

From Torah Warnings to Modern Realities: Unveiling Lead Toxicity in the Jewish Community

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Lead (Pb), a seemingly simple elemental metal, has played complex and often conflicting roles throughout human history. Dating back to its mention in sacred texts to its prevalence in modern society, lead characterizes a historical presence that is both compelling and perilous. This comprehensive exploration will contextualize the biological basis of lead toxicity and poisoning along its path from biblical narratives to contemporary realities.

Lead is a metal found in the archives of Jewish tradition, most notably in ancient scriptures and Rabbinic literature. Numerous references to lead exist in the Bible, where it is mentioned alongside other metals, such as gold, silver, and copper [4]. Prophets and scholars often used lead to symbolize strength and judgment, while practical applications included its use in crafting sacred vessels and writing instruments [8].

Lead's mention in biblical texts often serves as a metaphor for heaviness or affliction. For example, in Exodus, it is compared to the sinking of the Egyptian chariots in the Red Sea:

The enemy said, "I will pursue, I will overtake, I will divide the spoil; my desire shall have its fill of them. I will draw my sword; my hand shall destroy them." You blew with your wind; the sea covered them; they sank like lead in the mighty waters [3].

Here, lead symbolizes the inevitability of

defeat and destruction. Similarly, in the Book of Job, lead is referenced in a context of permanence and affliction:

He has put my brothers far from me, and those who knew me are wholly estranged from me. My relatives have failed me, my close friends have forgotten me. The guests in my house and my maid servants count me as a stranger; I have become a foreigner in their eyes. I call to my servant, but he gives me no answer; I must plead with him with my mouth for mercy. My breath is strange to my wife, and I am a stench to the children of my own mother. Even young children despise me; when I rise they talk against me. All my intimate friends abhor me, and those whom I loved have turned against me. My bones stick to my skin and to my flesh, and I have escaped by the skin of my teeth. Have mercy on me, have mercy on me, O you my friends, for the hand of God has touched me! Why do you, like God, pursue me? Why are you not satisfied with my flesh? neuroOh that my words were written! Oh that they were inscribed in a book! Oh that with an iron pen and lead they were engraved in the rock forever [7]!

Lead is referenced as a symbol of permanence, suggesting the desire for enduring testimony to suffering.

Lead was originally valued for its malleability and durability, but modern science has exposed its negative, dangerous side: neurotoxicity. Research has proven the harmful effects of lead

exposure on human health, specifically on the nervous system and cognitive development. Lead can bind to sulfhydryl and electron donor groups. This affects many proteins and interferes with cell mechanisms that are regulated by cations, such as calcium and zinc. Lead exposure to any degree is unsafe; even low levels present significant risks, especially for children. For example, lead disrupts regular synaptic pruning in young brains, which contributes to behavioral and cognitive abnormalities in children exposed to high levels of lead. Lead exposure can also cause anemia by interfering with enzymes involved in heme synthesis and red blood cell membrane integrity, possibly resulting in decreased production and increased destruction of red blood cells [5].

Lead poses significant health risks by interfering with cellular processes, inducing DNA damage, and generating reactive oxygen species. The enzyme ALAD is a biomarker for lead-induced toxicity, as lead inhibits its function and causes oxidative stress. Industrial workers, such as those involved with welding and brick kilns, are exposed to lead and are at risk of DNA damage and altered gene expression [1].

Lead poisoning results when lead accumulates in the body over time, often through consistent and regular exposures to small amounts of lead-containing materials. Common sources of lead exposure include Pb-based paint and Pb-contaminated soil, dust, and water. Since 1978, there have been restrictions on

lead content in paint, yet lead-based paint remains a significant source of lead exposure in young children. As previously described, children are especially hypersusceptible to lead poisoning due to their developing bodies and tendency to put objects in their mouths. Lead may harm the brain, kidneys, liver, and bone marrow once absorbed, as it binds to red blood cells and incorporates into bone and soft tissues. About 535,000 children in the United States between ages 1 and 5 have elevated blood lead concentrations, which is defined as greater than or equal to 5 $\mu\text{g}/\text{dL}$ [13].

Lead poisoning can be painfully and sometimes irreversibly damaging as it impacts nearly every system in the human body. Lead exposure can cause developmental delays, learning disabilities, behavioral problems, and reduced IQ in the younger population. For older individuals, lead poisoning can cause high blood pressure, kidney damage, reproductive issues, and an increased risk of cardiovascular disease [5]. Triglyceride glucose (TyG) is a surrogate marker for insulin resistance and cardiovascular-metabolic disease. The TyG index was determined using the triglyceride levels of 9,645 adults who participated in the Korea National Health and Nutrition Examination Survey in 2005, 2008–2013, and 2016. The researchers observed an increasing trend in the TyG index as blood lead and cadmium concentrations rose. Participants in the highest quartile of blood lead and cadmium concentrations showed higher TyG index values compared to those in the lowest

quartile. The study highlights the relationship between cardiovascular-metabolic disorders and individuals exposed to heavy metals, such as lead [6]. The correlation between lead exposure and severe health issues, specifically cardiovascular-metabolic disorders, shows the pressing need to take proactive measures to mitigate lead toxicity and safeguard public health.

