The Role of Lead in the Neanderthal Demise

A new suspect joins a 40,000-year-old cold case, and the lesson still lands on a child's blood test today

By Elizabeth O'Brien, Lead Scientist and Lead Advisor, orchestrated by Ian Smith, Systems Analyst, using OpenClaw on top of Claude AI and Ollama local AI models where possible, on solar-powered infrastructure. © The LEAD Group Inc. November 2026

Neanderthals were not the shambling losers of the old cartoon. They were a hardy kind of human who ranged across Ice-Age Europe and western Asia for hundreds of thousands of years, knapped fine tools, buried their dead, and carried brains every bit as large as ours. Then, roughly 40,000 years ago, they were gone (National Geographic 2023). Why is one of the most worried-over questions in human origins, and the suspect list is long.

The catalogue of theories reads like the index to a murder mystery:

- violence;
- disease carried by incoming modern humans;
- competitive replacement;
- interbreeding;
- natural catastrophe;
- climate change; and
- inbreeding in an already small population (Wikipedia n.d.).

The honest answer is that it was probably several of these at once, and two of the better-evidenced culprits have firmed up lately. Working from stalagmites in two Romanian caves, one team matched a run of extreme cold, dry spells between 44,000 and 40,000 years ago to gaps in the Neanderthal tool record, arguing that the cold itself thinned their numbers (Northumbria University 2018). A separate mathematical model shows you may not need a catastrophe at all: steady, small waves of modern humans breeding into a smaller Neanderthal population could dilute them out of existence over 10,000 to 30,000 years, absorbing them rather than killing them, which is why a little Neanderthal deoxyribonucleic acid (DNA) still rides in most people of Eurasian descent today (Amadei et al 2025). That is the premise of the documentary "The Neanderthal in Us": they did not entirely vanish, some of them became us (Spark 2024).

In October 2025 a new name was added to the charge sheet, and it is one The LEAD Group has spent decades on: lead (Science 2025). An international study led by Professor Renaud Joannes-Boyau of Southern Cross University, with colleagues at Mount Sinai, the University of California San Diego (UC San Diego) and Arizona State, did something clever with old teeth (Arizona State University 2025).

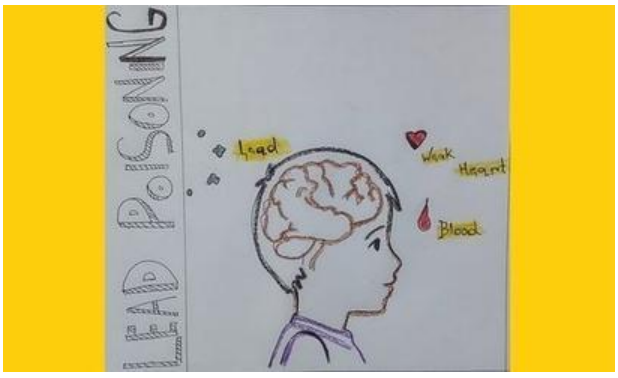
Teeth keep a diary. Enamel and dentine are laid down in fine layers through childhood, and whatever is circulating in the body at the time is written into the layer. Reading 51 teeth from fossil apes, early hominins such as Australopithecus and Paranthropus, early Homo, Neanderthals and Homo sapiens with high-precision laser geochemistry, the team found

sharp “lead bands”, pulses of exposure, stretching back almost two million years. Lead, in other words, is not an invention of Roman plumbing or leaded petrol. Our ancestors met it in contaminated water, soil and volcanic dust, and released their own stored dose from bone during illness and stress, long before anyone smelted a thing.



2024 Volcano Art Prize (VAP) Entry. Artist: Jennifer Chuah. Title: Three Skull Kings. Lead-Safety Message: Lead stored in your bones can actually kill you so contribute to or join The LEAD Group’s project to have bone lead testing available in Australia by portable X-Ray Fluorescence (pXRF). Description of Work: Coloured pencil drawing collaged in Powerpoint. URL: https://volcanoartprize.com/portfolio-item/three-skull-kings/ [LID 28175]

That would be a good story on its own. The twist is what the team did next. They grew “brain organoids”, pea-sized clusters of lab-grown neural tissue, and pitted two versions of a single gene against the same dose of lead. The gene is neuro-oncological ventral antigen 1 (NOVA1), a master regulator that, among other jobs, choreographs how developing neurons respond to lead. Modern humans carry a version of NOVA1 that differs by a single change from the one Neanderthals and other extinct hominids had, and until now nobody knew why ours evolved. When organoids built with the archaic Neanderthal NOVA1 met lead, they showed marked disruption in neurons expressing the forkhead box P2 (FOXP2) gene in the cortex and thalamus, the circuitry that builds speech and language; the modern-human organoids were largely spared. “Our NOVA1 variant may have offered protection against the harmful neurological effects of lead,” says Alysson Muotri of UC San Diego, one of the authors, “an example of how an environmental pressure could have driven genetic changes that improved survival.” Same poison, two lineages, and the damage landing on the machinery of language.



