Fungi have a hand in depleted uranium's environmental fate

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Fungi may have an important role to play in the fate of potentially dangerous depleted uranium left in the environment after recent war campaigns, according to a new report in the May 6th issue of *Current Biology*, a publication of Cell Press.

The researchers found evidence that fungi can "lock" depleted uranium into a mineral form that may be less likely to find its way into plants, animals, or the water supply.

"This work provides yet another example of the incredible properties of microorganisms in effecting transformations of metals and minerals in the natural environment," said Geoffrey Gadd of the University of Dundee in Scotland. "Because fungi are perfectly suited as biogeochemical agents, often dominate the biota in polluted soils, and play a major role in the establishment and survival of plants through their association with roots, fungal-based approaches should not be neglected in remediation attempts for metal-polluted soils."

The testing of depleted-uranium ammunition and its recent use in Iraq and the Balkans has led to contamination of the environment with the unstable metal, Gadd explained. Depleted uranium differs from natural uranium in the balance of isotopes it contains. It is the byproduct of uranium enrichment for use in nuclear reactors or nuclear weapons and is valued for its very high density. Although less radioactive than natural uranium, depleted uranium is just as toxic and poses a threat to people.

In the new study, the researchers found that free-living and plant symbiotic (mycorrhizal) fungi can colonize depleted-uranium surfaces and transform the metal into uranyl phosphate minerals.

While they probably still pose some threat, he said, “The fungal-produced minerals are capable of long-term uranium retention, so this may help prevent uptake of uranium by plants, animals, and microbes. It might also prevent the spent uranium from leaching out from the soil.”

Gadd said that a combination of environmental and biological factors is involved in the process. First, the unstable uranium metal gets coated with a layer of oxides. Moisture in the environment also “corrodes” the depleted uranium, encouraging fungal colonization and growth. While the fungi grow, they produce acidic substances, which corrode the depleted uranium even further. Some of the substances produced include organic acids that convert the uranium into a form that the fungi can take up or that can interact with other compounds. Ultimately, he said, the interaction of soluble forms of uranium with phosphate leads to the formation of the new uranium minerals that get deposited around the fungal biomass.

“We have shown for the first time that fungi can transform metallic uranium into minerals, which are capable of long-term uranium retention,” the researchers concluded. “This phenomenon could be relevant to the future development of various remediation and revegetation techniques for uranium-polluted soils.”

Source: Cell Press