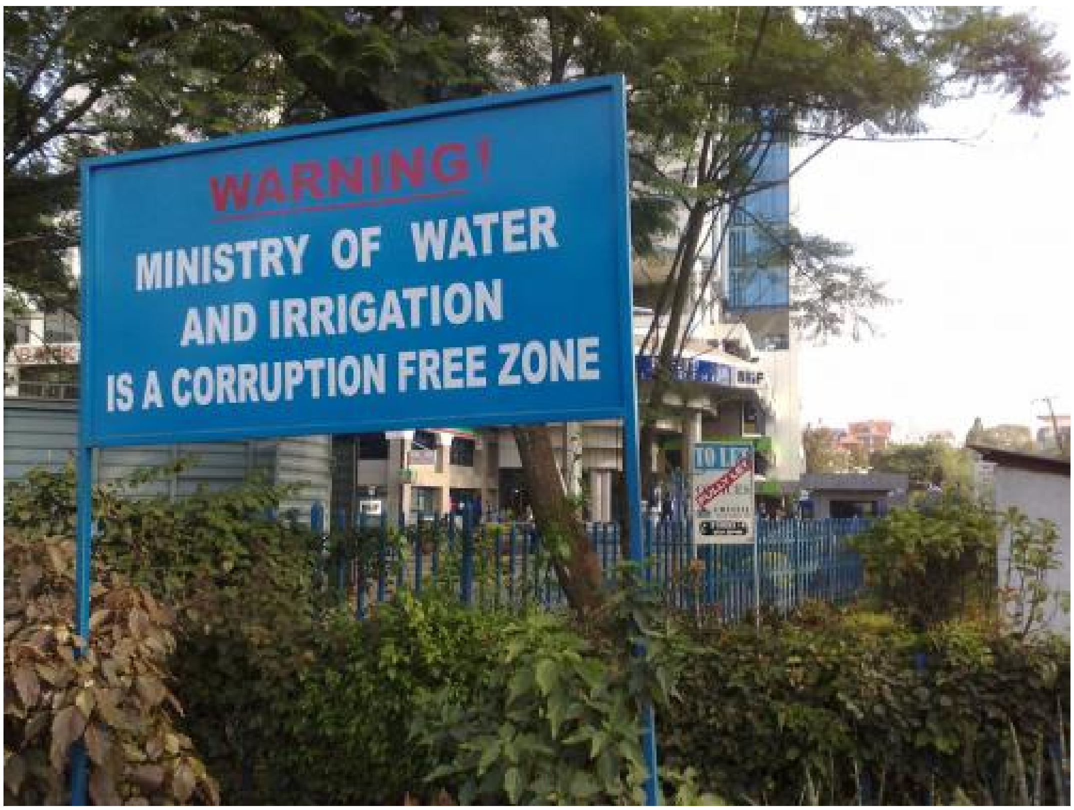
Prehistoric parasite egg suggests early disease spread through human technology

June 20 2014, by Piers Mitchell



Unless you're a schistosomiasis parasite. Wayan Vota, CC BY-NC

We are used to the idea that modern technological inventions can have unforeseen consequences on health. Infamous examples include the anti-nausea drug thalidomide, which caused limb defects in unborn babies, and the pesticide DDT, which led to poorly formed egg shells in birds of prey and a crash in the population. Another example in recent history is

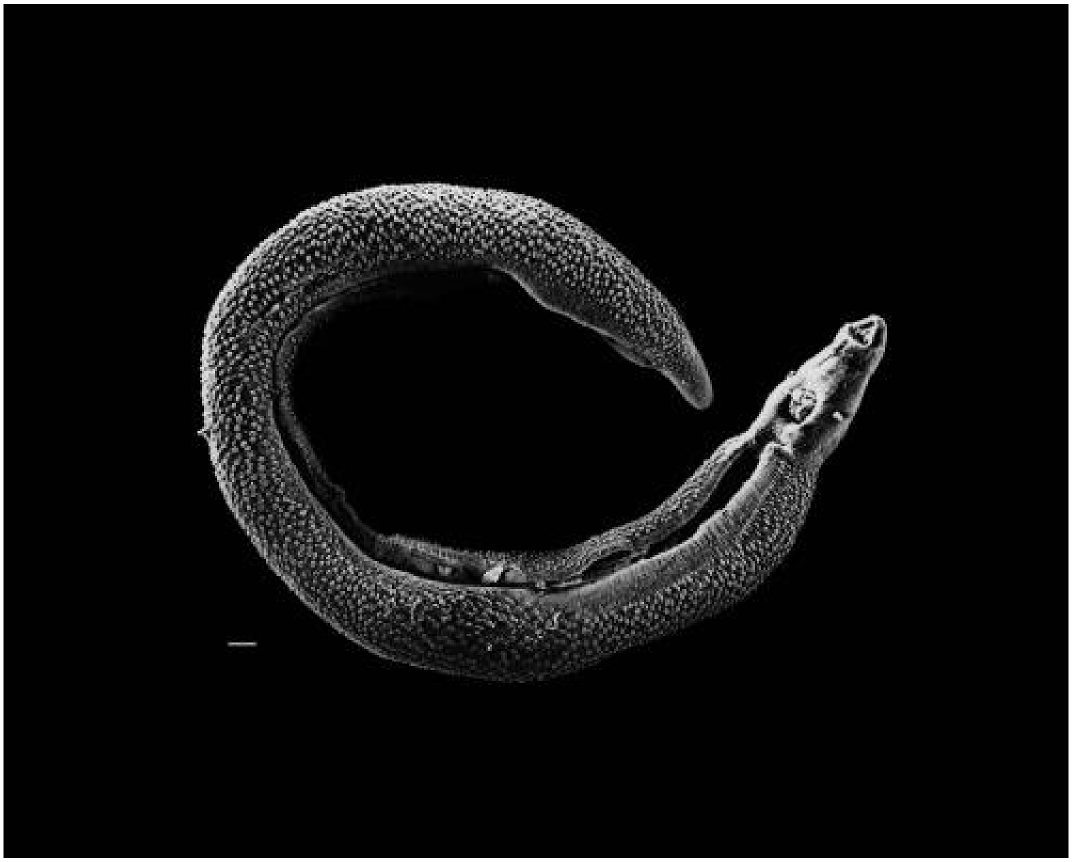
Marie Curie and her colleagues who developed bone marrow failure or cancer after discovering radiation and developing X-ray imaging. However, much less is known about the earliest time periods and the impact of new man-made technologies.

