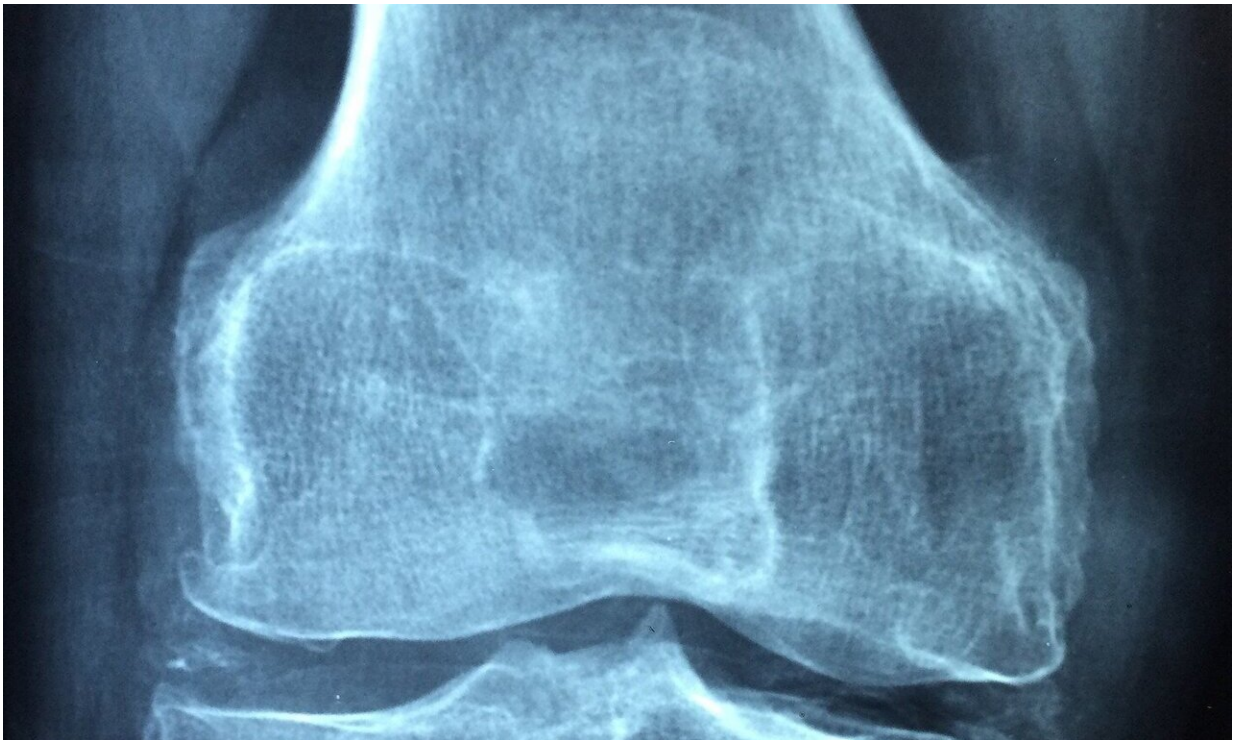


An experimental vaccine against rheumatoid arthritis

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Researchers at The University of Toledo have developed an experimental vaccine that shows significant promise in preventing rheumatoid arthritis, a painful autoimmune disease that cannot currently be cured.

The findings, detailed in a paper published in the journal *Proceedings of the National Academy of Sciences*, represent a major breakthrough in the study of [rheumatoid arthritis](#) and autoimmune diseases in general.

One of the most common autoimmune diseases, rheumatoid arthritis occurs when the body's immune system attacks and breaks down healthy tissue—most notably the lining of joints in the hands, wrists, ankles and knees.

Some estimates suggest rheumatoid arthritis affects as much as 1% of the global population.

"In spite of its high prevalence, there is no cure and we don't entirely know what brings it on. This is true of nearly all autoimmune diseases, which makes treating or preventing them so difficult," said Dr. Ritu Chakravarti, an assistant professor in the UToledo College of Medicine and Life Sciences and the paper's lead author. "If we can successfully get this vaccine into the clinic, it would be revolutionary."

Chakravarti has for years studied a [protein](#) called 14-3-3 zeta and its role in immune pathologies, including aortic aneurysms and interleukin-17—a cytokine associated with [autoimmune diseases](#). Based on their prior work, the research group was focused on the protein as a potential trigger for rheumatoid arthritis.

Instead, they found the opposite.

Rather than preventing rheumatoid arthritis, researchers discovered that removing the protein through gene-editing technology caused severe early onset arthritis in animal models.

Working under a new theory that the 14-3-3 zeta protein protects against rheumatoid arthritis, the team developed a protein-based vaccine using

purified 14-3-3 zeta protein grown in a bacterial cell.

They found the vaccine promoted a strong and immediate—but long-lasting—response from the body's innate immune system, providing protection against the [disease](#).

"Much to our happy surprise, the rheumatoid arthritis totally disappeared in animals that received a vaccine," Chakravarti said. "Sometimes there is no better way than serendipity. We happened to hit a wrong result, but it turned out to be the best result. Those kinds of scientific discoveries are very important in this field."

In addition to suppressing the development of arthritis, the vaccine also significantly improved bone quality—a finding that suggests there should be long-term benefits following immunization.

Currently, rheumatoid arthritis is treated primarily with corticosteroids, broad scale [immunosuppressive drugs](#) or newer, more targeted biologics that target a specific inflammatory process.

While those therapeutics can alleviate pain and slow the progression of the disease, they also can make patients more vulnerable to infection and, in the case of biologics, can be costly.

"We have not made any really big discoveries toward treating or preventing rheumatoid arthritis in many years," Chakravarti said. "Our approach is completely different. This is a [vaccine](#)-based strategy based on a novel target that we hope can treat or prevent rheumatoid [arthritis](#). The potential here is huge."

Researchers have filed for a patent on their discovery and are seeking pharmaceutical industry partners to support safety and toxicity studies in hopes of establishing a preclinical trial.

More information: Joshua Kim et al, 14-3-3 ζ : A suppressor of inflammatory arthritis, *Proceedings of the National Academy of Sciences* (2021). [DOI: 10.1073/pnas.2025257118](https://doi.org/10.1073/pnas.2025257118)

Provided by University of Toledo

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