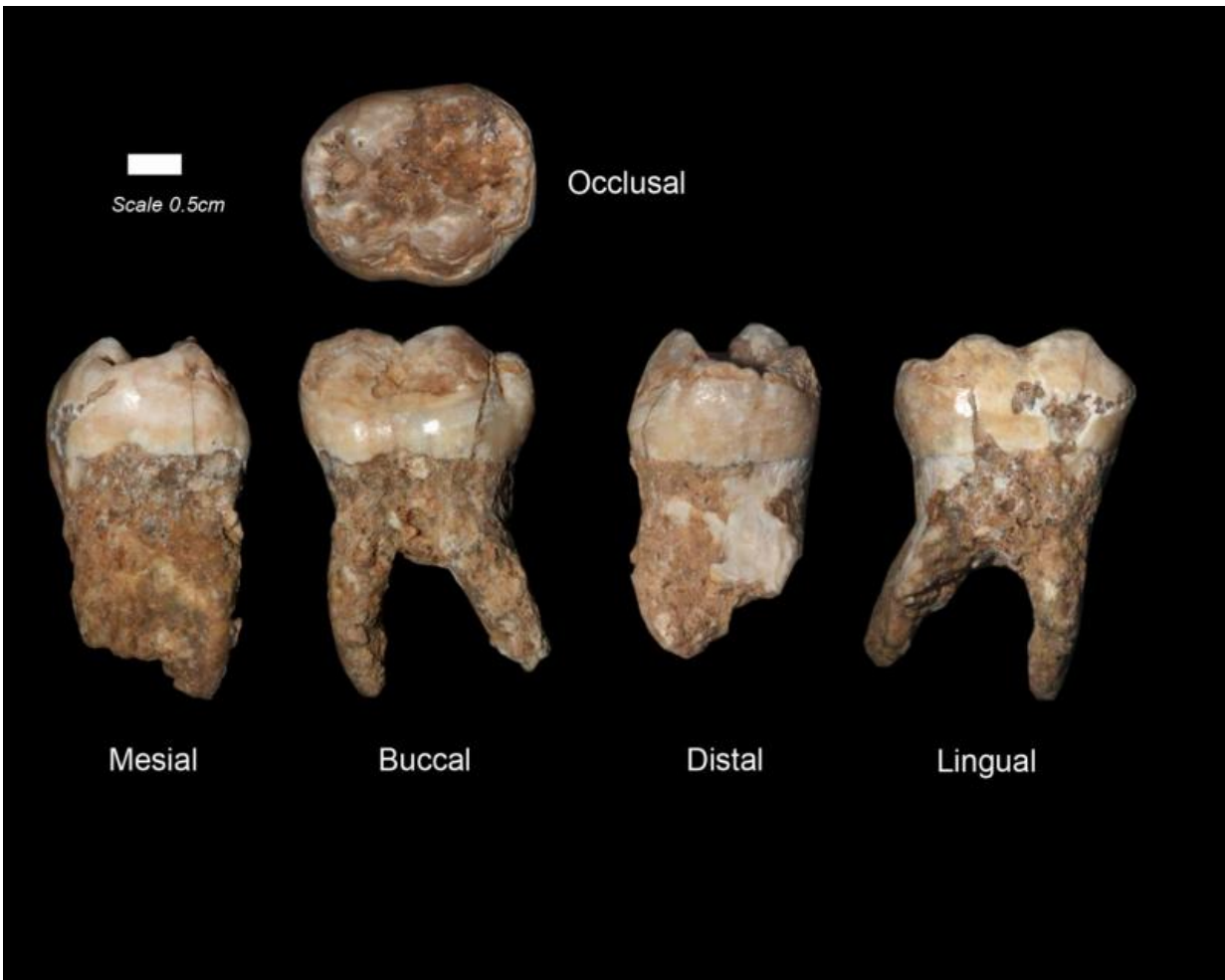


400,000-year-old dental tartar provides earliest evidence of manmade pollution

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Human teeth from Qesem Cave. Credit: Prof. Israel Hershkovitz, Tel Aviv University

Most dentists recommend a proper teeth cleaning every six months to prevent, among other things, the implacable buildup of calculus or tartar—hardened dental plaque. Routine calculus buildup can only be removed through the use of ultrasonic tools or dental hand instruments. But what of 400,000-year-old dental tartar?

