

# Advances in anti-aging: Rapamycin shows potential to extend lifespan and improve health, expert says

August 1 2024, by Cynthia McCormick Hibbert

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People looking to slow or reverse the symptoms of aging can find remedies ranging from restricted diets and ice baths to an alphabet soup of vitamins.

Should they look no further than the tablet form of rapamycin, a molecule isolated from soil bacteria on Easter Island that's been shown to [extend the lifespan](#) of mice, yeast, worms and flies?

Ramkumar "Ram" Hariharan, a computational biologist on Northeastern University's campus in Seattle, says rapamycin has the potential to be among the first generation of anti-aging drugs.

"Among all the anti-aging interventions that are currently being talked about, rapamycin seems to be a best bet," says Hariharan, a data scientist and associate teaching professor and director of College of Engineering programs in Seattle.

"Rapamycin has been shown to be effective in extending the mouse lifespan by 15 to 20%, even when started during mouse middle age," he says.

## Health span versus life span

Clues to how it could affect the human lifespan are expected to come from [a study](#) of how rapamycin affects treatments for [periodontal disease](#), a gum condition associated with aging that has been considered treatable but incurable, Hariharan says.

While the FDA will examine the effects of rapamycin on study participants' periodontal disease, other researchers will work with the principal investigator to look for markers of biological aging.

"The jump from mouse to human will require proper clinical trials, with human subjects," Hariharan says.

"You cannot expect to measure life span," since tracking 70 to 100 study participants to the end of their lives is not practical, he says.

"The way that people are trying to solve that problem is by looking at proxy markers of aging," such as epigenetic changes to DNA that alter gene expression during the [aging process](#), Hariharan says.

When it comes to humans, it's also important to consider health span versus life span, he says.

"No matter what you do, you may not be able to extend the human lifespan beyond 120 or 125 years," Hariharan says.

"But we may be able to add more life to those years so you can go all the way to 100 and the last 10 years would be much better with the intervention than without intervention."

Adding to the excitement around rapamycin are mouse studies that show its potential to reduce Alzheimer's disease and cardiac disease.

"The question becomes, if you slow down aging, would you also be able to stave off or at least delay the initiation of these diseases? And rapamycin has shown some promise," Hariharan says.

A [pilot study](#) is also looking at whether a weekly dose of rapamycin can slow ovarian aging and delay menopause, which has implications for fertility.

## **What is rapamycin and how does it work?**

Rapamycin is named after Rapa Nui, the indigenous name for Easter Island, where it was discovered as an antibiotic produced by soil bacteria.

Studies in [the 1970s and 1980s](#) showed that the molecule worked as an anticancer drug in humans in addition to being an immunosuppressant that helped kidney transplant patients accept new organs.

Rapamycin works by modulating the effects of a protein called mTOR, short for mammalian target of rapamycin.

Hariharan says that mTOR promotes aging by slowing down the process of cell repair known as autophagy.

"Autophagy is great because it recycles everything, at least theoretically," Hariharan says.

He says to think of rapamycin as promoting [cell survival](#) by turning down the dial on cellular growth and reproduction in a way that limits the buildup of waste that can lead to disease.

## **Is rapamycin safe for humans?**

Because rapamycin is an FDA-approved immunosuppressant, "we kind of know its safety profile," Hariharan says. Some reported side effects are canker sores and mouth ulcers.

In any event, he says, "The dosage that people are talking about for extending health span is much, much tapered down."

"To the best of what we know, it does not decrease your bone mineral density. It does not make you tired," Hariharan says, pointing out that bone loss and fatigue are associated with another promising anti-aging regimen known as calorie restricted dieting.

Rapamycin shows such promise that some people have begun self-dosing with the tablet, and they are not reporting negative effects, Hariharan says.

"Those people might be biased," he says. "A proper clinical trial hasn't been done."

## **The leader in anti-aging**

"You definitely don't want to be taking it when you are still growing up," Hariharan says.

He says people interested in rapamycin should talk to their medical provider about getting a prescription.

"I cannot say that [rapamycin](#) is definitely an anti-aging therapy," Hariharan says. "But it definitely seems to be the leader among the different anti-aging interventions."

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Provided by Northeastern University

Citation: Advances in anti-aging: Rapamycin shows potential to extend lifespan and improve health, expert says (2024, August 1) retrieved 1 August 2024 from <https://medicalxpress.com/news/2024-08-advances-anti-aging-rapamycin-potential.html>

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