

Do 3 meals a day keep fungi away?

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This is Arturo Casadevall, M.D., Ph.D., chair and professor of microbiology & immunology at Einstein. Credit: Albert Einstein College of Medicine

The fact that they eat a lot - and often - may explain why most people and other mammals are protected from the majority of fungal pathogens, according to research from Albert Einstein College of Medicine of Yeshiva University.

The research, published in the [Journal of Infectious Diseases](#), showed that the elevated body temperature of mammals - the familiar 98.6F or 37C in people - is too high for the vast majority of potential fungal invaders to survive.

"Fungal [strains](#) undergo a major loss of ability to grow as we move to mammalian temperatures," said Arturo Casadevall, M.D., Ph.D., chair

and professor of [microbiology](#) & immunology at Einstein. Dr. Casadevall conducted the study in conjunction with Vincent A. Robert of the Utrecht, Netherlands-based Fungal Biodiversity Center, also known as Centraalbureau voor Schimmelcultures.

"Our study makes the argument that our warm temperatures may have evolved to protect us against fungal diseases," said Dr. Casadevall. "And being warm-blooded and therefore largely resistant to fungal infections may help explain the dominance of mammals after the age of dinosaurs."

There are roughly 1.5 million fungal species. Of these, only a few hundred are pathogenic to mammals. Fungal infections in people are often the result of an impaired immune function. By contrast, an estimated 270,000 fungal species are pathogenic to plants and 50,000 species infect insects. Frogs and other amphibians are prone to fungal pathogens, one of which, chytridiomycosis, is currently raging through frogs worldwide. Fungi are also important in the decomposition of plants.

In their study, the researchers investigated how 4,082 different fungal strains from the Utrecht collection grew in temperatures ranging from chilly - 4C or 39F - to desert hot - 45C or 113F. They found that nearly all of them grew well in temperatures up to 30o C. Beyond that, though, the number of successful species declined by 6 percent for every one degree centigrade increase. Most could not grow at mammalian temperatures. Those that did well in hotter conditions were often from warm-blooded sources.

Dr. Casadevall noted that the current study covered thousands of fungal strains and made use of a computerized database of the Utrecht collection. In the past, this type of research would have required retrieving this information manually, which Dr. Casadevall noted would have been a very time-consuming task.

"This was possible only because we could use bioinformatic tools to analyze the records in the culture collection," he said. "There is no way to do a study like this without such technology given the enormous numbers of samples and the labor involved."

The results of the study, he added, could help explain why mammals maintain a seemingly energy-wasteful lifestyle requiring a great deal of food. By contrast, reptiles need only eat once a day or even less often.

"The payoff, however, may be that mammals are much more resistant to soil and plant-borne fungal pathogens than are reptiles and other cold-blooded vertebrates," said Dr. Casadevall.

This stronger immunity to fungi could explain why mammals rose to dominance after the dinosaur extinction event 65 million years ago. Indeed, the fungal bloom that occurred then may be one reason for the extinction of dinosaurs, a possibility outlined in a 2004 Fungal Genetics and Biology paper from Dr. Casadevall.

More information: The research paper, "Vertebrate Endothermy Restricts Most Fungi as Potential Pathogens," appeared in the October 13 online edition of the *Journal of Infectious Diseases*.

Source: Albert Einstein College of Medicine ([news](#) : [web](#))

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