**Foods, beverages, and dietary supplements may be vulnerable to lead contamination as the result of leaded soil, water, or lead canning.
Image Source: Unsplash user Ali Inay**

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In April of 2014, the city of Flint, Michigan, changed its water source. After 50 years of purchasing treated water from Detroit, city officials elected to switch to water sourced from the Flint River for an annual savings of about $5 million. The true cost of the switch is only now becoming evident; following complaints from residents regarding the taste, smell, and appearance of the new water, testing revealed astoundingly high levels of lead in the water supply due to the river water's corrosive elements wreaking havoc the city's deteriorating water distribution system. Upon testing, the average lead concentration was discovered to be 2,000 ppb with some samples reaching 13,200 pb, "200-1,300 times higher than the World Health Organization standards of 10ppb," according to *The Guardian*.[1]

For reference, the Environmental Protection Agency's threshold for hazardous waste is 5,000 ppb. By the time Governor Rick Snyder declared a state of emergency in January of this year, 10 people had died of Legionnaire's disease and as many as 10,000 people have experienced other medical problems caused by the contaminated water.[2]

As the city grapples with the implications and long-term consequences of its water crisis, public concern regarding leaded water has spread across the United States. According to *Builder* magazine, "Unbelievably, an estimated three to six million miles of lead pipes across the U.S. still carry water, and most all of them are vulnerable to dangers like those in Flint."[3] However, drinking water isn't the only potential source of lead contamination in consumable products; foods, beverages, and dietary supplements all have the potential to contain unacceptable levels of lead as the result of cultivation in leaded soil, lead-soldered canning, or inclusion of leaded water.[4] Lead exposure can lead to a host of serious and destructive health effects, including neurological and nervous system damage,

anemia, kidney failure, increased risk of miscarriage, and even death. As a result, it is imperative that the food industry engages in rigorous, ongoing lead testing to ensure the safety of their products.

The USP colorimetric lead testing method cannot be applied to alkali earth elements due to condensation formation during sample digestion.
Image Source: Unsplash user Neslihan Gunaydin

Current Lead Testing Methods

The most widespread, reliable methods for lead testing currently in use are inductively coupled plasma mass spectroscopy (ICP-MS) and graphite furnace atomic absorption spectroscopy (GFAAS).[5] Unfortunately, these methods are often prohibitively expensive for many food and supplement manufacturers; an ICP-MS instrument, for example, can cost as much as $750,000 to purchase and over $1000 a day to operate. While GFAAS instrumentation is considerably less expensive, it requires a spotless operating environment, thereby incurring potentially substantial operating costs over time.[6] Although newer methods have been developed over the past decade, they tend to be limited in scope and the colorimetric method recommended by the US Pharmacopeia (USP) can be time-consuming, inaccurate, environmentally hazardous, and unable to analyze all types of samples.[7] To fill the need for more rapid, versatile, and economically viable lead testing, researchers have recently turned to **UV-Vis spectrophotometry**.

UV-Vis spectrophotometry expands accessibility of reliable, accurate lead testing to help manufacturers of consumable goods ensure the safety of their products.
Image Source: Kai Jerke

A UV-Vis Spectrophotometric Method of Lead Testing

UV-Vis spectrophotometry is renowned for its ability to **accurately analyze water quality, rapidly detecting impurities and quantifying critical elements** commonly found in our water supply. But UV-Vis instrumentation can also be used to measure lead within consumable goods that may have been exposed to lead during the production process. As detailed in *Pharmaceutical Technology*, research spearheaded by Qingyong Lang, senior analytical chemist from Nutritional Laboratories International in Missoula, MT, has led to the development of a UV-Vis spectrophotometric lead

testing method that solves many of the problems associated with both traditional and recently developed testing practices.[8] The benefits of the UV-Vis method include:

- Capable of measuring even trace amounts of lead under 1 ppb.
- Applicable to all organic and inorganic samples, including alkali earth elements.
- Reliable and accurate, as validated by standard addition method and ICP-MS.
- Does not require extensive preparation of testing environment.

For most samples, the UV-Vis spectrophotometric method allows for rapid results. The researchers note that while testing of "complicated dietary supplements, which might contain either certain compounds with high molecular weights or a mixture of organic and mineral ingredients" may take up to 2 hours, UV-Vis still offers a significant time advantage over the USP method, which can take up to several days. The versatility of the method means that lead testing may be performed on virtually any material, including "pharmaceutical, agricultural, food, and raw dietary supplements," allowing for broad application and the ability to test a manufacturer's full range of products throughout the production process.

HunterLab UV-Vis Spectrophotometers

HunterLab is committed to providing our customers with the finest tools available to ensure that the food industry meets both aesthetic expectations and health and safety standards. We offer a full range of UV-Vis spectrophotometers for the ultimate in accuracy, flexibility, and quality assurance in liquid, powder, and solid consumable goods. **Contact us** to learn more how HunterLab instrumentation can enhance your testing protocols.

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