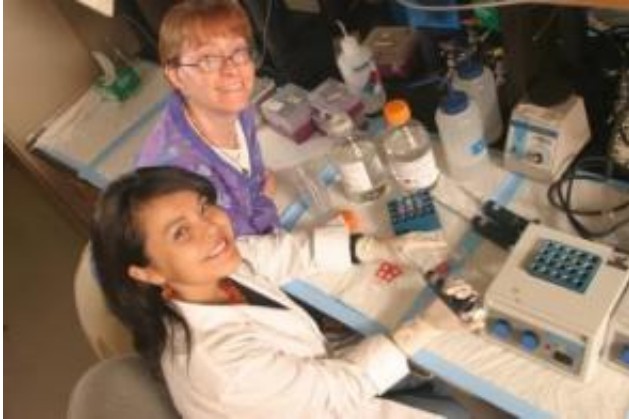


Study may help slay 'Yellow Monster'

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Northern Arizona University biochemist Diane Stearns, top, working with student researchers like Hertha Woody, has discovered that uranium damages DNA as a heavy metal, independent of its radioactive properties. Photo by Jerry Foreman

Low-grade uranium ore is nicknamed "yellowcake" for its color and powdered consistency. The Navajo have another name: Leetso, or "yellow monster." The yellow monster surfaced on the Navajo Nation with uranium mining that started in the 1940s and continued for the next several decades. In its aftermath came illnesses such as lung cancer among mine workers and worries about environmental contamination among people who live on that land.

The Navajos believe you must gain knowledge of a monster to slay it and restore nature's balance. Northern Arizona University biochemist Diane Stearns and her Navajo students are not only gaining knowledge, they are

adding to that knowledge with new discoveries about uranium.

The fact that uranium, as a radioactive metal, can damage DNA is well documented. But what Stearns and her collaborators recently have found is that uranium can also damage DNA as a heavy metal, independent of its radioactive properties.

Stearns and her team are the first to show that when cells are exposed to uranium, the uranium binds to DNA and the cells acquire mutations. When uranium attaches to DNA, the genetic code in the cells of living organisms, it can change that code. As a result, the DNA can make the wrong protein or wrong amounts of protein, which affects how the cells grow. Some of these cells can grow to become cancer.

"Essentially, if you get a heavy metal stuck on DNA, you can get a mutation," Stearns explained. Other heavy metals are known to bind to DNA, but Stearns and her colleagues are the first to identify this trait with uranium. Their results were published recently in the journals *Mutagenesis* and *Molecular Carcinogenesis*.

Their findings have far-reaching implications for people living near abandoned mine tailings in the Four Corners area of the Southwest and for war-torn countries and the military, which uses depleted uranium for anti-tank weapons, tank armor and ammunition rounds. Depleted uranium is what is left over when most of the highly radioactive isotopes of uranium are removed.

"The health effects of uranium really haven't been studied since the Manhattan Project (the development of the atomic bomb in the early 1940s). But now there is more interest in the health effects of depleted uranium. People are asking questions now," Stearns said.

The questions include whether there is a connection between exposure to

depleted uranium and Gulf War Syndrome or to increased cancers and birth defects in the Middle East. Stearns said it is estimated that more than 300 tons of depleted uranium were used during the first Gulf War. Military uses of depleted uranium in weapons continue today.

Closer to home, questions continue to be asked about environmental exposure to uranium from mine tailings that dot the landscape across the Navajo Nation.

"When the uranium mining boom crashed in the '80s, it really crashed and there wasn't much cleanup," Stearns said. Estimates put the number of abandoned mines on the Navajo Nation at more than 1,100.

NAU senior Hertha Woody grew up on the Navajo Nation in Shiprock, N.M. Before joining Stearns' research group, Woody said she was not very aware of heavy metal contamination of soil and water from a large uranium tailing pile near her hometown. But now she wonders about the ongoing health problems of her uncle who worked in the uranium mine at Shiprock. And she worries about others living in the area.

"My parents still live there and drink the water," she noted.

There's another Navajo word that Woody shares. It is hozho, which relates to harmony, balance and beauty. Woody explained that the yellow monster disrupts hozho and that uranium should remain in the ground to ensure balance. In fact, in the spring of 2005, Navajo Nation President Joe Shirley, Jr., signed the Diné Natural Resources Protection Act, which bans uranium mining and processing on the Navajo Nation.

Woody said she has learned a great deal and not just in the realm of science. "It opens up doors and windows everywhere else," she said, noting that the work has raised her awareness about mine safety, tribal issues and reclamation efforts.

"When we first heard of the yellow monster, it was scary and not much was understood until the research began and it was passed on to the people through booklets and talks at the chapter houses," said Sheryl Martinez, a junior in NAU's nursing program and another member of Stearns' research group. Martinez, also a native of Shiprock, hopes to return to her community and put her knowledge to work after graduation.

The funding for Stearns' work is tied to improving health among Native American communities. Stearns is the NAU principal investigator of a grant jointly awarded to NAU and the Arizona Cancer Center by the National Cancer Institute. Louise Canfield is the principal investigator on the grant for the Arizona Cancer Center. Collectively, these two grants comprise the Native American Cancer Research Partnership, a consortium of cancer researchers and educators at NAU and the Arizona Cancer Center. NACRP is one of only five such partnerships in the nation and the only one focused on Native American issues.

"The data on Native Americans for cancer evidence is very poor," Stearns said. "Navajo and Hopi may not get cancer to a greater extent, but the survival rate is lower than the general population." Stearns said the lower survival rate might be more the result of limited access to care or cultural boundaries that may prevent people from seeking care.

A goal of the partnership is to address these disparities by training Native students for cancer-related careers.

In this way, Stearns and her students can help slay the yellow monster, whether on the Navajo Nation or abroad.

Source: Northern Arizona University

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