Evolving Health

The Origins of Illness and How the Modern World Is Making Us Sick

Noel T. Boaz
To Homo sapiens,
that they may learn to live with themselves
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At times, I have felt overawed by the immensity of the subject of evolutionary medicine, and concerned that the book would jump tracks from the hypoglossal to the Panglossian, or from the homeotic to the homeostatic. I can only beg the reader’s indulgence if I have lingered too long on long-lost organismal details or paid too little attention to certain important topics that should have been dealt with in more depth. I alone am responsible for any misdirected leaps of logic or unwarranted extrapolations that the following pages may contain.
Introduction

It is possible to prevent most modern diseases. Strangely, this secret to health is not waiting to be unveiled by white-coated lab scientists. It has already been unearthed by dusty paleontologists. It is the lifestyle of our ancestors.

Human evolution is the framework for this book, but it is health and prevention of disease that give it its focus. The evolutionary framework is a *scala adaptiva*, made up of evolutionary levels to which each of our adaptations belongs. Our ability to breathe air, for example, is inherited from our amphibian forebears who lived some 300 to 340 million years ago (Level 8 in our scheme, introduced in chapter 2). When something goes wrong with our ability to breathe then, such as in the lung disease emphysema, there is a fundamental unraveling of a Level 8 adaptation that natural selection crafted many, many years ago. By understanding how the adaptation came about and then dissecting how a modern disease deranges that adaptation, we gain a very good idea of the disease. This knowledge helps sufferers of the disease understand and work to alleviate their symptoms, and it helps others prevent the disease.

This book is organized by evolutionary levels. Birth defects and mutations, discussed in chapter 3, are ultimately traceable to failures of adaptations of our extremely remote single-celled ancestors (at Levels 1 and 2). Cases of direct poisoning of our cells, as by mercury, for example, even recall adverse chemical reactions before the advent of life itself (Level 0). Our cells’ competition (and coevolution) with viruses is probably almost as ancient, and is discussed in chapter 4. Flu and the common cold are the most familiar modern representatives of Level 2 and 3 diseases. Cancer is a failure of the major adaptation of Level 3, that of cells living together cooperatively, and is treated in chapter 5.
Hormones became important at this same level as ways for cells to communicate, and they mediate such reproductive system cancers as breast carcinoma and prostate cancer, discussed in chapter 6. Heart disease, the number one cause of death in the Western world, originates as a problem of salt and water balance, an adaptation of our fish ancestors at Level 7. It is the topic of chapter 7. We evolved air-breathing lungs as amphibians at Level 8, and failure of this adaptation leads to such diseases as emphysema and lung cancer, dealt with in chapter 8. We developed a perpetual sweet tooth—for the energy-rich sugars and vitamin C in fruits—as early primates in Level 11. Today, carbohydrate-rich sources of sugar lead to diabetes mellitus type II, discussed in chapter 9. Mutations to conserve the body’s water occurred at Level 14, in our ape ancestors, the precursory condition for gout (chapter 10). Many musculoskeletal and mechanical problems, such as back pain and flatfeet, track back to our adoption of an upright, two-legged posture as hominids (Level 15 and chapter 11). Chapter 12 discusses diseases of the digestive tract that are failures of our basic hominid dietary adaptation (also Level 15), although some other digestive problems that affect only some groups of people, such as celiac sprue, are of very recent evolutionary origin (Level 17). Psychiatric illnesses (discussed in chapter 13) represent failures of our complex brain—a hallmark of humanity (Level 16). Earlier adaptations then show through, as in obsessive-compulsive disorder, when behavior becomes rigid, stylized, and repetitive, recalling adaptations inherited from our Level 9 reptilian ancestors and controlled by the ancient reptilian parts of our brain.

