

## **Biblical kings were plagued by parasites, study of 2,700-year-old Jerusalem toilet shows**

**Analysis of cesspit in Judahite palace reveals even elites were afflicted by intestinal bugs – which may have been thanks to the Assyrian conquest, archaeologist suggests**

Ariel David | Jan. 4, 2022 | 10:41 AM

The Bible tells stories about miracles, wars, kings and prophets, but doesn't reveal much about the daily lives of the ancient Israelites. A glimpse into the challenges of life during the First Temple period is now offered by the study of a 2,700-year-old toilet found in a Jerusalem palace – and it's not a pretty sight.

It appears that even the elite echelons of the Kingdom of Judah, including possibly the monarchs of the Davidic dynasty, suffered from crippling parasitic infections, reports Dafna Langgut, head of the archaeobotanical lab at Tel Aviv University and the Steinhardt Museum of Natural History.

For a study published Tuesday in the *International Journal of Paleopathology*, Langgut sampled sediments under a stone seat with a distinctive hole in the middle that was recently found on the Armon Hanatziv promenade in Jerusalem.

This was the site of a palace or royal estate built in the early seventh century B.C.E., sporting elaborately decorated capitals and a spectacular view on the center of Jerusalem and the Temple Mount. Ya'akov Billig, the director of the excavation on behalf of the Israel Antiquities Authority, explains that the royal estate dates back to the mid-7th century B.C.E. and featured stone artifacts of a quality not observed elsewhere in ancient Israel.

Whether the palace belonged to a high-ranking official or the king of Judah himself is not known, but in any case it also featured a luxury that very few could afford in biblical times: an outhouse with a stone seat and a cesspit dug under it, which was a rare luxury in the late Iron Age.

### **You know who crawls in**

Despite having access to the most advanced form of private sanitation of the time – which, admittedly, is not saying much – the residents of the palace were ridden with parasites.

In the cesspit beneath the stone seat, microscopic eggs belonging to different intestinal pests were found, including tapeworm, roundworm, pinworm and whipworm, Langgut reports.

The worms themselves have of course long decomposed, but their eggs, while no longer alive, can remain intact for millennia. Control samples taken from sediments near the installation didn't turn up any parasite offspring, proving that the results were indeed linked to the presence of the toilet and not to a later contamination of the site.

The study had a number of goals. Firstly, it confirms that the perforated stone table found at the palace was indeed a toilet. This may seem trivial, but because only the very rich could afford them, just a handful such installations from the First Temple period have been found, and archaeologists often disagree as to whether these stone slabs were indeed used as toilets or had other purposes, such as pouring in cultic offerings.

The methodology used in the study on the toilet from Armon Hanatziv can now be used to test similar structures when they are found, Langgut tells Haaretz.

More broadly, such research helps us understand the spread of diseases throughout history, as well as the living conditions and hygiene practices of ancient peoples, she says.

“Because of COVID-19 people today understand better the meaning of pandemics and how they can affect anyone, independently of social status,” she says. “These too were pandemic diseases.”

The parasites identified in Jerusalem are fairly easily dealt with today, but untreated they can cause anything from light to severe symptoms. Tapeworm is generally contracted from eating raw or poorly cooked beef and pork meat (yes, apparently ancient Israelites occasionally ate pork) and can cause abdominal pain, nausea, diarrhea and weight loss.

Roundworm and whipworm, which were the most represented species in the samples, can cause minor infections but in serious cases, they may contribute to malnutrition, childhood stunting and cognitive impairment.

These parasites are spread by coming into contact with feces and ingesting their eggs. This usually happens due to poor sanitation, contamination of food and water supplies with waste, and the use of human feces as field fertilizer, Langgut explains.

### **Did the Assyrians give us parasites?**

Intestinal parasites were legion in the ancient Levant and are mentioned in some of the earliest medical tractates, including an Egyptian papyrus from 3,500 years ago.

But Langgut wonders how these parasites became endemic to ancient Judah to the point that they seemed to afflict elite individuals. They could have contracted tapeworm from eating undercooked meat but how would they become infected with whipworm and roundworm? One could expect that the king or his entourage would not have had much direct contact with other people's feces.

