Why would I want my doctor to have studied evolution?

By: Shobha Topgi

Last winter, I tried all available over-the-counter medications to alleviate my flu. When I could not bear any more suffering, I consulted my doctor. Within days, the prescribed medication reduced the symptoms. Thinking that my body could independently fight off the rest of the flu, I decreased the dose of medication. The next day, I was once again in my previous flu state. My doctor in turn prescribed a more potent drug. As a student of science, I wondered what was happening with my body and its defense mechanism. Evolutionary biology indicates that these body responses are defensive actions to ward off the foreign organisms lethal actions.

When looking into historic flu incidences, I was stunned to learn of the 1918 flu pandemic. Further research led me to Darwin's evolutionary theory which explained the pandemic phenomena. Molecular biologists used tissue from a body that had been frozen in the Alaskan permafrost for almost a century to sequence the three unknown genes from the 1918 flu virus. They found that over the years, the 1918 strain had lost its reliance on trypsin, an enzyme that viruses normally borrow from their hosts as they infect cells. Instead, the 1918 strain depended on an in-house enzyme. As a result, the virus was able to reach remarkably high concentrations in the lung tissue of tested mice, helping explicate its virulence in humans. The finding could point to new ways to prevent similar deadly infections in the future.[5]

The golden age of antibiotics was unfortunately short-lived. Evolutionary theory predicted that bacterial resistance would happen. Given time, heredity, and variation, any living organisms will evolve when a selective pressure is introduced.[3] During the past few decades, many strains of bacteria have evolved resistance to antibiotics. Evolutionary theory gives doctors and patients some specific strategies for developing novel effective antibiotics.[1]

Though infections, injury, intoxication, genetic diseases, aging, allergy, cancer and mental disorders are pervasive over the world, the extent, intensity, mode and nature varies from race to race and location to location. Variation among individuals is a hallmark of living systems. In theory, variation is central to the process of evolution by natural selection. Mankind's self-made environment has changed too much, too swiftly. Like all biological systems, human populations are continually locked in evolutionary arms races with pathogens that raid our bodies. The evolution of disease-causing organisms may outpace our ability to conceive new treatments, but studying the evolution of drug resistance can help us slow it. Learning about the evolutionary origins of diseases may offer clues about how to treat them.[3]

Genetics and genomics provide a wealth of examples of how evolutionary principles can be used to gain a better basic understanding of fundamental biological processes and an understanding of the molecular underpinnings of human health and disease. Evolution and selection are essential to genomics and genetics, and genomics and genetics are essential to variation and disease. Only by tracing physical signs and symptoms back through physiology, biochemistry, and molecular biology to genomics and genetic variations, we can locate the origins of diseases and develop strategies to treat and prevent them. Therefore, the natural selection and evolution are apparent in analyses of disease that define diagnosis and treatment.[4]

Symptoms such as cough, fever, and diarrhea are useful responses shaped by natural selection, but knowing when is it safe to block them requires studies grounded in an understanding of how selection shaped the systems that regulate such defenses.[1] Doctors usually try to find medication that would relieve these unpleasant symptoms rather than evaluating the situation in the light of evolutionary mechanism. They have not wondered enough about why these symptoms are there in the first place. Usually the body

is attempting to heal itself in disease. These and other examples make a strong case for recognizing evolution as a basic science for medicine.

1. In the early stages of a bacterial infection, the iron count is often low since the liver and other organs are pulling the iron out of the blood as a way of depriving the bacteria. A physician without knowledge of evolutionary biology would consider it as an abnormality and would prescribe iron restoratives.[2]
2. Obstetricians have not considered the possibility that nausea of pregnancy may be a defense against toxins. Morning sickness has evolved as a mechanism that takes account that fetal tissues are more vulnerable to toxins. Doctors need to consider the background of the mother and the developmental aspects of the child in order to prescribe the appropriate diet and/or medication.[2]
3. Psychiatrists still act as if all anxiety, sadness, and jealousy is abnormal and they do not yet look for the selective advantages of genes that predispose to schizophrenia and bipolar disorder.[2]
4. Rheumatologists do not know that the high uric acid levels of gout may have been selected to slow aging and they prescribe anti-inflammatory agents that may hasten hip degeneration.[2]
5. Biochemistry courses highlight the bilirubin metabolism, but it is evolutionary biology that explains its vital role as an efficient free-radical scavenger. In the absence or inactivation of that metabolic system, a doctor would prescribe a random free-radical scavenger that would in turn exacerbate the situation and prove toxic to the metabolism of the patient.[1]
6. In primitive tribal life, only 1 or 2 percent were nearsighted. In today's society, 25 percent of the population grows up nearsighted, which is incredible from an evolutionary perspective. Over the years, something in our society and living style has dramatically changed.[6]

Nothing in medicine makes sense except in the light of evolutionary biology. That is why my doctor would need to have studied evolutionary biology. Doctors would better understand the root cause of a variety of diseases and look into different possibilities for disease prevention and treatment, if they considered the developmental history, environmental aspects, genetic background and body defence mechanisms. I also believe that if the evolutionary medicine paradigm is adopted, health care systems would save billions of dollars in addition to countless lives.

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