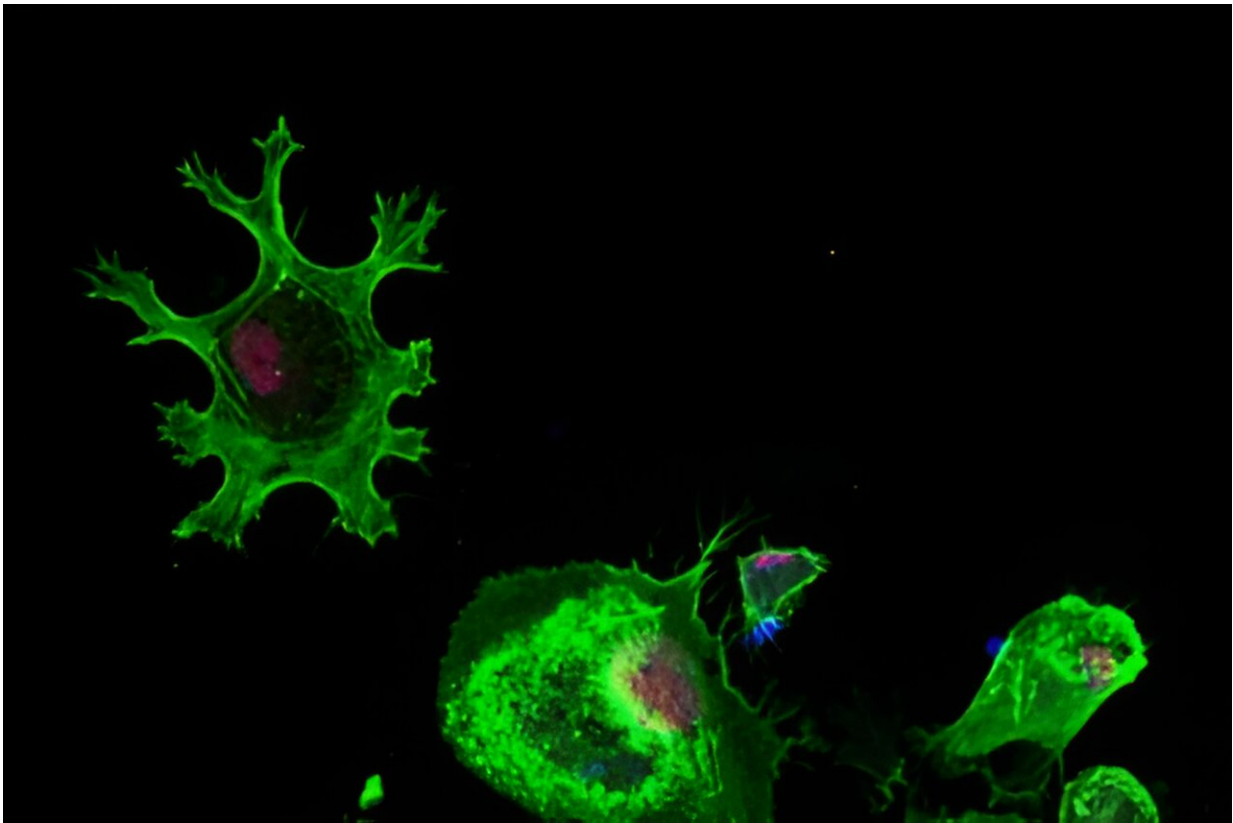


# Study finds some people have a uniquely human gene that enhances immune function

April 30 2024, by Ellen Goldbaum

---



This confocal image of a macrophage (a type of white blood cell in the immune system) differentiated from induced pluripotent stem cells shows that the human specific gene *CHRFAM7A* rearranges the actin cytoskeleton (green). Credit: University at Buffalo

University at Buffalo researchers have found that the active form of a

gene promotes a broad range of protective traits. The gene is found in 75% of the population and is known to protect against neurodegeneration. Now, UB researchers have found that this same gene enhances immune function, too.