The second theme in the book is “adaptive normality.” By viewing the many levels of human evolution from the present, we can come to understand what our normal ranges of environment, anatomy, physiology, and behavior really are. Our internal body temperature, for example, is normally between 98 degrees Fahrenheit and 99 degrees Fahrenheit, and when it lies outside this, something is wrong. In this book we will seek the evolutionary reasons for why our various gauges are set where they are. We are at thermal equilibrium when the temperature next to our skin is about 70 degrees Fahrenheit, indicating that we humans are at base tropical creatures, evolved over millions of years, mainly on the African continent. Our physiology maintains stability as much as possible
around this set point—sweating if we are too hot or shivering if we are too cold. Illness happens when our coping mechanisms with environmental change are overwhelmed or stressed—for example, in fever or hypothermia.

A lack of fit between environmental conditions and the adaptations of an individual is termed “discordance,” and it is the major cause of preventable disease in the modern world. If a human being tried to live without clothes, shelter, and fire in the Northern Hemisphere winter, for example, he or she would soon die because of the extreme discordance between our tropical adaptation and the low environmental temperatures. Most of the discordances that we deal with today are of much lower magnitude, but their cumulative effects over time can be no less deadly. Our goal in this book is to reduce discordance and to find the optimal operating ranges or zones for major human adaptations. Seeking adaptive normality is a new concept in medicine, but it is important to you in understanding health and disease, and in maintaining a healthy lifestyle.

Although an integrated evolutionary understanding of health and disease promises a powerful new scientific approach, evolutionary medicine is not yet mainstream; however, it is not “alternative medicine,” either. It is firmly grounded in the Western scientific tradition and fully incorporates modern scientific findings. It also has its detractors. James Bull, a molecular biologist at the University of Texas, has called evolutionary medicine “mostly a guessing game about how we think evolution worked in the past—what it designed us for.” Of course, like all science, it is guesswork initially, but with the new tools of molecular biology and geochronology, combined with the old methods of comparative anatomy, pathology, and clinical medicine, the hypotheses of evolutionary medicine can be tested. For example, we can decide competing evolutionary explanations of gout discussed in chapter 10 by putting together molecular and paleontological data to date the gene mutations underlying the disease. And we must reassess the paleodietary proscription against eating dairy products (as dietary components too recently evolved to be good for us) because clinical experience has shown that people whose herding ancestors evolved lactase genes in order to effectively digest milk do just fine eating dairy products (chapter 14). Evolutionary medicine is built of hypotheses that can be disproved by scientific data
that contradict them or by clinical experience not consistent with predicted outcomes.

Evolutionary medicine promises not only a revolutionary new approach to the science of medicine, but a powerful way for people to integrate a new understanding of health and lifestyle to prevent disease. The most common and debilitating modern diseases can be prevented—by knowledge, and action based on that knowledge. Patients can assume more responsibility for themselves, and as prevention becomes more and more a part of standard medical practice, they can become full partners with their doctors in maintaining their health. By following the suggestions in this book, your quality of life, especially as you age, will stay high, and your life span may actually be lengthened. In medical parlance, the lifestyle changes advocated here will decrease morbidity, likely delaying mortality until older ages than now generally seen. Nothing advocated in the book will hurt you, not even adding insects to your diet (chapter 14), but as you regain your evolutionary birthright and evolve back to health, consult your physician.
Is it possible that something that makes us feel good might really not be good for us? In nature, animals are adapted to live in a particular way, and they almost certainly derive pleasure from doing the things that they do. Dogs, for example, adapted to hunting in packs, get a kick out of chasing large moving things. In the past these were always elks, moose, wildebeests, and even the odd infirm mammoth. Today, however, if a suburban dog chases down and takes a bite out of the only large prey available to him, the rolling rubber tire of a garbage truck, it could be fatal. What the dog has evolved to like to do is injurious to its health and longevity.

