

Extracting heavy metals with vegetable oils

August 18 2016, by Sandra Avant



In the vial, the oil droplet's red color shows that it absorbed metals from the water/metal solution. Credit: Kim Ascherl

Dangerous lead levels in drinking water in cities across the nation have recently made national headlines. Water contaminated with lead, mercury, or other heavy metals poses serious problems for not only our health but also for our environment.

At the Agricultural Research Service's (ARS) National Center for Agricultural Utilization Research (NCAUR) in Peoria, Illinois, scientists are investigating safe ways to remove [heavy metals](#) from various substances. Recently, they developed and patented a new method that uses [vegetable oils](#) to remove metals from liquids, solids, and gases.

Rex Murray, research leader at NCAUR's Bio-Oils Research Unit, and his colleagues have created a chemical process to modify vegetable oils into "functionalized" vegetable oils that effectively separate heavy metal ions from [water](#). The team included chemist Kenneth Doll, physical scientist Grigor Bantchev, chemical engineer Robert Dunn, and physical science technician Kim Ascherl.

Vegetable oils have excellent environmental attributes, Murray says. They are biodegradable, nontoxic, and derived from renewable resources. NCAUR scientists have a history of developing different nonfood uses for vegetable oils, including as inks, diesel fuel, and lubricants. In earlier research, Bantchev produced sulfide-modified vegetable oil lubricants from canola and corn oil, which led to heavy-metal extraction research.

"We found that our bio-oils—functionalized vegetable oils—that were used as lubricants are also good for absorbing heavy metals. The process is simple," Murray says. "When you mix the functionalized oil with water contaminated with toxic heavy metals, certain atoms in the oil bind to the heavy metals, pulling them out of the water." The clean water can then be easily separated from the heavy-metal-containing oil, and the oil can then be safely removed from the environment.

"We analyzed the amount of metal removed by different functionalized oils," Murray says. "Corn oil worked better than canola oil. We believe a different fatty-acid content in corn oil leads to its better metal-binding capabilities."

This research shows that modified vegetable oils hold promise as a safe method to help clean up heavy-metal waste in the future, Murray adds. Other studies are under way to determine the effectiveness and ability of vegetable oils to extract other metals from solutions.

Provided by Agricultural Research Service

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