16.2: ANTHROPOLOGY AND THE BIOCULTURAL PERSPECTIVE

Evolutionary biology is a field of study that investigates the ways that natural processes have shaped the development of life on Earth, producing measurable changes in populations over time. Humans, Homo sapiens, are a special case in the discussion of evolution. We are a relatively young species that has been on Earth for only about 195,000 years. Although this may sound like a long time, compared with other animals, humans are newcomers and we have been subject to processes of natural selection and adaptation for less time than many other living things. In that short time period, human lifestyles have changed dramatically. The first humans evolved in Africa and had a foraging lifestyle, living in small, kin-based groups. Today, millions of people live in crowded, fast-paced, and technologically advanced agricultural societies. In evolutionary terms, this change has happened rapidly. The fact that these rapid changes were even possible reveals that human lifestyles are biocultural, products of interactions between biology and culture. This has many implications for understanding human health.

The theory of natural selection suggests that in any species there are certain physical or behavioral traits that are adaptive and increase the capacity of individuals to survive and reproduce. These adaptive traits will be passed on through generations. Many human traits contributed to the survival of early human communities. A capacity for efficient walking and running, for instance, was important to human survival for thousands of years. However, as cultural change led to new lifestyles, some human characteristics became maladaptive.

One example is the obesity epidemic that has emerged all over the world. According to the Center for Disease Control and Prevention, more than one-third of the population of the United States is obese. Obesity is considered to be a “disease of civilization,” meaning that it did not exist in early human populations. Taking a biocultural evolutionary approach to human health, we can ask what traits characteristic of early human foraging populations might have encouraged an accumulation of fat in the human body. The answer comes from the evidence of food shortages among foraging populations. In fact, 47 percent of societies that forage experience food shortages at least once per year. Another 24 percent experience a shortage at least every two years. When taking this into account, the ability to retain
body fat would have been advantageous for humans in the past. Women with more body fat could give birth to healthy babies and breastfeed them, even in periods of food scarcity. It is also possible that women and men would have viewed body fat as a sign of health and access to resources, choosing sexual partners based on this characteristic. If so, powerful biological and cultural forces would have contributed to genetic traits that led to efficient metabolism and higher body fat.

With the development of agriculture, calories became more easily available while many people in the population became more sedentary. Traits that were once adaptive became maladaptive. The development of cultural preferences for foods high in fat and sugar, such as the "standard American diet" (SAD) is directly associated with obesity. These cultural changes have had a negative impact on health in many places. In Polynesia, for instance, obesity rates were around 15 percent in traditional farming communities, but climbed to over 35 percent as people moved to cities.6 This is an example of the biocultural nature of many human health challenges.

Another example of this biocultural dynamic is sickle cell anemia, an inherited disease that can be fatal. A person who inherits the sickle cell gene from both parents will have red blood cells with an usual sickle (crescent) shape. These cells cannot carry oxygen as efficiently as normal red blood cells and they are also more likely to form painful and dangerous blood clots. Ordinarily, genetic conditions that make it more difficult for individuals to survive or have children, will become less common in populations over time due to the effects of natural selection. From an evolutionary perspective, one might ask why a deadly genetic condition has remained so common in human populations.

The cultural context is important for answering this question. The sickle cell gene is found most often in human populations in Africa and Southeast Asia where malaria is widespread. Malaria is a mosquito-borne illness that can be deadly to humans. People who have inherited one copy of the sickle cell anemia trait (instead of the two copies that cause sickle cell disease) have resistance to malaria. This is a significant adaptive trait in parts of the world where malaria is widespread. There is some evidence that malaria became a significant threat to human health only after the invention of agriculture. The deforested areas and collections of standing water that characterize agricultural communities also attract the mosquitos that carry disease. 7 In this case, we can see biocultural dynamics in action. Because resistance to malaria is an adaptive trait, the sickle cell gene remained common in populations where malaria is present. In parts of West and Central Africa, up to 25 percent of the population has the sickle cell gene. While sickle cell anemia is still a deadly disease, those who inherit a single copy of the gene have some protection from malaria, itself a deadly threat in many places. This example illustrates the biocultural interaction between genes, pathogens, and culture.

Infectious diseases generally do not have an adaptive function for humans like the examples above, but many infectious diseases are influenced by human cultural systems. Because early human communities consisted of small groups with a foraging lifestyle, viruses and bacteria transmitted from person to person were unlikely to result in large-scale epidemics. Healthy individuals from neighboring groups could simply avoid coming into contact with anyone who was suffering from illness and outbreaks would be naturally contained.8

The rapid increase in the size of human communities following the invention of agriculture changed this pattern. Agriculture can support more people per unit of land and, at the same time, agriculturalists need to live in permanent urban settlements in order to care for their crops. In a cyclical way, agriculture provides more food while also requiring that people have sizeable families to do the necessary farm work. Over the course of several thousand years, agricultural communities became increasingly densely populated. This had many implications for local ecology:
problems disposing of waste and difficulty accessing clean water. A prime example of the health effects of the transition to urban settlements is cholera, a water-borne illness that spreads through water that has been polluted with human feces. Cholera, which was first detected in urban populations in India, has killed tens of thousands of people throughout history and continues to threaten populations today, particularly in developing countries, where access to clean water is limited, and in places that have experienced natural disasters.9

From an adaptive perspective, human beings die from infectious diseases because they do not have immunity to them. Immunity can be built up over time for some diseases, but unfortunately only after the illness or death of many members of a population.10 When a new infectious disease reaches a population, it can wreak havoc on many people. Historically, several new infectious diseases are known to have been introduced to human populations through contact with livestock. Tuberculosis and smallpox were linked to cattle and influenza to chickens. When humans domesticated animal species, and began to live in close proximity to them, new routes for the transmission of zoonotic disease, illnesses that can be passed between humans and animals, were established.11 Living in cities accelerates the spread of infectious diseases and the scale of outbreaks, but may also contribute to the natural selection of genetic traits that confer resistance to disease. This biocultural evolutionary process has been documented in urban populations where there are genes providing some resistance to leprosy and tuberculosis.12