She then enthusiastically adopted a strict, plant-based diet, based on my assurance that it would lower her blood sugar and cholesterol, thus indicating that we were achieving some traction in moving her genetic risks. When her markers failed to budge after some months on her new diet, I e-mailed Colin Campbell, copying Caldwell Esselstyn and Joel Fuhrman (authors of recent books largely based on Dr Campbell's findings). Was there, I asked, some undiscovered quirk in her chemistry that accounted for her failure to respond as Dr Campbell's research would have predicted? Had I failed to measure some trace element or consider some accessory nutritional factor that they could suggest based on patients who failed to respond to a plant-based diet? In other words, had I overlooked something specific to her individual biochemical situation, thus explaining the failure of the generic plant-based dietary approach? The answer was a unanimous, "No." The problem was not individuality—it was a question of strictness, about which Dr Esselstyn and Dr Fuhrman had slightly different spins, but a single voice: Some people need to go *beyond* a plant-based diet.

At the time of my questioning, Dr Esselstyn's book, *Prevent and Reverse Heart Disease* (Avery, 2007), had just been published. My patient and I read it. She started his plant-based and no-oils diet. Her disappointment in the failure of her previous dietary experiment registered in a tone of resignation when she asked when we might check her lipid and carbohydrate markers again, maybe in 6 months? I tried to close the gap between her high commitment and low expectation, suggesting that it would be interesting to recheck in a few weeks, because Dr Esselstyn's end-stage heart disease patients at the Cleveland Clinic had turned around their lipid and carbohydrate markers within days to weeks of instituting his diet. Within a month, my patient's cholesterol fell below 150 and her blood sugar markers normalized.

100 Horses

Getting people to change what they eat is a challenge for even the most zealous and persuasive clinician, and the expected lack of immediate gratification amplifies that challenge. One of the pleasures of learning about Dr Esselstyn's research and witnessing my patients' successes in applying its lessons is seeing how quickly metabolic healing can take place.

I have come to refer to Dr Esselstyn's diet as "the hundred-horse diet." Why? If your cart is stuck in the mud and you get a hundred horses, you can pull it out. It will work every time. Dr Esselstyn's diet did not look at a variety or combination of approaches to rescuing patients who were to be sent home to die of cardiovascular disease. He simply called on the 100 horses of a diet that eliminates all animal protein and all oils. He did not investigate the value of a few horses plus a good whip and driver and a different cart, or the effects of 6 men pushing. He just asked his patients to do the diet without changing their supplements, their physical activity, or their meditative, spiritual, or psychological regimen. It may be that there are ways of tweaking the diet that depend on individual needs, and it may be that some generic recipe of supplements, exercise, meditation, medication, acupuncture, detoxification, and massage may do the same job. However, if today you have a patient whose cart is stuck in the mud of terminal cardiovascular disease, then Dr Esselstyn's published research and his popular book say that 100 horses will get that person out of trouble—and quickly.

The simple elegance and persuasiveness of Dr Esselstyn's research, its publication in the peer-reviewed literature, and that fact that it comes from one of the foremost clinician-researchers in his field make the work stand out in my mind as one of the top contributions of the past half-century to private and public health. His research stands on the shoulders of Dr Campbell's China study.

Whatever faith my patients may place on my opinion, and however persuasive I may be in presenting options for getting out of serious trouble, I could never match the influence of these 2 bodies of research, each by one of our top contemporary scientists. Imagine me leading my patients on a narrow mountain trail, gradually gaining elevation from which they can have a constructive view of the landscape of their unique metabolic situations. We are confronted by an enormous boulder blocking the trail. It is the challenging obstacle of change, among which change in diet is the most defiant. With the leverage provided by Campbell and Esselstyn's books, I can become Superman and move that rock as I never could with my own resources of persuasion. My appeal to you, the reader, is, "Just read the books!"

