UC Davis may have solved mystery of chemical contamination

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A dangerous chemical on the site of a former animal-testing laboratory at UC Davis may not have come from experiments there, but rather from a chemical reaction underground in the years since.

For 30 years starting in 1958, the Laboratory for Energy-Related Health Research was, for some, a place of discovery. For others it was a source of nightmares.

The lab conducted Cold War-inspired research for the U.S. Department of Energy, including exposing beagles to lethal radiation to judge how humans might survive.

Waste from those experiments, including hundreds of radioactive dog carcasses, was dumped on-site in crudely built landfills. The 15-acre location south of Interstate 8O was declared a federal Superfund site in 1994, a category reserved for the nation's most toxic industrial facilities.

Yet the presence of cancer-causing chromium-6 on the site has been a mystery. There is no evidence the chemical was used at the lab, said Sue Fields, an environmental engineer at the university. And the plume of chromium-6 in groundwater is strangely isolated rather than linked to a particular disposal area.

Now a consultant hired by the university has concluded the carcinogen was probably formed by a chemical interaction underground.

Chromium-3 is a naturally occurring and nontoxic chemical that happens to be common in area soils.

Recent research by Stanford University scientists has shown that chromium-3 can be converted into the toxic chromium-6 variety when it mixes with nutrients such as sewage and with naturally occurring manganese in the soil.

The university once operated a campus sewage treatment plant near the laboratory. And it turns out that sewage sludge from the treatment plant was dumped in landfills on the lab grounds.

The sludge likely migrated into groundwater, feeding a reaction that bred chromium-6.

"I've worked a lot of Superfund sites and have really never seen this pattern of contamination before," said Fields. "We just have this unique area where we have naturally high chromium and manganese in our soil."

Chromium-6 has been detected at the site at levels 10 times greater than California drinking water standards. But there is no evidence the contaminant has migrated off the site or tainted any active drinking water wells in the area.

University officials plan a pilot project to treat the chromium-6 by converting it back to chromium-3. This will be attempted by injecting calcium polysulfide underground to trigger a reverse reaction.

G. Fred Lee, a consultant in environmental engineering, said success depends on how well the injected chemical can penetrate the soil. Lee works with the Davis South Campus Superfund Oversight Committee, a neighborhood group monitoring the cleanup.

Even if it succeeds, this will not end the cleanup work. The site has a host of other problems, notably a massive plume of hazardous chloroform in groundwater that extends nearly a mile beyond the site.

"They'll be pumping and treating and using other methods for a very long time," said Lee. "For a number of years, they didn't move as fast as they should have. I think they're making pretty good progress now."

UC Davis and the Department of Energy have been working to clean up the lab location for at least 15 years. The energy agency on Jan. 29 released a record of decision on final plans to clean its portion of the site. UC Davis expects to submit its own plan to the U.S. Environmental Protection Agency this fall.

A lingering question is whether the chemical process at work on the UC Davis site could explain other chromium-6 problems in California groundwater – such as near septic tanks or other landfills.

"If we're right about this, I think that's something that needs to be studied," Fields said.

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