

# Researchers discover 'radiation-eating' fungi

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Scientists have long assumed that fungi exist mainly to decompose matter into chemicals that other organisms can then use. But researchers at the Albert Einstein College of Medicine of Yeshiva University have found evidence that fungi possess a previously undiscovered talent with profound implications: the ability to use radioactivity as an energy source for making food and spurring their growth.

"The fungal kingdom comprises more species than any other plant or animal kingdom, so finding that they're making food in addition to breaking it down means that Earth's energetics—in particular, the amount of radiation energy being converted to biological energy—may need to be recalculated," says Dr. Arturo Casadevall, chair of microbiology & immunology at Einstein and senior author of the study, published May 23 in PLoS ONE.

The ability of fungi to live off radiation could also prove useful to people: "Since ionizing radiation is prevalent in outer space, astronauts might be able to rely on fungi as an inexhaustible food source on long missions or for colonizing other planets," says Dr. Ekaterina Dadachova, associate professor of nuclear medicine and microbiology & immunology at Einstein and lead author of the study.

Those fungi able to "eat" radiation must possess melanin, the pigment found in many if not most fungal species. But up until now, melanin's biological role in fungi—if any--has been a mystery.

"Just as the pigment chlorophyll converts sunlight into chemical energy

that allows green plants to live and grow, our research suggests that melanin can use a different portion of the electromagnetic spectrum—ionizing radiation—to benefit the fungi containing it," says Dr. Dadachova.

The research began five years ago when Dr. Casadevall read on the Web that a robot sent into the still-highly-radioactive damaged reactor at Chernobyl had returned with samples of black, melanin-rich fungi that were growing on the reactor's walls. "I found that very interesting and began discussing with colleagues whether these fungi might be using the radiation emissions as an energy source," says Dr. Casadevall.

To test this idea, the Einstein researchers performed a variety of in vivo tests using three genetically diverse fungi and four measures of cell growth. The studies consistently showed that ionizing radiation significantly enhances the growth of fungi that contain melanin.

For example, two types of fungi--one that was induced to make melanin (*Cryptococcus neoformans*) and another that naturally contains it (*Wangiella dermatitidis*)—were exposed to levels of ionizing radiation approximately 500 times higher than background levels. Both species grew significantly faster (as measured by the number of colony forming units and dry weight) than when exposed to standard background radiation.

The researchers also carried out physico-chemical studies into melanin's ability to capture radiation. By measuring the electron spin resonance signal after melanin was exposed to ionizing radiation, they showed that radiation interacts with melanin to alter its electron structure. This is an essential step for capturing radiation and converting it into a different form of energy to make food.

Dr. Casadevall notes that the melanin in fungi is no different chemically

from the melanin in our skin. "It's pure speculation but not outside the realm of possibility that melanin could be providing energy to skin cells," he says. "While it wouldn't be enough energy to fuel a run on the beach, maybe it could help you to open an eyelid."

Source: Albert Einstein College of Medicine

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