One hypothesis, she suggests, is that this is somehow connected to the subjugation of Judah by the Assyrian forces of King Sennacherib in 701 B.C.E.

At the time, most of the Levant was already under Assyrian control, and the empire cracked down hard on Judah when King Hezekiah and some of his neighboring rulers started a revolt. While Jerusalem itself survived the ensuing invasion, most of Judah's other towns were sacked and the kingdom lost considerable parts of its territory, particularly in the Shephelah, the fertile hilly region to the south-west of Jerusalem.

At the same time, the new overlords demanded heavy tribute and pushed Judah into creating a specialized economy that focused on the production of wine and oil – two products that were not widely available in the Mesopotamian heartland of the Assyrian Empire.

To deal with all this, even as they were trying to recover from the devastation of the recent invasion and the loss of territory, the Judahites had to start farming previously marginal lands, especially in the rocky hills that surround Jerusalem.

In recent years, archaeologists have extensively explored the agricultural development of these lands during the seventh century B.C.E., in the aftermath of Sennacherib's invasion. They have uncovered the remains of irrigation systems, royal estates and palaces, including the one at Armon Hanatziv, throughout the Jerusalem hinterland. With all this development it is possible that, either to make these areas more productive or because they were told to do so by the Assyrians, the locals began to fertilize their fields using the ample amounts of human waste that the city produced, Langgut suggests. This would inadvertently lead to widespread parasite contamination of water and food sources, affecting all social strata in the area, she says.

This of course is purely a hypothesis, which the researcher hopes to test in the future if similar toilets, possibly from an earlier age, are discovered in Jerusalem.

But as much as the Assyrians oppressed the Judahites, and possibly gave them parasites, their presence also had less pernicious consequences.



Reconstruction of the toilet room that stood in the garden of the Armon Hanatziv royal estate. Drawing by Yaniv Korman



The stone toilet seat found during the 2019 excavation at Armon Hanatziv. Photo by Ya'akov Billig

## The smells of Assyria

Trapped in the sediments beneath the toilet there was something else, besides icky parasite eggs: pollen. Langgut is an expert in analyzing fossilized pollens, which she has used in previous studies to glean information about climate change in prehistory and antiquity, and even reconstruct the Roman-style gardens of King Herod the Great.