Williamsburg, Brooklyn, is home to a well-known Hasidic Jewish community composed of individuals with deeply rooted religious and traditional values. Remarkably, lead poisoning is extremely prevalent in this community. Many children in Williamsburg display high rates of lead exposure, even surpassing those found in Flint, Michigan, during its water contamination crisis, which is wildly concerning. Aging infrastructure, lead-based paint, and industrial pollution are all factors that contribute to the elevated lead levels in this community.

Hasidic Williamsburg undoubtedly faces distinctive challenges when navigating its lead poisoning. Religious and cultural practices influence exposure risks since families often live in older homes with lead-based paint. Furthermore, language barriers and limited access to healthcare services create an obstacle in preventing, screening for, and treating lead poisoning [11]. Regardless of these challenges, public health officials and community leaders are working together to raise awareness about lead poisoning and provide resources for testing and treatment. Outreach efforts include educational routine screening,

workshops, home inspections, and partnerships with local healthcare providers. By empowering families with information and support, the Hasidic community in Williamsburg is taking proactive steps to protect its children from the dangers of lead exposure.

As we confront the modern-day challenges of lead toxicity, we cannot ignore the insight derived from ancient texts and teachings. From the metaphorical “sinking like lead” in Exodus to the use of molten lead as an instrument for the death penalty (Sanhedrin, 52a), these ancient texts serve as poignant reminders of lead’s threat.

Rabbinic literature shares further insights into the dangers of lead and its effect on health and society. In the Talmud, lead is associated with many hazards, including injury and toxicity. For example, in (Chullin 8a), lead is described as a naturally hot substance capable of causing harm:

Which wound is a boil and which is a burn? If one was struck with wood, with a stone, with pomace, with the hot springs of Tiberias, or with any item that is not heated by fire, a phrase that serves to include lead that was mined from its source in the ground, which is occasionally hot enough to burn a person, this impression left on the skin is a boil [2].

Again, the Talmud (Sanhedrin, 52a) expressed the usage of lead as a means for the death penalty, Serefa:

מאי פתילה אמר רב מתנה פתילה של אבר - What kind of wick is the Mishnah referring to?

Rav Mattana says: A wick of lead, i.e., a long, thin piece of lead in the shape of a wick, which is melted and poured down into the intestines [12].

In numerous places in the Talmud, the sages describe pouring molten lead down the esophagus as one of the four death penalties executed by the rabbinic courts [8]. The Talmud (Pesachim, 75a) discussed the case of an adulterous woman who is the daughter of a priest. She is sentenced to be burned, but Jewish law obligates the human body to remain intact, so instead of literally burning her body with fire, they would pour molten lead down her throat [10]. The Mishnah (Sanhedrin 7:2) outlined the process of execution by burning. The individual sentenced to death is submerged in manure, so that he is unable to move, and his neck is subsequently wrapped in a scarf, which is then pulled by two witnesses until the individual opens his mouth and molten lead is poured down his throat. His intestines then burn, leading to his death [9].

As is clear from rabbinic literature, lead carries cautionary tales that highlight the need for hypervigilance when handling it. Reinforcing the importance of understanding its properties and dangers, as it is certainly a destructive, corrosive metal.

With a surplus of evidence and dangerous consequences, action needs to be taken to eradicate lead poisoning from modern society. This will require a multi-faceted approach, including thorough lead testing and treatment efforts, public health

education campaigns, and policy interventions aimed at addressing environmental sources of lead contamination [5]. Targeted interventions tailored explicitly to high-risk communities, such as the Hasidic Williamsburg, are of the utmost importance to protecting and ensuring the health of particularly vulnerable populations.

The toxic nature of lead acts as a reminder of the interconnectedness of the past, present, and future. In modern times, as we face the challenges posed by this pervasive hazard, we reflect on the warnings deep in our ancient heritage and draw upon the collective wisdom of scientific inquiry to chart a path forward. By forging partnerships between communities, policymakers, religious thought leaders, and researchers, we can strive towards a world where the dangers of lead will be acknowledged, addressed, and eventually eradicated, relegated to our history and symbolism.

Acknowledgments

To my parents, thank you for the unwavering support, constant encouragement, involvement, and guidance with this article. Thank you, Dr. Babich, for encouraging me to submit an article to Derech Hateva and inspiring me to write about this topic matter. Most importantly, thank You, Hashem.

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[3] Exodus 15:9-10.

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