An Unnatural History of Emerging Infections

Book by Ron Barrett and George J Armelagos
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> "Modern humans are 'stone agers living in the fast lane'"

Reviewed by Vijay Shankar Balakrishnan, Ph.D.

An Unnatural History of Emerging Infections is essentially a time machine that takes the reader way back to the pre-historic age before bringing him/her again to the current world through deadly routes that perhaps few have had the chance to travel. It is a well-written verbal documentary bringing in front of the eyes the different tales of how we loftily contracted infections from nature, albeit unnaturally. The book is a gourmet diet for an interested reader who hungers for anecdotes, arguments, and expert interpretations with credible references on what separates modern man from the pre-historic in terms of eating, living, and getting sick. The book also dives into whether there is a chance to undo any damages that we have done throughout our history, and if yes, how, but if no, why! The ultimate goal of the book is to do away with three commonly held myths about emerging infections: first, that our conception of emerging infections like extensively drug-resistant tuberculosis is a new phenomenon; second, that this phenomenon is natural or spontaneous; and third, that the current determining factors of emerging infections are different from those in the past.

The authors divide the book into three sections based on the concept of epidemiological transition that was first laid out in 1971 by Abdel Omran. In following this concept, the authors identify a First Transition, including the pre-historic medical geography, a Second Transition, covering the Agricultural and Industrial Revolution; and a Third Transition, scaling the post-antibiotic era (i.e., from the discovery of antibiotics up to present day). The book tries to put together a number of historical notes with the help of several medical concepts and technologies in addition to contributions from the fields of paleopathology, bioarchaeology, palynology, and nosology, among others. And taking man's natural quest – subsistence, settlement, and social organization – as the threads, the authors connect the dots by untying a number of knots, while still leaving some for the future to untie.

In a nutshell, the authors' arguments are built around the idea that we have been coming to terms with microbes since pre-historic times. However, lately we consider it as a war and aim at winning it. Their three main supports for this conclusion are that (a) we largely have become sedentary rather than being hunters and gatherers, (b) we have taken up agriculture seriously and industrialized it with technologies, and (c) as a social animal, we have fallen prey to industrialization so as to construct and globalize hierarchies in societies. This has left us in a situation far worse than previous ages that had fewer or no medical facilities. The authors argue that modern humans are "stone agers living in the fast lane".

Our hunting-gathering world had far fewer people living in small groups. Man was very active and ate

a variety of foods, experiencing "nutrition diversity", which the authors label as a "Paleolithic Prescription" for modern man to follow. In addition to a lot of physical activity, survival historically demanded less sedentism and scarce/small settlements. Yet people contracted zoonotic infections such as tryponosomiasis from insect bites or the animals that they ate. Primary infections were thus blood-borne or vector-borne. And owing to the population structure and that social set up, acquired infections were acute and were only among the small nomadic, foraging groups. Even without advanced medicines, Paleolithic foragers survived successfully until they started migrating around the world, settling, and taking up agriculture. Once the domestication of plants and animals for food began, taming animals for husbandry was necessary, and man therefore gradually began to contract diseases from animals.

On top of this, due to the loss of a balanced diet thanks to less diverse nutrition, spinal injuries and additional diseases arose with the dawn of the agricultural and sedentary lifestyle as humanity transitioned from Paleolithic to Neolithic Age. With the help of early burial records, the authors are able to shed light on the onset and practice of social hierarchy that enabled later ancestors to live in different social classes – the rich getting more resources through work from the poor – driving differences in nutrition and life style. What more would a pathogen need when a healthy body is compromised by factors like these? Infections like small pox, syphilis, and plague easily arose. During the medieval age, as travelers like Columbus voyaged around the world, diseases from the Old World migrated along with them to the New World. As a hallmark example of this the authors point to the tragic impact of Old World diseases on Native American deaths. During this first transition in epidemiology, numerous mothers lost their children at early age.

After the rise of agriculture came the Industrial Revolution. The lessons learned from the explorers' 'gift' of syphilis and other epidemics created heightened awareness of the importance of sanitation during the industrial revolution. As a reminder, the authors point out that this was before the emergence of germ theory and antibiotics, and people learned important lessons from the first transition about keeping ourselves and our environment clean. During this time came the rise of people like Florence Nightingale who revolutionized healthcare and brought death rates down through improvements in nursing practices such as sanitation, hospital ventilation, and being nice to patients.

Then history saw the rise of microbiologists and physicians like Joseph Lister, Robert Koch, Paul Ehrlich, Louis Pasteur, and Edward Jenner, among others. According to the authors, all of their "discoveries" were indeed important and ground-breaking, yet they paled in significance in comparison to the improved sanitation practices. Population gradually grew, mainly due to lower death rates, with sanitation practices keeping diseases like cholera, tuberculosis and plague at bay. While the western world was growing affluent with improved health care, several poor countries were losing many of their citizens to deadly diseases as people started traveling across borders more than their ancestors. Infections brought back with travelers were called "re-emerging infections". Not only that, but with rising populations, both rich and poor worlds saw their worst sides due to malnutrition, social inequalities that seeded poor hygienic practices, and chronic infections and inflammatory diseases co-existing in immune-compromised patients. This latter challenge created a variety of syndemics (many diseases occurring together), such as an HIV infection along with complications like cancer or pneumonia.

The world later began to see the era of antibiotics during the world wars, followed by the abuse of

antibiotics and chemical fertilizers in farming and medicines, practices that have only just recently begun to be challenged. With animals for food are being grown in large herds, there seems to be no substantial difference in in food-borne illnesses between highly urbanized areas and areas with poor plumbing and sanitation. And, also important, when the industrial revolution brought technological advances, people began to travel alongside many other people – both sick and healthy. When distances in the world are measured in hours by high-tech vehicles, then we begin to witness epidemics and pandemics of SARS, MERS, and a variety of influenzas spreading as easily as touching a dirty doorknob.

During this third transition, we are now realizing the results of antibiotic misuse, industrialization, globalization, and urbanization, and are rapidly finding that we may be on the losing side of the "war" with microbes. And we, on daily basis, are getting scary news that we are the evolutionary tools and processes for microbes to evolve. But is there a way to win? Can we win, in the first place? Will the resistance continue to evolve? Or is there an undo button? If yes, how far and how quickly can we get things in order?

The book does not answer all of these questions, but many of them can be addressed in a few sentences. We've contracted infections as a result of agriculture, industrialization and globalization, which would need lot of time to be undone or attenuated evolutionarily. Until then, our efforts and hopes may rest on a combination of controlled use of antibiotics, trying as much as possible to follow a paleolithic prescription, continued development of improved antibiotics, and living as an altruistic social animal. If we cannot undo the damages we have created for ourselves, hopefully we can at least slow down the catastrophe. At the end of reading this highly palatable book, the reader is left in a provoked state, with questions rather than answers to make – or at least look forward to – changes in viewing and living life while learning from our past.

Vijay Shankar Balakrishnan is a freelance science writer from Germany. He holds a Ph.D. in Interdisciplinary Nanoscience, with a primary focus on the biochemistry and biophysics of peptides and membranes. Vijay devours anything that is wrapped with sensible science. Apart from writing, his interests surround reading, music, cooking, and photography.