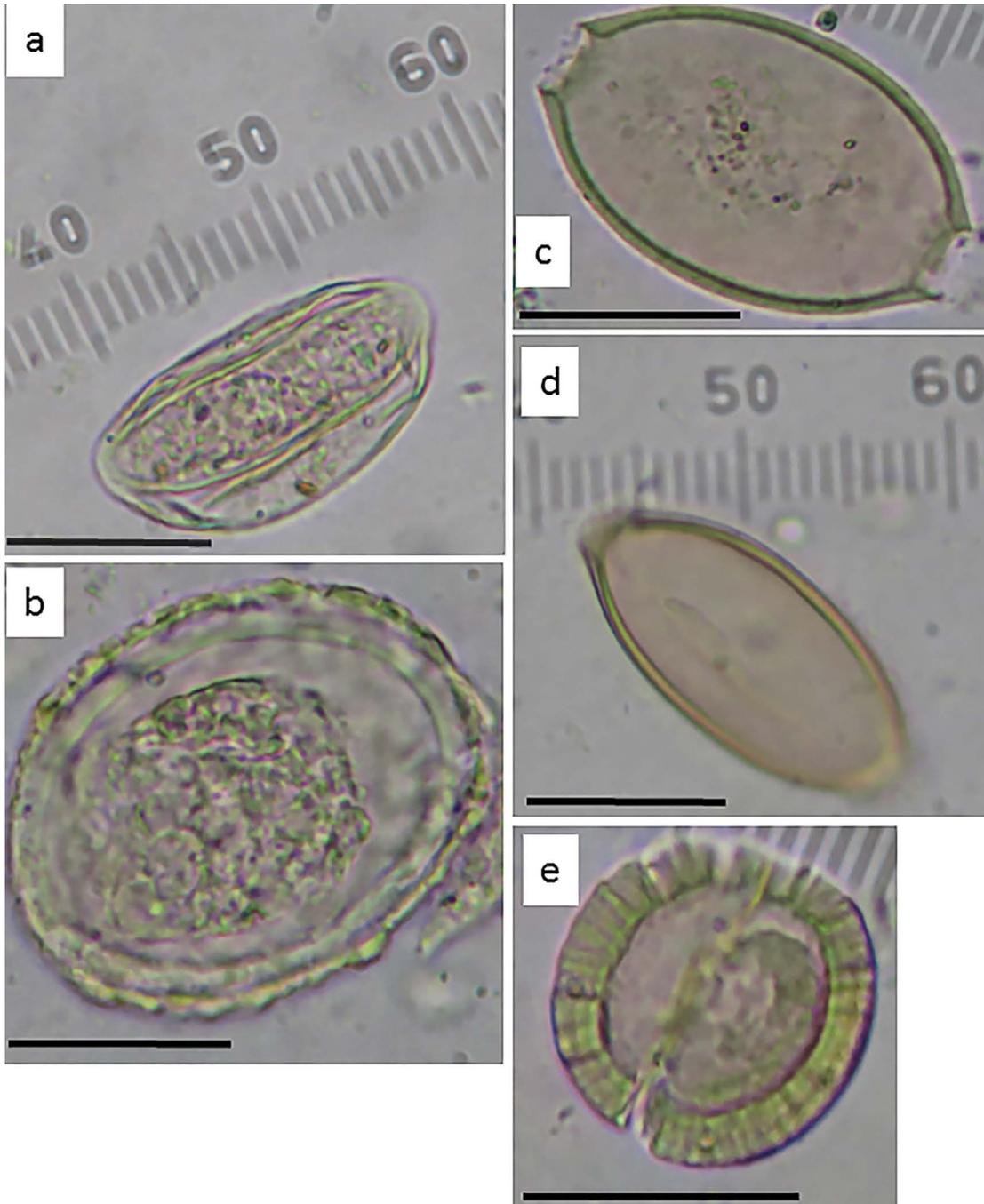
The microscopic pollen grains recovered from the cesspit indicate that at Armon Hanatziv there was a garden adjacent to the toilet. It was decorated mostly with fruit trees and ornamental plants, such as pine (which may have also served to cover the toilet's smells), cypress, grapevine and olive, Langgut says.

Based on texts and engravings from Mesopotamia, we know that these plants were typically found in Assyrian royal gardens, suggesting that the tastes and influence of Judah's conquerors were at work in the construction of the garden in Jerusalem, she says.

For the Assyrians, building elaborate ornamental gardens was a way of displaying their power by showing off their control over water and nature, particularly in arid regions like the Levant, Langgut explains. This symbolic use of gardens for political purposes may well have been adopted by their local vassals, the kings of Judah, as a means to project their own power and control.

This particular estate was located in a neighborhood known now as Armon Hanatziv, "Governor's Palace" in Hebrew, because of the nearby residence of the British High Commissioner in mandatory Palestine (today it functions as the local UN headquarters). The two palaces, the modern and the ancient one, are separated by some 2,700 years, but were built just a few meters apart. This shows that, throughout the ages, this hill that dominates the Old City of Jerusalem has always been a strategic location from which to exert control over the restive city. And this control could also be exercised through visual means, as the Assyrians knew well, by displaying a lush green space surrounding the estate of the king of Jerusalem.

"You might wonder then why they would keep a stinky outhouse in the middle of this beautiful garden," Langgut notes. "It is precisely because only the very rich could afford such a facility. Like the garden, the toilet was a symbol of status and power."



Intestinal parasite eggs recovered from sediment collected below the stone toilet seat at Armon Hanatziv. (a). *Enterobius vermicularis*; (b). *Ascaris lumbricoides*; (c). *Trichuris suis*; (d). *Trichuris trichiura*; (e). *Taenia* sp. Each bar = 25 micron. Photos by Eitan Kremer (magnification X 400).