

Ancient Tuberculosis Found In 500,000-Year-Old Fossil

By the University of Texas at Austin

Tuberculosis is a bacterial disease that infects over one-third of the population. From historical accounts of the disease and symptoms, researchers have assumed that tuberculosis has infected humans for at least 7,000 years, until recently. Researchers from the University of Texas at Austin have discovered evidence of tuberculosis infection in a human fossil from Turkey dating approximately 500,000-years-old. Previously, the oldest fossils that provided evidence of tuberculosis were found in Peru and Egypt and dated approximately 7,000-years-old.

Based on the amount of closure of the cranial sutures, sinus formation, and the anatomy of the brow area of the skull researchers determined that the human fossil is a young male from the *Homo erectus* species. In addition, they also identified small lesions etched on the inside of the orbit surrounding the eye socket. These lesions are characteristic of a form of tuberculosis, called *Leptomeningitis tuberculosa*, that infects the meninges that surround and protect the brain.

How is this information useful other than allowing us to date the earliest tuberculosis infection? Researchers at the University reviewed medical literature and discovered that certain groups of people were more susceptible to infection by this strain of tuberculosis. They identified two characteristics that were shared among the susceptible populations: darker skin color and migration from tropical environments to more temperate environments.

Physiological studies have determined that individuals with dark skin produce little vitamin D. Vitamin D is produced by the skin in the presence of



View of the inside of a plaster cast of the skull of the newly discovered young male *Homo erectus* from western Turkey. The stylus points to tiny lesions 1-2 mm in size found along the rim of bone just behind the right eye orbit. The lesions were formed by a type of tuberculosis that infects the brain and, at 500,000 years in age, represents the most ancient case of TB known in humans. (Credit: Marsha Miller, the University of Texas at Austin)

sunlight, or UV radiation, and individuals with darker skin having more melanin in their skin pigment, which blocks UV radiation. When they live in areas with less sunlight their immune systems can be compromised due to the lack of vitamin D.

The research team from the University of Texas at Austin hypothesize that *Homo erectus* evolved in a tropical environment and had dark skin, but migrated north. The lack of vitamin D led to an immune deficiency that allowed the young man to become infected with tuberculosis when it was otherwise unseen in the local population. This information may have implications in future treatments of tuberculosis. It is possible that exposing patients to intermittent UV radiation may “jump start” the patients immune system, and possibly provide a prevention or cure to tuberculosis.

Reference: University of Texas at Austin. 2007. Most Ancient Case Of Tuberculosis Found In 500,000-year-old Human; Points to Modern Health Issues. Science Daily. Retrieved December 15, 2013, from <http://www.sciencedaily.com/releases/2007/12/07091852.htm>.

Making Sense of *Homo floresiensis*: Small-Bodied Humans, Dwarfism, or Disease?

By Nature Education

Fossil remains from several small humanoid individuals were discovered on Flores island, near Indonesia, in 2004. Named *Homo floresiensis*, the remains were first thought to be a newly discovered extinct species, but their size and stature has made it difficult for researchers to agree on their evolutionary heritage. Numerous fossils were found, but only one set of nearly complete remains that exhibit a small body and brain. It is estimated that the individuals would have stood approximately 3'6" tall as an adult, which is about the size of a 3-4 year old child. As a result, *H. floresiensis* has been nicknamed the "Hobbit" species.

Contributing to the confusion is the geological age of the fossils, which puts them within the range of modern *Homo sapiens* that were living elsewhere in the world. The combination of a smaller brain and short stature at an evolutionary time when modern humans occupied the earth causes confusion and has led to several hypotheses. In general, there are three theories that have been developed surrounding *H. floresiensis*: (1) the species is simply a smaller version of modern humans, (2) the species experienced island dwarfism, or (3) the species stature can be attributed to disease.

The Disease Hypothesis

A possibility that *H. floresiensis* suffered from a disorder has been proposed as a theory. One of these conditions is microcephaly, which occurs when the brain of a normal healthy individual is considerably smaller. This can result from genetic disease and tends to be a symptom of other conditions, some of which also have shortness as a symptom. Other theories propose that *H. floresiensis*

suffered from hypothyroidism or Laron Syndrome. Hypothyroidism can develop from a lack of iodine in the diet and result in a hormone imbalance that could lead to a lack of growth during development. Laron Syndrome is a hereditary disorder that results in the body not responding to growth hormones. As a result, affected individuals are often shorter and have a disproportionate skull. One of the major issues with the disease hypothesis is that even though there is only one nearly complete set of remains, the other remains from individuals show some of the same traits. This means that if their size was caused by disease, they all had the disease.



Figure 1: Photograph of the LB1 skeleton, the type specimen of *Homo floresiensis*, laid out in approximate anatomical position. © 2012 Nature Education Photo courtesy of William Jungers.

Reference: Baab, Karen L. 2012. *Homo floresiensis*: Making Sense of the Small-Bodied Hominin Fossils from Flores. Nature Education Knowledge 3(9): 4.

Modern Cancer Type Found In Neanderthal Remains

By BBC News

The Neanderthals

Neanderthals, or *Homo neanderthalensis*, are an extinct humanoid species that are closely related to *Homo sapiens*. Neanderthal remains were discovered in Germany and became extinct anywhere from 25,000 - 45,000 years ago. It is believed that early *Homo sapiens* and Neanderthals interbred and therefore contributed in some part to our evolution due to the fact that similarities in DNA have been identified.



Figure 1. Neanderthal remains (left) compared to modern human remains (right.)

<http://www.pentagonpost.com/wp-content/uploads/2013/10/Neanderthal-Cro-Magnon.jpg>

Neanderthals and Cancer

A 120,000-year-old Neanderthal rib bone found in Croatia had a bone tumor, and is the oldest discovered evidence for the presence of cancer in human history. Before this discovery, the oldest evidence was found in Egyptian remains from approximately 4,000-years-ago. Cancer has been considered a modern disease caused by environmental pollutants and an increase in genetic mutations, but this discovery questions that theory.

The tumor was caused by fibrous dysplasia, which is one of the most common types of bone cancer found today. Fibrous dysplasia is a tumor of the fibrous tissue

within the bone. The tumor replaces normal bone with fibrous bone. This causes the bone to swell or grow and become brittle since fibrous bone is less dense than normal bone tissue. Most individuals only have one bone; most commonly the femur, humerus, or rib associated with this condition. This tumor is rarely life threatening, but it can cause pain, bone deformity, and an increase risk of fractures. This discovery may indicate that cancer can occur even in an environment that was relatively unpolluted. In addition, it appears that the fossil was from a relatively young individual, which also questions the idea that most cancers affect older individuals.



Figure 2. Neanderthal bone top demonstrating deformed fibrous bone tissue (top) compared to normal human rib bone with intact fibrous bone tissue (bottom).

<http://www.bbc.co.uk/news/science-environment-22780717>

Reference: Briggs, Helen. 2013. Neanderthal clues to cancer origins. BBC News, <http://www.bbc.co.uk/news/science-environment-22780717>.

