

# Neanderthal gut microbiota and the bacteria helping our health

February 5 2021

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The research group analysed the ancient DNA extracted from 50,000 years old sedimentary faeces (the oldest sample of faecal material available to date). The samples were collected in El Salt (Spain), a site where many Neanderthals lived. Credit: University of Bologna

Neanderthals' gut microbiota included beneficial microorganisms that are also found in the modern human microbiome. An international research group led by the University of Bologna achieved this result by extracting and analyzing ancient DNA from 50,000-year-old fecal sediments sampled at the archaeological site of El Salt, near Alicante (Spain).

Published in *Communication Biology*, their paper puts forward the hypothesis of the existence of ancestral components of [human microbiota](#) that have been living in the human gastrointestinal tract since before the separation between the Homo sapiens and Neanderthals that occurred more than 700,000 years ago.

"These results allow us to understand which components of the human gut microbiota are essential for our health, as they are integral elements of our biology also from an evolutionary point of view," explains Marco Candela, the professor of the Department of Pharmacy and Biotechnology of the University of Bologna, who coordinated the study. "Nowadays, there is a progressive reduction of our microbiota diversity due to the context of our modern life: this research group's findings could guide us in devising diet- and lifestyle-tailored solutions to counteract this phenomenon."

## **The issues of the "modern" microbiota**

The gut microbiota is the collection of trillions of symbiont micro-

organisms that populate the gastrointestinal tract. It represents an essential component of human biology and carries out important functions, such as regulating metabolism and the immune system and guarding against pathogenic micro-organisms.

Recent studies have shown how some features of modernity—such as the consumption of processed food, drug use, life in hyper-sanitized environments—led to a critical reduction of biodiversity in the gut microbiota. This depletion is mainly due to the loss of a set of microorganisms referred to as "old friends."

"The process of depletion of the gut microbiota in modern western urban populations could represent a significant wake-up call," says Simone Rampelli, who is a researcher at the University of Bologna and first author of the study. "This depletion process would become particularly alarming if it involved the loss of those microbiota components that are crucial to our physiology."

Indeed, there are some alarming signs. For example, in the West, researchers have noted a dramatic increase in cases of chronic inflammatory diseases such as inflammatory bowel disease, metabolic syndrome, type 2 diabetes and colorectal cancer.

## **How the "ancient" microbiota can help**

Which components of the gut microbiota are more important for health? Scientists have been seeking targeted solutions. This was the starting point behind the idea of identifying the ancestral traits of human microbiota—specifically, the core of the human gut microbiota, which has remained consistent throughout our evolutionary history. Technology now allows researchers to pursue paleomicrobiology, a new field that studies ancient microorganisms from archaeological remains through DNA sequencing.

The research group analyzed ancient DNA samples collected in El Salt (Spain), a site where many Neanderthals lived. To be more precise, they analyzed the ancient DNA extracted from 50,000-year-old sedimentary feces, the oldest sample of fecal material available to date. In this way, they managed to piece together the composition of the micro-organisms populating the intestine of Neanderthals. Comparing the composition of the Neanderthals' microbiota to modern humans revealed many similarities.

"Through the analysis of ancient DNA, we were able to isolate a core of microorganisms shared with modern Homo sapiens," explains Silvia Turrone, researcher at the University of Bologna and first author of the study. "This finding allows us to state that these ancient micro-organisms populated the intestine of our species before the separation between Sapiens and Neanderthals, which occurred about 700,000 years ago."

## **Safeguarding the microbiota**

These ancestral components of the human gut microbiota include many well-known bacteria that are fundamental to health, among which are *Blautia*, *Dorea*, *Roseburia*, *Ruminococcus* and *Faecalibacterium*. By producing short-chain fatty acids from dietary fiber, these bacteria regulate our metabolic and immune balance. There is also the *Bifidobacterium*, a microorganism playing a key role in regulating immune defenses, especially in early childhood. Finally, in the Neanderthal gut microbiota, researchers identified some of those "old friends." This confirms the researchers' hypotheses about the ancestral nature of these components and their recent depletion in the human gut microbiota due to our modern life context.

"In the current modernization scenario, in which there is a progressive reduction of [microbiota](#) diversity, this information could guide integrated diet- and lifestyle-tailored strategies to safeguard the micro-

organisms that are fundamental to our health," concludes Candela. "To this end, promoting lifestyles that are sustainable for our [gut microbiota](#) is of the utmost importance, as it will help maintain the configurations that are compatible with our biology."

**More information:** Simone Rampelli et al. Components of a Neanderthal gut microbiome recovered from fecal sediments from El Salt, *Communications Biology* (2021). [DOI: 10.1038/s42003-021-01689-y](#)

Provided by Università di Bologna

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