Final Thoughts

The fundamental—oceanic—processes that underlie the development of end-stage cardiovascular disease are the same as the processes that underlie all the so-called diseases you and I do not want to contract and within which our denial has less room to wiggle as we age. I have seen the end of my 70th year. The face I shave in the morning and the occasional glimpses of my reflection in a shop window remind me of the increasing gap between the way I look and the way I feel, which is pretty much as I always have. The gap says it is time to get serious about "rectangularizing" my morbidity curve. The metaphor and the reality of the oceanic disease helps me and my patients move away from the linguistic traps of medicine that hold us in the confines of disease "entities," each with its own genetic, environmental, preventive, and curative parameters. I may never have end-stage cardiovascular disease, but I can take a lesson from Drs Esselstyn and Campbell, whose breathtaking and life-giving research guides me and my patients in making choices based on the shared features of the common chronic illnesses of our culture.

With all the talk about the healthcare system in our culture, why does no one complain that the language we speak—and therefore the thinking we think—is based on an utterly false metaphor for chronic illness? The notion that diseases cause symptoms is fine for acute illness: broken arm, chicken pox, grief. But the constant repetition in medical dialog of the notion that arthritis causes joint pain, colitis causes diarrhea, and depression causes sadness is a reflection of a fundamental logical error. Diseases are the names

not the causes of our problems, and they are concepts we form about groups of people, not individuals.

As such, the concept of an oceanic disease is spawned from the ecology of our modern industrialized societies' major illnesses. It is an understanding of disease that comes, not from linear thinking embodied in the false metaphor that a disease causes its symptoms, but from a concept of an epidemic that is systemic—not only in the sense of being general but also in the sense of being understood in terms of systems theory: a web of interacting factors. As a clinician, I find myself easily lost in my efforts to find the most accessible and productive strands in each patient's web. My epiphanies beginning in 2006 at the IFM symposium and culminating with Esselstyn's very specific studies of end-stage cardiovascular disease have led me to a new appreciation of the raw power of diet to promote healing.

Sidney MacDonald Baker, MD, is an author, an associate editor of *Integrative Medicine: A Clinician's Journal*, and currently practices integrative medicine in Sag Harbor, New York.

References

1. Holmes AS, Blaxill MF, Haley BE. Reduced levels of mercury in first baby haircuts of autistic children. *Int J Toxicol.* 2003;22(4):277-285.
2. Adams J, Levine KE, Lin-Wen H. Mercury in first-cut baby hair of children with autism vs typically developing children. In: *Proceedings of the Autism Society of America Annual Conference.* Providence, RI: Autism Society of America; 2006.
3. Ashwood P, Anthony A, Pellicer AA, Torrente F, Walker-Smith JA, Wakefield AJ. Intestinal lymphocyte populations in children with regressive autism: evidence for extensive mucosal immunopathology. *J Clin Immunol.* 2003;23(6):504-517.
4. Ashwood P, Anthony A, Torrente F, Wakefield AJ. Spontaneous mucosal lymphocyte cytokine profiles in children with autism and gastrointestinal symptoms: mucosal immune activation and reduced counter regulatory interleukin-10. *J Clin Immunol.* 2004;24(6):664-674.
5. Pardo CA, Vargas DL, Zimmerman DL. Immunity, neuroglia and neuroinflammation in autism. *Int Rev Psychiatry.* 2005;17(6):485-495.
6. James SJ, Melnyk S, Jernigan S, et al. Metabolic endophenotype and related genotypes are associated with impaired methylation capacity and oxidative stress in children with autism. *Am J Med Genet B Neuropsychiatr Genet.* 2006;141(8):947-956.
7. Prance GT, Beentje H, Dransfield J, Johns R. The tropical flora remains undercollected. *Ann MO Bot Garden*. 2000;87(1):67-71.
8. Govaerts R. How many species of seed plants are there? *Taxon*. 2001;50(4):1085-1090.
9. Campbell TC, Campbell TM II. *The China Study*. Dallas, TX: Benbella Books; 2006.
10. Pangborn J, Baker SM. *Autism: Effective Biomedical Treatments.* 2nd ed. San Diego, CA: Autism Research Institute; 2005.
11. Cavalieri EL, Rogan EG. A unified mechanism in the initiation of cancer. *Ann N Y Acad Sci.* 2002 Apr;959:341-354.
12. Baker SM. Clinical tuning: rhythms, resonance, and harmony. *Integr Med Clin J.* 2005;4(3):10-13.