Sometimes even severe object lessons cannot teach the dog otherwise. A dog I had when I was six, Blackie, loved to chase cars. One day Blackie’s leg was broken by a mail truck he was pursuing. The vet thought that Blackie should be put to sleep, but we had a cast put on the leg and it eventually healed. I hoped that this painful episode would convince Blackie to reform, but it didn’t. Only a few months later Blackie was found smashed in the road.
and was taken away by the sanitation workers when I was at school. I wondered for years what deep-seated desire it was that made dogs chase moving motor vehicles. After losing two more dogs, otherwise well trained, to similar highway accidents, I eventually concluded that this behavior was hardwired in them—left over from some Pleistocene adaptation that had benefited their species in the past but now was killing them.

Unlike dogs, human beings are omnivorous—scavenging, gathering, and hunting primates who can eat just about anything that crawls, walks, swims, or flies. Although few of us have a problem confusing a car with our next meal, we have a flaw as hardwired as our dogs': fat. Especially tasty to us are food items that are full of fatty acids—energy-rich molecules that become stored around our midsections in fat cells and substances craved by our voracious lipid-rich brains. We also love sugar, a predilection developed by our fruit-eating ancestors who, when they found a tree with ripe, sweet fruit, gorged on it to excess. The realities of our evolutionary past were that fats and sugars were in short supply and famine might hit tomorrow. These evolved tastes were adaptive, and it made evolutionary sense for our hominid ancestors to store up energy reserves for lean times ahead. Today, we store up dessert, eating it even after our stomachs are full, simply because it tastes so good, and building up fat cells that famine will never diminish.

Human evolution is both history and current reality. Its twists and turns have bequeathed to us inborn responses and anatomical traits that serve to adapt us admirably to our many activities and undertakings. But we also obey obviated evolutionary commands. We fear the dark, for example, not because this is a rational decision on our part, but because we are descended from millions of generations of visually oriented, day-living primates systematically preyed upon by nocturnal predators. Amazonian snakes are major predators of New World monkeys still today, and ancient leopards left bite marks on South African australopithecine fossils 3 million years ago. Over the long course of our evolution things that went bump in the night really could kill us. Fear of the dark was an evolutionary outgrowth of natural selection—the more fearful, more vigilant, and thus most quickly reacting individuals avoided being eaten by the snakes, large raptorial birds, and cats that preyed on
small-bodied, tree-living primates. Today, innate fear of the dark can still be of survival advantage to us, as when we become nervous and suspicious when walking down a poorly lit urban street at night. But irrational fear of the dark seems to be primarily a characteristic of children, whose small size and experience would have made them most vulnerable to predation in the past. Natural selection hardwired this primate response to danger the same as it did the “freeze-crouch” of a frightened fawn.¹

Many human traits and behaviors that were adaptive in our evolutionary past may now be maladaptive because the environment in which we arose has changed. In fact, the habitats in which we find ourselves today have changed so drastically and so rapidly from the conditions in which we evolved that it is surprising that we live in them as well as we do. The ultimate irony is that the biggest agent of change in our environment—the architect of our various habitats on Earth—is none other than Homo sapiens.

The Cultural Econiche

Every species has its own econiche—a place in nature where it is at home. An econiche includes not only a physical location on Earth, but the dietary adaptations, daily activity patterns, mating behaviors, and physical attributes that adapt a species to a particular way of life. Hominids, those two-legged creatures that evolved from apes in the African Miocene about 7 million years ago, used to know their place. Their ancestral biological econiche was in the savannas and woodlands of Africa.² But their descendants, the human beings, have more recently wandered widely over Earth and have somehow lost this knowledge. As a species, we have lost sight of home.

Culture, the composite of all learned human behavior passed on socially, was the hominids’ passport out of Africa and into Eurasia, 1.9 million years ago.³ Culture makes human beings very adaptable organisms, and it allows humans to cope more rapidly in different circumstances than would be possible left only with their biological rate of evolutionary change. For this reason anthropologists consider that humans have now evolved to live in a new econiche, a cultural econiche.⁴ Instead of slowly evolving biologically in