[Population Study Identifies Immunosuppression Associated with Measles](http://blog.fisherbioservices.com/population-study-identifies-immunosuppression-associated-with-measles-infection)

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As we discussed in our [previous post](http://blog.fisherbioservices.com/vaccine-and-cold-chain-are-inseparable), vaccines are more prevalent now than ever before and maintaining the vaccines' integrity is of utmost importance. Additionally, it is also important to discuss how the lack of vaccination can have an irreversible impact on the immune system. Previously we identified the importance of safeguards surrounding [cold chain](http://www.fisherbioservices.com/services/distributiontransport) in handling high-value material, such as vaccines. For this post, let's explore how data gathered from population studies is being used to understand the implications of disease and vaccinations on the immune system.

**Measles Infection and Vaccine**

Infection often causes post-recovery immunosuppression that leaves patients vulnerable to secondary infections and other illnesses. This is especially true in cases of measles infections, which clinicians have long suspected of leaving its victims susceptible to opportunistic infections for several weeks or even months.

New research performed by researchers from Princeton University’s Woodrow Wilson School of Public and International Affairs and Department of Ecology and Evolutionary Biology, however, suggests that measles infection does much more substantial and long-lasting damage to the immune system of those who survive the illness.

Published in [Science](http://www.sciencemag.org/content/348/6235/694.abstract), the study shows that measles infection erases the immune system’s “memory” of previously learned immunities and protections gained from vaccinations and natural infection. In essence, a measles infection reboots the immune system to recreate an immuno-naïve system.

Immunosuppression lasts much longer than previously understood. Researchers used population study data to demonstrate that immunosuppression associated with measles infection actually decreases host resistance for two to three years. The scientists recognized the association between measles infection and non-measles infectious disease mortality in high-income nations during pre- and post-vaccine eras. The researchers concluded that measles infection causes long-term immunological consequences resulting in non-measles deaths.

“We already knew that measles attacks immune memory, and that it was immunosuppressive for a short amount of time. But this paper suggests that immune suppression lasts much longer than previously suspected,” said co-author and assistant professor of ecology and evolutionary biology and public affairs at Princeton, C. Jessica Metcalf. “In other words, if you get measles, three years down the road, you could die from something that you would not die from had you not been infected with measles.”

If substantiated, the data could underscore the benefits of measles vaccination in reducing or preventing other infectious diseases. The results are consistent with other recent research that attributes these immunosuppressive effects of measles to the depletion of B and T lymphocytes.

**The Immune System**

The immune system is highly adaptive to infections it has encountered before. Immunological memory allows the immune system to respond more rapidly and effectively to pathogens it has previously encountered.

During the primary immune response, levels of plasma cells secreting antibodies to the new pathogen and T cells that recognize the pathogen increase at a modest pace.

Encountering the pathogen again stimulates the differentiation of memory B and T cells into plasma cells and cytotoxic T cells without input from APCs or TH cells. Immunological memory allows this secondary immune response to occur much faster than the primary immune response.

The primary response, resulting from either vaccination with inactive pathogens or exposure to active ones, allows the immune system to develop a memory of the pathogen. Encountering several pathogens causes the immune system to build up a substantial number of immunological memories. One infection from measles can wipe out all the immunological memories so that subsequent encounters with pathogens elicit a slower primary response rather than a quicker secondary one.

Vaccination allows the immune system to develop a memory of a pathogen to shorten response time. The primary response to most pathogens can take up to 14 days to develop. Lag time can be substantially longer for some pathogens, taking months or even years.

**Other Vaccinations Impact on Immunity**

Researchers are looking into other instances where vaccinations affect immunity in unexpected ways. A recent [study](http://jid.oxfordjournals.org/content/199/7/919.full#ref-4) showed that bivalent vaccine against HPV-16 and -18 produced with ASO4 adjuvant (Cervarix) offers partial cross-protection against 6-month persistent infection with HPV-31, -45, and -52. This cross-protection for HPV infections could improve protection from HPV-associated cervical cancer.

Scientists from one multi-institutional [research project](http://www.pnas.org/content/109/8/3173.full.pdf) investigated the cross-protective impact of vaccinations for influenza. Currently, flu vaccination programs focus primarily on protecting specific risk groups rather than providing mass protection. The researchers in that study used epidemiological studies to show that new vaccine technology that aims at broad-spectrum protection could lower transmission rate and improve herd immunity.

**Eradicating Disease with Vacination**

The erasure of the immune system underscores the importance of eradicating measles with vaccinations. Vaccines provide herd immunity to large groups of people. Vaccination can also protect polymicrobial herd immunity by preventing immune memory loss, like that caused by measles infection.

Lead author of the study, Michael Mina, was a student at Emory University School of Medicine who worked on the study as a postdoctoral researcher at Princeton. Mina [said](http://wws.princeton.edu/faculty-research/research/item/long-term-measles-induced-immunomodulation-increases-overall), “Our findings suggest that measles vaccines have benefits that extend beyond just protecting against measles itself.”

Mina reiterated the importance of measles vaccinations by saying, “It is one of the most cost-effective interventions for global health.”

To learn more about how data from longitudinal studies is changing the future of medical and public health research, and how the National Children's Study is on the forefront of these changes, download our InfoPoster and the official NCS overview presentation.