Researchers confirm lead as cause of Beethoven's illness

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Researchers at the U.S. Department of Energy's Argonne National Laboratory have found massive amounts of lead in bone fragments belonging to 19th Century composer Ludwig von Beethoven, confirming the cause of his years of chronic debilitating illness.

The bone fragments, confirmed by DNA testing to have come from Beethoven's body, were scanned by X-rays from the Advanced Photon Source at Argonne, which provides the most brilliant X-rays in the Western Hemisphere. A control bone fragment sample from the same historic period was also examined. Both bone fragments were from the parietal section – the top – of the skull.

“The testing indicated large amounts of lead in the Beethoven bone sample, compared to the control,” said Bill Walsh, chief scientist at the Pfeiffer Treatment Center in Warrenville, Ill., and director of the Beethoven Research Project.

The bone fragment is the property of Paul Kaufman, a California businessman who inherited the relics through other family members from his great-great uncle, an Austrian doctor. Not sure if the fragment was actually from the composer, Kaufman sent it to the University of Muenster in Germany for mitochondrial DNA comparison with the samples of Beethoven's hair, owned by the Beethoven Society and also analyzed by Walsh and his colleagues at the Advanced Photon Source.

The findings confirm the earlier work done on the hair samples. In

addition, the researchers found no detectable levels of either cadmium or mercury – both considered possibilities for causing Beethoven's illness – in either the bone fragment or the hair.

“The finding of elevated lead in Beethoven's skull, along with DNA results indicating authenticity of the bone/hair relics, provides solid evidence that Beethoven suffered from a toxic overload of lead,” Walsh said. “In addition, the presence of lead in the skull suggests that his exposure to lead was not a recent event, but may have been present for many years.”

The half life of lead in the human body is about 22 years, with 95 percent of “old” lead residing in the skeletal structure. Beethoven experienced a change of personality and abdominal illness in his late teens and early 20s that persisted throughout his adult life. His abdominal symptoms and autopsy findings are both consistent with lead poisoning, Walsh said.

There have been documented cases of deafness resulting from lead poisoning, but this has been a relatively rare occurrence. There is no solid evidence that lead poisoning was a cause of Beethoven's deafness, Walsh said.

"Beethoven saw physician after physician in search of a cure for his physical ailments," said Walsh. In fact, in a letter to a friend, he expressed the wish that after his death, researchers would use his remains to help determine the cause of his illness so that others would not have to suffer as he did. "Beethoven suffered from bad digestion, chronic abdominal pain, irritability and depression. Since he died in 1827 at age 57, there has been much speculation but no proof of the cause of his illnesses and death."

Researchers performed the elemental X-ray fluorescence analysis at an

Advanced Photon Source X-ray Operations and Research beamline.

"The APS is the only machine in the country where we can perform the research in this detail," said Ken Kemner, one of the Argonne researchers involved in the project. The group used microimaging to look at the distribution of lead in and on both the bone fragment and the hair to identify the presence of any surface effects and to determine the timeline of the lead exposure.

Argonne's Advanced Photon Source is a premier national research facility providing X-rays to more than 5,000 scientists from around the world. “Our users bring with them ideas for new discoveries in nearly every scientific discipline,” said Murray Gibson, Argonne associate laboratory director for scientific user facilities. “They bring their ideas to the APS because our X-ray beams let them collect data in unprecedented detail and in amazingly short time frames.”

Other members of the research team are Derrick Mancini and Francesco DeCarlo of the Advanced Photon Source Experimental Facilities Division.

Source: Argonne National Laboratory