The new findings were [published](#) in *eBioMedicine*.

CHRFAM7A is a uniquely human gene that occurred after humans split from a [common ancestor](#) with chimpanzees millions of years ago.

The gene has been implicated and studied in neuropsychiatric disorders. The UB team's previous work identified how the gene is protective against memory disorders, such as Alzheimer's disease, but its role in [immune function](#) has not been well understood.

Kinga Szigeti, MD, Ph.D., corresponding author, professor of neurology in the Jacobs School of Medicine and Biomedical Sciences at UB and a physician with UBMD Neurology, says the team wasn't surprised to find that the gene has an immune-enhancing function.

## **Immune advantage**

"We always thought that the fact that this mutation is enriched in the human population—meaning that since it helped people survive, more and more people became carriers—indicated that it would provide an immune advantage," she says.

The research reveals how it does that, and it turns out to be related to the team's previous work.

Last year, the UB team published a [study](#) showing that the active form of the CHRFAM7A gene allows brain cells to be more flexible. That work showed that it does this by activating actin cytoskeleton, which provides

structural support to cells, allowing brain cells to be more resilient. That property provides protection against [neurodegenerative diseases](#) such as Alzheimer's.

Now the team has found that the gene's activation of [actin cytoskeleton](#) also enhances immune function.

"Our research shows that as human cells evolved with their cytoskeleton, they gained new function, allowing them easier access to fight sources of infection in the body," says Szigeti.

She explains that CHRFAM7A changes calcium signaling in the cell, that's the cell's most ancient signal-transduction system (i.e., communication system).

"That signaling change leads to a switch in how the actin is organized, producing cells that are tougher on the outside, creating a stronger, better shield, which is called lamellipodia," explains Szigeti.

## **Cutting through the matrix**

The CHRFAM7A cells have an additional immune advantage. "The immune system needs a road to get into infected tissue," she adds, "and the CHRFAM7A cells developed a new mechanism: They can cut through the extracellular matrix, or fabric of the organs, and get to places that have limited vascularization or have been compromised by disease."

Since this advantage allows immune system cells to get into the infected tissue more efficiently, the infection can be controlled earlier, leaving the bacteria or the virus limited time to replicate, she continues.

Because of the gene's impact on calcium signaling, which is a key driver

of numerous fundamental biological processes, including cellular metabolism, it likely also affects many other biological and pathological processes.

Uniquely human [genes](#) endow people with human-specific traits; Szigeti notes that traditional animal models of diseases, which lack these genes, cannot therefore accurately reflect how some drugs will function in humans.

"So far, it's clear that the active form of CHRFAM7A provides protection against multiple disorders," says Szigeti. "This research could lead to the identification of important new drug targets."

To do the current study, the team used [pluripotent stem cells](#) that have the mutation through genetic engineering.

"We used human cells that can be differentiated into the first responders of the immune system (monocytes) and tested how they can get into engineered substrates that model human tissue stiffness in health and disease," she says.

So far, the gene has been implicated in the systemic inflammatory response, [inflammatory bowel disease](#) (IBD), COVID-associated cytokine storm, HIV-associated neurocognitive disorders, osteoarthritis and cancer metastasis.

The UB team is currently testing the gene's role in the human brain, IBD and cancer metastasis.

**More information:** Kinga Szigeti et al, CHRFAM7A diversifies human immune adaption through Ca<sup>2+</sup> signalling and actin cytoskeleton

reorganization, *eBioMedicine* (2024). DOI: [10.1016/j.ebiom.2024.105093](https://doi.org/10.1016/j.ebiom.2024.105093)

Provided by University at Buffalo

Citation: Study finds some people have a uniquely human gene that enhances immune function (2024, April 30) retrieved 21 May 2024 from <https://medicalxpress.com/news/2024-04-people-uniquely-human-gene-immune.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.