Immune response might be for signaling to others for help, not to protect your body

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A major debate during the pandemic, and in infectious disease research more broadly, is why infected people die. No virus "wants" to kill anyone, as an epidemiologist once said to me. Like any other form of life, a virus's goal is only to survive and reproduce.

A growing body of evidence instead suggests that the human immune system—which the science writer Ed Yong says is "where intuition goes to die"—may itself be responsible for many people's deaths. In an effort to find and kill the invading virus, the body can harm major organs, including the lungs and heart. This has led some doctors to focus on attenuating an infected patient's immune response to help save them.

This brings up an evolutionary puzzle: what's the point of the immune system if its overzealousness can kill the same people it evolved to defend? The answer may lie in humanity's evolutionary history: immunity may be as much about communication and behavior as it is about cellular biology. And to the degree that researchers can understand these broad origins of the immune system, they may be better positioned to improve responses to it.

The concept of the behavioral immune system is not new. Almost all humans sometimes feel disgust or revulsion—usually because whatever has made us feel that way poses a threat to our health. And we aren't alone in these reactions. Research shows that some animals avoid others that are showing symptoms of illness.

Eliciting care

However, more recent theoretical research suggests something more: humans, in particular, are likely to show compassion to those showing symptoms of illness or injury. There's a reason, this thinking goes, why people tend to exclaim when in pain, rather than just silently pull away from whatever is hurting them, and why fevers are linked to sluggish behavior.

Some psychologists argue that this is because immune responses are as much about communication as they are about self-maintenance. People who received care, over humanity's history, probably tended to do better than those who tried to survive on their own.

In the broader evolutionary literature, researchers refer to these kinds of displays as "signals." And like many of the innumerable signals we see across the natural world, immune-related signals can be used—or faked—to exploit the world around us, and each other. Some birds, for example, feign injury to distract predators from their nests; rats suppress disease symptoms so that potential mates won't ignore them.

We also see many illustrations of immune-signal use and misuse in human cultures. In The Adventure of the Dying Detective (1913), for example, Sherlock Holmes starves himself for three days to elicit a confession from a murder suspect. The suspect confesses only when he is convinced that his attempt to infect Holmes with a rare disease has been successful, misreading Holmes's signs of illness.

This is an extreme example, but people feign signals of pain or illness all the time to avoid obligations, to elicit support from others, or even to avoid submitting an article by an agreed deadline. And this is an essential element of any signaling system. Once a signal, be it a wince or a jaundiced complexion, elicits a response from whoever sees it, that response will start to drive how and why the signal is used.

Even germs use—and abuse—immune signals for their own gain. In fact, some viruses actually hijack our own immune responses, such as coughs and sneezes, to pass themselves on to new hosts, using our own evolved functions to further their interests.

Other germs, like SARS-CoV-2 (the virus that causes COVID-19) and *Yersinia pestis* (the bacterium that causes plague), can prevent our signaling to others when we are sick and pass themselves on without anyone realizing.

This perspective of immunity—one that takes into account biology, behavior and the social effects of illness—paints a starkly different picture from the more traditional view of the immune system as a collection of biological and chemical defenses against sickness. Germs use different strategies, just as animals do, to exploit immune signals for their own purposes. And perhaps that's what has made asymptomatically transmitted COVID-19 so damaging: people can't rely on reading other people's immune signals to protect themselves.

Insofar as doctors can predict how a particular infection—whether SARS-CoV-2, influenza, malaria or the next pathogen with pandemic potential—will interact with a patient's immune system, they'll be better positioned to tailor treatments for it. Future research will help us sort through the germs that hijack our immune signals—or suppress them—for their own purposes.

Viewing immunity not just as biological, but as a broader signaling system, may help us to understand our complex relationships with pathogens more effectively.

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