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The daily life of Neandertals

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Neandertals are our closest evolutionary relative. They have been extinct for approximately 40,000 years, but lived across Europe and West Asia where they co-existed and interbred with humans. Despite their remarkable physical and genetic similarity to us humans, our understanding of their lifestyle is limited. Who were our enigmatic genetic cousins?

Understanding the diet of an ancient group can give insight into many aspects of their lives. What foods they ate shows how they interacted with their environments. In turn, knowing how the landscape was exploited and managed provides insight into knowledge, tools, and social structures that may have been in place. On a more personal note, food is a central part of day-to-day life and knowing what someone ate can help us see the world through their eyes. Recently, a new method has been developed to directly recover elements of an individual's diet from their dental calculus. This often-ignored deposit on the teeth has shed new light onto the Neandertals.

Dental calculus is a calcified layer of dental plaque, also known as tarter. Dental plaque is a slightly sticky layer of microbes that grow on the teeth. Small fragments of anything placed in the mouth may become stuck in the sticky plaque and preserved during the calcification. For three Neandertals, one from the cave at Spy in Belgium and two from the caves at El Sidron in Spain, their dental calculus was cleaned from their teeth. Then, using a technique called metagemomics all the preserved DNA within the dental calculus was retrieved and used to identify those ancient fragments, a direct insight into Neandertal diet.

The diets of the two regions were markedly different. DNA from the Spy individual indicated that he had consumed what we may expect of a Stone Age hunter: wooly rhino and sheep, alongside mushrooms. Meanwhile, the dental calculus of the El Sidron individuals did not contain any indication of meat, instead revealing a diet that contained mushrooms, pine nuts, forest moss, and poplar. This paints a picture of the Neandertals ability to adapt to their environment and survive on varying resources. However, the DNA didn't just give an indication of what these individuals ate as they sat down for dinner.

Contrasting with the Neandertal brutish stereotype, the Spy individual appears to have been self-medicating, a complex behaviour requiring the understanding of the effects of various, specific resources. He was likely combating the pain from a tooth abscess (which was visible by looking at the jaw bone) and a gut parasite (whose DNA was recovered from the dental calculus), and he was doing it with aspirin and antibiotics. The natural sources of these modern medicines were identified from the dental calculus. This individual had eaten material from the poplar tree, which contains the painkiller salicylic acid, (the active ingredient in aspirin), and the antibiotic producing fungus penicillium. Humans would, of course, also use these resources through the ages, culminating in today's modern medicines. The knowledge that Neandertals used these resources should be pulling down the boorish Neandertal stereotype and replacing it with a nuanced appreciation of their abilities.

While the behavioural similarities between humans and Neandertals are becoming evident, it is the microbes that are showing just what has changed. As noted, dental calculus is primarily made up of microbes. This microbial community is part of the microbiome, which plays key roles in health and disease, and is vertically inherited (read also the Break: The cutting EDGE: Bringing genomics to everyone). Despite being evolutionarily separate, ancient humans and Neandertals have exchanged at least one microbe. The full genome of a gum disease causing archaea (*Methanobrevibacter oralis*) was reconstructed from the Neandertal dental calculus. This genome was a subspecies of the one found in human mouths, which is what you'd expect when humans and Neandertals were different species (or subspecies). However, the archaea subspecies had diverged when humans and Neandertals were already two different species. How this transfer occurred is only speculation: via the environment, from sharing tools, even from kissing. However, it occurred, further demonstrating that humans and Neandertals directly interacted with one another.

Our picture of the Neandertals as a complex, intelligent group is growing ever clearer. Here, ancient DNA from the dental calculus of Neandertals inferred dietary differences between Neandertal groups and knowledge of self-medication. The transfer of at least one oral pathogen also strongly indicates that our ancestors and our genetic cousins had a social relationship. This research delivers new information in the ever more humane view of the cavemen.