Transcript Is Human Evolution Speeding up or Slowing down?

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The Tibetan high plateau lies about 4500 meters above sea level, with only 60% of the oxygen found below. While visitors and recent settlers struggle with altitude sickness, native Tibetans sprint up mountains. This ability comes not from training or practice, but from changes to a few genes that allow their bodies to make the most of limited oxygen. These differences are apparent from birth— Tibetan babies have, on average, higher birth weights, higher oxygen saturation, and are much likelier to survive than other babies born in this environment. These genetic changes are estimated to have evolved over the last 3,000 years or so, and are ongoing. That may sound like a long time, but would be the fastest an adaptation has ever evolved in a human population. It's clear that human evolution isn't over— so what are other recent changes? And will our technological and scientific innovations impact our evolution? In the past few thousand years, many populations have evolved genetic adaptations to their local environments. People in Siberia and the high arctic are uniquely adapted to survive extreme cold. They're slower to develop frostbite, and can continue to use their hands in subzero temperatures much longer than most people. They've undergone selection for a higher metabolic rate that increases heat production. Further south, the Bajau people of southeast Asia can dive 70 meters and stay underwater for almost fifteen minutes. Over thousands of years living as nomadic hunters at sea, they have genetically-hardwired unusually large spleens that act as oxygen stores, enabling them to stay underwater for longer— an adaptation similar to that of deep diving seals. Though it may seem pedestrian by comparison, the ability to drink milk is another such adaptation. All mammals can drink their mother's milk as babies. After weaning they switch off the gene that allows them to digest milk. But communities in sub-Saharan Africa, the middle east and northwest Europe that used cows for milk have seen a rapid increase in DNA variants that prevent the gene from switching off over the last 7 to 8000 years. At least in Europe, milk drinking may have given people a source of calcium to aid in vitamin D production, as they moved north and sunlight, the usual source of vitamin D, decreased. Though not always in obvious ways, all of these changes improve people's chance of surviving to reproductive age— that's what drives natural selection, the force behind all these evolutionary changes. Modern medicine removes many of these selective pressures by keeping us alive when our genes, sometimes combined with infectious diseases, would have killed us. Antibiotics, vaccines, clean water and good sanitation all make differences between our genes less important. Similarly, our ability to cure childhood cancers, surgically extract inflamed appendixes, and deliver babies whose mothers have life-threatening pregnancy-specific conditions, all tend to stop selection by allowing more people to survive to a reproductive age. But even if every person on Earth has access to modern medicine, it won't spell the end of human evolution. That's because there are other aspects of evolution besides natural selection. Modern medicine makes genetic variation that would have been subject to natural selection subject to what's called genetic drift instead. With genetic drift, genetic differences vary randomly within a population. On a genetic level, modern medicine might actually increase variety, because harmful mutations don't kill people and thus aren't eliminated. This variation doesn't necessarily translate to observable, or phenotypic, differences among people, however. Researchers have also been investigating whether genetic adaptations to a specific environment could appear very quickly through epigenetic modification: changes not to genes themselves, but to whether and when certain genes are expressed. These changes can happen during a lifetime, and may even be passed to offspring— but so far researchers are conflicted over whether epigenetic modifications can really persist over many generations and lead to lasting changes in populations. There may also be other contributors to human evolution. Modern medicine and technology are very new, even compared to the quickest, most recent changes by natural selection— so only time can tell how our present will shape our future.