NEWS HEALTH

Measles Outbreak Traced to Fully Vaccinated Patient for First Time

"Measles Mary" raises questions about how long vaccine-given immunity lasts

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Get the measles vaccine, and you won't get the measles—or give it to anyone else. Right? Well, not always. A person fully vaccinated against measles has contracted the disease and passed it on to others. The startling case study contradicts received wisdom about the vaccine and suggests that a recent swell of measles outbreaks in developed nations could mean more illnesses even among the vaccinated.

When it comes to the measles vaccine, two shots are better than one. Most people in the United States are initially vaccinated against the virus shortly after their first birthday and return for a booster shot as a toddler. Less than 1% of people who get both shots will contract the potentially lethal skin and respiratory infection. And even if a fully vaccinated person does become infected—a rare situation known as "vaccine failure"—they weren't thought to be contagious.

That's why a fully vaccinated 22-year-old theater employee in New York City who developed the measles in 2011 was released without hospitalization or quarantine. But like Typhoid Mary, this patient turned out to be unwittingly contagious. Ultimately, she transmitted the measles to four other people, according to a recent report in *Clinical Infectious Diseases* that tracked symptoms in the 88 people with whom "Measles Mary" interacted while she was sick. Surprisingly, two of the secondary patients had been fully vaccinated. And although the other two had no record of receiving the vaccine, they both showed signs of previous measles exposure that should have conferred immunity.

A closer look at the blood samples taken during her treatment revealed how the immune defenses of Measles Mary broke down. As a first line of defense against the measles and other microbes, humans rely on a natural buttress of IgM antibodies. Like a wooden shield, they offer some protection from microbial assaults but aren't impenetrable. The vaccine (or a case of the measles) prompts the body to supplement this primary buffer with a stronger armor of IgG antibodies, some of which are able to neutralize the measles virus so it can't invade cells or spread to other patients. This secondary immune response was presumed to last for decades.

By analyzing her blood, the researchers found that Measles Mary mounted an IgM defense, as if she had never been vaccinated. Her blood also contained a potent arsenal of IgG antibodies, but a closer look revealed that none of these IgG antibodies were actually capable of neutralizing the measles virus. It seemed that her vaccine-given immunity had waned.

Although public health officials have assumed that measles immunity lasts forever, the case of Measles Mary highlights the reality that "the actual duration [of immunity] following infection or vaccination is unclear," says Jennifer Rosen, who led the investigation as director of epidemiology and surveillance at the New York City Bureau of Immunization. The possibility of waning immunity is particularly worrisome as the virus surfaces in major U.S. hubs like Boston, Seattle, New York, and the Los Angeles area. Rosen doesn't believe this single case merits a change in vaccination strategy—for example, giving adults booster shots—but she says that more regular surveillance to assess the strength of people's measles immunity is warranted.

If it turns out that vaccinated people lose their immunity as they get older, that could leave them vulnerable to measles outbreaks seeded by unvaccinated people—which are increasingly common in the United States and other developed countries. Even a vaccine failure rate of 3% to 5% could devastate a high school with a few thousand students, says Robert Jacobson, director of clinical studies for the Mayo Clinic's Vaccine Research Group in Rochester, Minnesota, who wasn't involved with the study. Still, he says, "The most important 'vaccine failure' with measles happens when people refuse the vaccine in the first place."

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