Molecular evidence modern humans are interbred with now extinct species.

Abstract

An overview of leading molecular evidence that show humans are interbred with other species. DNA was traced to find our ancestry begins at Africa and humans migrated from there. There are many consequences to the interbreeding of homo sapiens both positive and negative. Some which allow humans to survive modern situations but also putting others at risk in other factors. The points discussed prove wrong the common misconception that humans are descendants from Neanderthals.

Introduction

The topic I will be discussing is molecular evidence that modern humans are inbred, three main forms of evidence will be explored, literature in the topic area was reviewed providing accurate information and different perspectives. This paper was made to inform the reader about the relationship of Neanderthals and modern humans.

Key words:

- Hybridization - the process of an animal or plant breeding with an individual of another species or variety.
- Mitochondrial DNA - the small circular chromosome found inside of mitochondria.

- Single nucleotide polymorphism - a type of mutation where only one base pair is affected.
- Denisovan - an extinct species of human of robust build, distributed from Siberia to SE Asia in the Upper Palaeolithic
- Haplogroup - a genetic population group of people who share a common ancestor on the matriline or matriline.

Nuclear DNA

It has been found that Homo sapiens have 1-4% of Neanderthal DNA except for people with a sole ancestry from Africa. This shows that homo sapiens originally descend from Africa and in fact migrated, several times, and bred with other species. 10% of primates hybridize, considering how many of them encounter each other, that is a big percentage. So, it would not be an unexpected occurrence within nature. Homo sapiens were not the only ones who inbred with Neanderthals.

Neanderthals bred with Denisovan species and people from south east Asia have been found to have 6% Denisovan DNA.

June 2015 researchers found that a skeleton from Romania had 6%-9% DNA from Neanderthals. This is the human with the greatest amount of neanderthal DNA. The skeleton was named the “Oase individual”. Anatomists suggested the jawbone had neanderthal traits, this was confirmed by the researchers that found that the neanderthal ancestor lived only about 200 years before the death. Three chromosomal segments of neanderthal ancestry are over 50 centimorgans, suggesting that the neanderthal ancestors lived 4-6 generations beforehand. The Oase population is thought to not have contributed a lot to later humans in Europe though as the individual did not share more alleles with later Europeans.

Hybridization helping modern immune systems.

Another evidential factor of hybridization is our immune systems. It is found that the interbreeding between Neanderthals, humans and Denisovans has equipped modern day humans with immunity genes. One of the more prominent results in the exchange is how we can adapt to our environments. The ability to resist pathogens and ward off infections and left some people more prone to allergies. Humans inherited toll like receptors (TLR) genes. They are conveyed on the cell surface, where they can detect and then respond to fungi, bacteria and parasite components. These are important in causing inflammatory and anti- microbial responses, also activating adaptive immune responses. Most changes in protein coding genes happened in last 6000-13000 years as human populations shifted in roles of gathering to farming. TLR and other immunity genes are present in higher levels of neanderthal genome ancestry than the remainder of coding genome.

Mitochondrial DNA and maternal ancestry

We are thought to all be descended from the same mother; she is commonly referred to as ‘mitochondrial eve’. She was thought to live about 200,000 years ago in Africa. The oldest haplogroups are found in Africa. During migration from Africa, they became macro-haplogroups to form the global phylogenetic tree. There are problems with ancient Mitochondrial DNA (mtDNA) being contaminated and being authentic, post-mortem damages can occur and errors during sequencing process, so there is a developed criterion for getting the authentic mtDNA multiple methods and approaches of analysis in the last two decades gave promising results. mtDNA was taken from 147 people from different geographic populations that was analysed by restriction mapping. mtDNA can only be passed on by the mother as sperm does not pass on mitochondria.

mtDNA also does not go thorough recombination, so the sequence remains the same over generations and is used at looking at ancestry and has a higher evolutionary importance compared to nuclear DNA. For example, there is a mutation called single nucleotide polymorphism, the mtDNA can mutate 5 to 10 times faster than nuclear DNA. By looking at patterns of mutation it is possible to trace back in maternal ancestry and comparing patterns between different groups.

Discussion

For a long time, claims of neanderthal and modern human interbreeding based on skeletal evidence seemed to be contradictory with DNA evidence. But the contradictions seemed to be cleared after a study Endicott et al (2010) study. I found a lot of papers got deleted that spoke about the evidence not coinciding. The direct evidence helps in mapping individuals' personal genetic histories and give information on traits like blood pressure (both systolic and diastolic), body mass index and more. Interbreeding with Neanderthals did not only have positive effects: the interbreeding can increase the frequency of rare variants in human populations leading to an overall worsening on the population's health. Also, according to a recent study showed that a big risk factor for infection and hospitalisations of SARS-CoV-2 is due to a gene cluster on chromosome 3 that causes respiratory failure in SARS-CoV-2, this is inherited from Neanderthals (July 3, 2020). This is an example of why it is so important to research ancestry.

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