If Immunity Is Innate, What Impacts Our Ability to Fight Infections?

Balyn Zaro, PhD, of UCSF, studies genetic differences in the innate immune system and how they can impact the effectiveness of the meds we take.

February 27, 2023 By University of California San Francisco

This story is one in a series marking International Women and Girls in Science Day, marked each February 11. Join us as we celebrate some laboratory leaders taking research to new heights.

As an assistant professor of pharmaceutical chemistry at University of California, San Francisco, Balyn Zaro, PhD, is drawn to genetic differences in the innate immune system. After all, those differences can impact the effectiveness of the medications we take.

Her lab investigates the cause and consequence of genetic diversity in the immune system, in hopes that her discoveries can lead to better treatments for all patients.

What drew you to this research?

I've always been interested in differences in the human immune system. In the clinic, this is seen in patient responses to immunotherapeutics, which can help a person fight infection, cancer and other diseases. A subset of patients, about 20%, respond extremely well to treatment, but we still don't understand why. Identifying and understanding these differences could revolutionize the way we treat human diseases.

What made you want to study the innate immune system?

There is plenty of research on the adaptive immune system, which is the system humans develop throughout their life. I was surprised by how little understanding there is of the innate immune system in comparison.

What is "self" and "non-self" in innate immune system terms?

The innate immune system works by recognizing "self" and "non-self." It encounters other cells – bacteria, for example – throughout the body and asks whether those cells belong there. It has been assumed that this process is identical across humans. My lab's research suggests that this process is less identical than we previously thought, which is what we are currently investigating.

It may not be that every human’s innate immune system recognizes self and non-self the same way.

How does this impact people’s ability to fight infections?

Some people seem unable to clear their body of a bacterial infection with a traditional course of antibiotics. Our findings may provide an explanation as to why some people respond better to antibiotics and clear infections better than others.

What does this research look like in the lab?

We use Lyme disease as a model for infectious diseases. We want to know why some people respond better to treatment for Lyme than others. We believe the innate immune system may play a critical role.

We’re also asking what other self and non-self cells our bodies might detect differently. This could explain how our bodies recognize and destroy cancer cells. Immunotherapy is advancing the way we treat cancer, but people have vastly different responses. I want to understand why those differences exist, which could lead to more targeted treatments and help more patients.

This article was originally published February 8, 2023, by the University of California, San Francisco, News Center. It is republished with permission.

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