In new research published in *The Lancet Infectious Diseases*, we investigated the parasites present in 26 prehistoric burials of people living at the site of Tell Zeidan, an early farming settlement located on the confluence of the Balikh and Euphrates rivers in northern Syria, which dates from between 7,800 to 6,000 years ago. The burials studied date from about 6,200 years ago.

In one individual, we found the egg of a terminal spined schistosome, which is a flatworm parasite that causes schistosomiasis, also called bilharzia.

We analysed soil samples from the pelvic area in front of the sacrum bone, where the abdominal organs would have been as they decomposed. Control samples were also taken from the head and feet of these burials, where no abdominal parasites would have been during life and these showed negative for parasite eggs, showing that the soil had not been contaminated by the later use of the area as a toilet.

The disease is spread by people wading or swimming in warm, slow moving, fresh water. These sources of water are colonised by water snails that can then act as an intermediate host for the parasite. When people are in the water, the parasites leave the snails and burrow through the human skin. They then migrate to the blood vessels in the abdomen where they grow, mate and produce eggs.



Schistosoma parasite worm. Credit: David Williams

There are different species of schistosomiasis parasites, with some choosing the blood vessels of the bladder, and others the blood vessels of the intestines. These parasites have severe consequences as blood loss into the bladder or intestines results in marked anaemia and so reduce the ability to undertake physical work. Long-term infection with *S. haematobium* can also trigger bladder cancer.

In modern times, the two species of schistosome whose eggs most closely match the shape of the prehistoric egg are *S. haematobium* and *S. intercalatum*. While the first of these is found in the Middle East today, *S. intercalatum* is only found in west Africa. That means either this parasite is an *S. haematobium*, or the region in which *S. intercalatum* was endemic in the past was once very much larger and included the Middle East.

A role for man-made technology

This discovery is also particularly fascinating as in modern times in regions such as Africa, schistosomiasis is commonly spread by man-made irrigation technology such as water channels and reservoirs used to irrigate crops. If a new dam is built, frequently schistosomiasis moves into the region within a few years. The snail eggs can be transmitted on the feet of birds, and the parasite spread by infected travellers going to the toilet in or near to water sources. More than 200m people in the world are infected with schistosomiasis today.

Water irrigation technology was first invented in the world about 7,500 years ago, in the region of the Middle East between the Euphrates and Tigris river systems known as Mesopotamia. Different techniques are thought to have been used, including facilitating the flooding of fields with river water, and moving water to the fields in man made channels. At Tell Zeidan, the archaeologists believe crop irrigation of some kind was in use as they have found evidence for crops such as wheat and barley that require more water to grow than could be obtained from rainfall alone at the time the settlement was in use. Research into prehistoric rainfall in the region suggests it was just too arid to grow these crops there without extra water.

We will never know if the prehistoric individual at Tell Zeidan caught the infection from wading or swimming in a natural water source, or if it was from wading in an agricultural irrigation system. But the presence of schistosomiasis at this early time, in the centuries following the invention of crop irrigation in the region, does show that it could easily have been spread that way, and that early irrigation could have facilitated the spread of the disease across the region.

The later Assyrian culture flourished in Mesopotamia from 4,500 years ago, and their medical texts include descriptions of red urine. Since *S. haematobium* causes blood loss in the urine, this early textual evidence provides further support for the identification of schistosomiasis in the region. People at the time would have seen the benefits of their crop irrigation on the amount of food they could grow, and also the types of plants they could cultivate. However, they would have had no idea that the new technology would lead to huge numbers of people across the world contracting schistosomiasis over the following 6,000 years.

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