Tel Aviv University researchers, in collaboration with scholars from Spain, the U.K. and Australia, have uncovered evidence of food and potential respiratory irritants entrapped in the [dental calculus](#) of 400,000-year-old teeth at Qesem Cave near Tel Aviv, the site of many major discoveries from the late Lower Paleolithic period. The research, published in *Quaternary International*, led by Prof. Karen Hardy of ICREA at the Universitat Autònoma, Barcelona, Spain, together with Prof. Ran Barkai and Prof. Avi Gopher of TAU's Department of Archaeology and Ancient Near Eastern Civilizations, in collaboration with Dr. Rachel Sarig of TAU's School of Dental Medicine, Dr. Stephen Buckley of the University of York, Anita Radini of the University of York and the University of Leicester, U.K., and Prof. Les Copeland of the University of Sydney, Australia, provides direct evidence of what early Palaeolithic people ate and the quality of the air they breathed inside Qesem Cave.

Possible respiratory irritants, including traces of charcoal—manmade [environmental pollution](#)—found in the dental calculus, may have resulted from smoke inhalation from indoor fires used for roasting meat on a daily basis. This earliest direct evidence for inhaled environmental pollution may well have had a deleterious effect on the health of these early humans.

"Human teeth of this age have never been studied before for dental calculus, and we had very low expectations because of the age of the plaque," said Prof. Gopher. "However, our international collaborators, using a combination of methods, found many materials entrapped within

the calculus. Because the cave was sealed for 200,000 years, everything, including the teeth and its calculus, were preserved exceedingly well."



Burned animal bones from Qesem Cave Credit: Ruth Blasco

In what Prof. Barkai describes as a "time capsule," the analysed calculus revealed three major findings: charcoal from indoor fires; evidence for the ingestion of essential plant-based dietary components; and fibers that might have been used to clean teeth or were remnants of raw materials.

"Prof. Karen Hardy published outstanding research on the dental calculus of Neanderthals from El Sidron cave in Spain, but these dated back just 40,000-50,000 years—we are talking far earlier than this," said Prof. Barkai.

"This is the first evidence that the world's first indoor BBQs had health-related consequences," said Prof. Barkai. "The people who lived in Qesem not only enjoyed the benefits of fire—roasting their meat indoors—but they also had to find a way of controlling the fire—of living with it.

"This is one of the first, if not the first, cases of manmade pollution on the planet. I live near power plants, near chemical factories. On the one hand, we are dependent on technology, but on the other, we are inhaling its pollutants. Progress has a price—and we find possibly the first evidence of this at Qesem Cave 400,000 years ago."

The researchers also found minute traces of essential fatty acids, possibly from nuts or seeds, and small particles of starch in the analysed calculus. "We know that the cave dwellers ate animals, and exploited them entirely," said Prof. Barkai. "We know that they hunted them, butchered them, roasted them, broke their bones to extract their marrow, and even used the butchered bones as hammers to shape flint tools. Now we have direct evidence of a tiny piece of the plant-based part of their diet also, in addition to the animal meat and fat they consumed.

"We have come full circle in our understanding of their diet and hunting and gathering practices."

Within the calculus, the researchers also discovered small plant fibers, which they suspect may have been used to clean teeth—prehistoric tooth picks.

"Our findings are rare—there is no other similar discovery from this time period," said Prof. Barkai. "The charcoal and starch findings give us a more comprehensive idea of how these people lived their lives—and this broader view came directly from their teeth."

More information: Dental calculus reveals potential respiratory irritants and ingestion of essential plant-based nutrients at Lower Palaeolithic Qesem Cave Israel, is published in *Quaternary International*. To read, visit: www.sciencedirect.com/science/.../S1040618215004553

Provided by Tel Aviv University

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