The Çatalhöyük site in Turkey FIRDES SAYILAN/SHUTTERSTOCK.COM

Animal fat on ancient pottery reveals a nearly catastrophic period of human prehistory

By **Michael Price** | Aug. 13, 2018 , 3:05 PM

A bit more than 8000 years ago, the world suddenly cooled, leading to much drier summers for much of the Northern Hemisphere. The impact on early farmers must have been extreme, yet archaeologists know little about how they endured. Now, the remains of animal fat on broken pottery from one of the world's oldest and most unusual protocities—known as Çatalhöyük—is finally giving scientists a window into these ancient peoples' close call with catastrophe.

"I think the authors have done an excellent job," says John Marston, an environmental archaeologist at Boston University who wasn't involved in the current study. "It shows the people of Çatalhöyük were incredibly resilient."

Today, Çatalhöyük is just a series of dusty, sun-baked ruins in central Turkey. But thousands of years ago it was a bustling prehistoric metropolis. From about 7500 B.C.E to 5700 B.C.E., early farmers grew wheat, barley, and peas, and raised sheep, goats, and cattle. At its height, some 10,000 people lived there. Among

its more noteworthy features, Çatalhöyük's inhabitants were **obsessed with plaster**, lining their walls with it, using it as a canvas for artwork, and even **coating the skulls of their dead** to recreate the lifelike countenances of their loved ones.

Around 6200 B.C.E., climates cooled across the globe. Massive glacial lakes in North America emptied into the Atlantic Ocean, scientists believe, altering sea currents and weather patterns and triggering what's known simply as the 8.2-kiloyear event (referring to its occurrence 8200 years ago).

A team of researchers led by biochemists Mélanie Roffet-Salque and Richard Evershed of the University of Bristol in the United Kingdom and archaeologist Arkadiusz Marciniak at Adam Mickiewicz University in Poznań, Poland, wondered whether Çatalhöyük's farmers left behind any trace of the climate shift. Over the past few years, Marciniak had been digging up fragments of clay pottery (or potsherds) left buried in ancient trash piles, dating from about 8300 to 7900 years ago.

These clay pots were used to store meat, and researchers found relatively well preserved animal fat residue soaked into the porous, unglazed sherds. Extreme drought brought on by the 8.2-kiloyear event would have frizzled feed crops and grazing lands, and cooler winters would have increased animals' food requirements. The combined effect would have been leaner, thirstier livestock, and their fat may have recorded chemical echoes of that dietary stress, the researchers reasoned.

The team used a technique known as gas chromatography–mass spectrometry to identify elemental variants known as isotopes. When the researchers looked at the fat deposits' hydrogen isotopes, something interesting jumped out: In sherds dating to about 8200 years ago—and only those sherds—the ratio of the isotope deuterium, or heavy hydrogen, rose by about 9% in relation to other hydrogen isotopes from the samples. Previous research on the region's climate and plant chemistry has shown that **lower precipitation rates correlate with higher ratios of heavy hydrogen**, which the livestock would have consumed as they grazed during the drought.

The isotopic signature was thus likely caused by the 8.2-kiloyear event, the researchers report today in the *Proceedings of the National Academy of Sciences*, the first direct archaeological evidence of this phenomenon. By analyzing other fat-soaked pot sherds from sites around the world, the team adds, scientists will for the first time be able to accurately recreate climate conditions for other ancient societies.

"I think this could be a very useful tool indeed," says David Orton, a zooarchaeologist at the University of York in the United Kingdom. "[It's a] a big step forward."

Additional finds from Çatalhöyük reveal how the farmers adapted to the cooler, drier conditions. Animal bones from that time have a relatively high number of cut marks, suggesting they were butchering for every last edible bit. Cattle herds shrunk while goat herds rose, the authors note, perhaps because goats could better handle drought. Çatalhöyük's architecture changed, as well, with the site's iconic, large, communal

dwellings giving way to smaller houses for individual families, reflecting a shift toward independent, self-sufficient households.

Although these changes underscore humans' historical resilience in the face of capricious conditions, they also show how even relatively minor climate shifts can fundamentally alter a society, Evershed says.

Yet Orton cautions that Çatalhöyük's architecture had been gradually evolving for hundreds of years before the 8.2-kiloyear event, making it difficult to say how much of that was related to changing climate. "It seems that Çatalhöyük was already in a period of fairly rapid change well before the 8.2 event. So while the climatic shift probably fed into and perhaps accelerated these changes, it's certainly not the whole story."

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