2026 Volcano Art Prize (VAP) Entry. Artist: Paula Jacobe. Title: How Lead Harms. Lead-Safety Message: Lead replaces iron in the blood causing anaemia, reduces IQ making it harder to learn, and increases the risk of early death from stroke and heart attack. Protect their future: keep kids safe from lead poisoning. Description of Work: Pen and colouring pencils on paper. URL: https://volcanoartprize.com/portfolio-item/how-lead-harms/ [LID 29411]

You can see where this points. If the developing Neanderthal brain was more sensitive to a toxin both species were unavoidably exposed to, then across thousands of generations that is a quiet, permanent tax on the very organ that runs planning, language and learning. It need not kill anyone outright. A small, steady handicap in brain development, compounded over a population already squeezed by cold and outnumbered by incomers, is exactly the sort of thumb on the scale that decides a slow contest. Lead does not evict the climate and competition theories. It joins them, and it may help explain why the competition went the way it did. None of this is proven. It is a

single new study, and its authors are careful to cast lead as a contributing pressure rather than the executioner, which is why Science's own write-up kept a question mark in its headline. But the part that should matter most to us does not depend on winning the Neanderthal argument.



2026 Volcano Art Prize (VAP) Entry. Artist: Grandma Lead. Title: Unleaded Children. Lead-Safety Message: Unleaded children and deleaded children and adults are our hope for a Lead-Safe and Climate-Safe future. Warmer seas must be cooled so jellyfish overpopulation is averted. Smarter adults of the future will have to solve many such problems. Description of Work: iPhone 13 photos. URL: https://volcanoartprize.com/portfolio-item/unleaded-children/ [LID 29992]

For a lead-safety audience the deep-time detail is fascinating, but the part that should stop you is the genetics. This is direct evidence that susceptibility to lead is written partly in the genes, that the same exposure can injure one developing brain more than another. It is the oldest imaginable argument for the thing The LEAD Group keeps saying: there is no safe level of lead, and the dose one resilient brain seems to shrug off can still be quietly harming a vulnerable one. Forty thousand years on, we are, apparently, the lineage that drew the more protective card. And we are still lacing our children's water, soil, paint and air with the same metal that may have helped finish our cousins. The Neanderthals paid that bill in full. We have no such excuse.

References

Amadei, A, Lin, G and Fattorini, S (2025) A simple analytical model for Neanderthal disappearance due to genetic dilution by recurrent small-scale immigrations of modern humans, Scientific Reports 15:38593, https://www.nature.com/articles/s41598-025-22376-6 [LID 29464]

Arizona State University (2025) Study finds ancient lead exposure shaped evolution of human brain, ASU News, 15 October 2025, https://news.asu.edu/20251015-health-and-medicine-study-finds-ancient-lead-exposure-shaped-evolution-human-brain [LID 29460]

National Geographic (2023) What is a Neanderthal, and why did they go extinct?, 6 March 2023, https://www.nationalgeographic.com/history/article/who-were-the-neanderthals [LID 29462]

Northumbria University (2018) Cold climates contributed to the extinction of the Neanderthals, 29 August 2018, https://newsroom.northumbria.ac.uk/pressreleases/cold-climates-contributed-to-the-extinction-of-the-neanderthals-2654839 [LID 29463]

Science (2025) ScienceAdviser: Did lead poisoning doom Neanderthals?, Science.org, 17 October 2025, https://www.science.org/content/article/scienceadviser-did-lead-poisoning-doom-neanderthals [LID 29459]

Spark (2024) What Caused The Extinction Of The Neanderthals? | The Neanderthal in Us [video], YouTube, 9 June 2024, https://www.youtube.com/watch?v=K-qUKsr_3bg [LID 29461]

Wikipedia (n.d.) Neanderthal extinction, accessed 7 September 2026, https://en.wikipedia.org/wiki/Neanderthal_extinction [LID 29465]