

# Human adaptaiion



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Human Adaptation Have you ever wondered how or why some humans have the ability to tolerate milk and some don't? Perhaps humans are passed down a trait from their mother or father that allows for them to digest milk compared to those individuals who can't. In many populations milk comes from several types of animals with the cow being its main source.

In the year of 1997, a woman by the name of Sarah Tishkoff decided that she would go to Africa to see if she could trace any history of lactase persistence in ones genetic origins through the collection of DNA samples and tests from 470 individuals from 43 different ethnic groups. Through the results of her tests, could it be possible to predict if Neandertals had the ability to tolerate milk If so this could also explain what would happen to any population if they were to stop drinking milk all together. In the human body there needs to be a number of enzymes allowed to metabolize lactose which is a sugar that is produced only when there isn't a significant source of glucose present (Robert & Joan B.

, 2012). As in the majority of adults get their milk either from their mother, an animal (mostly the cow), or in powder form, tend to stop drinking it at an early age typically around 5 years old. Some humans are not even able to tolerate milk as an infant due to natural selection which acts only on already existing genes such as survival and reproductive traits (Robert & Joan B., 2012). Through several evolutionary periods and thousands of years ago, lactase persistence spread throughout human populations. One of the earliest populations is known to have originated in Europe (Check, 2006).

The genetic changes that are needed for a human to tolerate milk include sexual reproduction, natural selection, mutation and genetic drift. Genetic mutation was needed for humans to tolerate lactose since humans were not designed to digest milk due to lactose sugar that is the main source in milk. Northern European ancestors domesticated cattle; therefore they were able to tolerate lactose compared to Southern Europeans who did not have the mutation to digest lactose (Check, 2006). Sexual reproduction and random mating can change the genotypic frequencies in humans that allow them to be able to tolerate milk by looking at Hardy Weinberg's theory on population genetics which is the study of processes that change gene frequencies within a population (Robert & Joan B., 2012). Weinberg's theory states that if no changes are occurring within a population, gene frequencies at a locus remain the same. If change is occurring, evolution is happening within the population. In Africa most of the populations were pastoralist and some hunter-gatherers.

Genetic variation for milk digestion turned up in the African population in Tishkoff's studies. Three different mutations were linked to a chromosome, near the gene coding for the enzyme "lactase" (Check, 2006). Knowing that mutation is the only source of new alleles and genetic information, they based their information off this and concluded that the mutation evolved over a 7, 000-year time span, when different groups of Africans were moving from being hunter-gatherer to pastoral cultures. If a population, depending on the size, were to stop drinking milk all together one could assume that genetic drift would come into play. Random change in allele frequency over time can cause genetic drift. Within a population,

separate small populations will form over time causing sampling variation to occur which can lead to changes in the gene frequency among each population.

Allele frequency will began to fluctuate due to genetic drif, t meaning that alleles could be lost and the other fixed in a population causing a population to become genetically different from one another. If a population stopped drinking milk altogether, mutations will provide a continual mechanism of genetic changes, continually opening doors to possible frequency increases, thus evolution of the human genome. Thereafter, the smaller populations could migrate and spread the allele in other populations (Robert & Joan B., 2012). Milk is the main source of nutrients and water when there is a drought. Humans those are able to tolerate milk intake important minerals, calcium and magnesium. Whereas humans that are not able to drink milk do not have the ability to digest it leading to harmful results such as diarrhea and dehydration.

The fact that this trait of the ability to tolerate milk has been selected for independently in different regions is a good indication that it is the result of selective pressure on humans. This has been called the best example of convergent evolution in humans (Check, 2006). The question still remains as to if Neandertals were able to tolerate milk as adults.

Looking back on the article and multiple hypotheses I would have to say that they were not able to tolerate milk due to the fact that the lactase persistence trait didn't truly come into play until about 8, 000 years ago. Neandertals did not carry the variants that would have allowed them to

digest lactose based on human genome and natural selection. In conclusion, one could conclude the environmental changes based on what Darwin hypothesize that offspring survive in an environment would possess advantages for acquiring food and that frequency of the advantage would increase.

If the environmental conditions were to change then the offspring without the advantages to adapt to the changes would die off and over time, a common ancestor would take place to related humans/species. In Sara Tishkoff's studies she was able to analyze DNA samples to provide new insight into biological relationships between humans and their relations to lactose persistence and the study to illnesses and convergent evolutionary change in people. Work Cited Robert, B., & Joan B., S. (2012). How humans evolved. (6th ed.

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