Immune system research also may help reveal new asthma clues

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New knowledge about the immune system may lead to better understanding of asthma and how best to treat it.

A new method of developing vaccines could point the way forward in the fight against infectious diseases for which traditional vaccination has failed, according to a new Rutgers study.

The method involves training white blood cells that have not previously been the primary focus of vaccine development. William Gause, senior associate dean for research at Rutgers New Jersey Medical School, led the study, which recently was published in the journal *Nature Immunology*.

"The approach we have developed in this research could well be important," Gause says, "in the development of vaccines against a variety of pathogens. Also, these studies may provide insights into the causes of both asthma and chronic obstructive pulmonary disease (COPD), where elements of the immune system can contribute to lung damage."

More than 18 million adults and 7 million children in this country suffer from asthma, according to the Centers of Disease Control and Prevention, and nearly 3,400 Americans died from it in the most recent reporting year.

Gause's research shows that a white blood cell called a macrophage is able to develop a memory response to an invading pathogen—reacting robustly to the infection as if the body had seen and subdued it before. While macrophages are well known to effectively fight many disease-causing agents, this study provides evidence that these macrophages can be trained during initial infections so that they can promote a rapid and more effective response when the body is exposed to the pathogen a second time.

The research team made its discovery by introducing parasitic worms into mice. The presence of the worms triggered a reaction by white cells called neutrophils, which in turn activated the macrophages in the lung. Weeks later, the researchers transferred the primed lung macrophages into different mice that had never been infected.

When worms were then introduced into the second group of mice, those mice developed a rapid immune response that expelled the parasites. It was as if the macrophages "remembered" their previous encounter with the parasites and acted against the worms on their own – the precise response that vaccines are designed to produce.

If targeted activation of macrophages is shown to be an effective path to

producing vaccines, it will be seen as a welcome addition to current methods, which focus on activating other immune cells called T and B cells. Vaccines train those cells to detect the presence of specific proteins called antigens that many disease-causing microbes release – much as fire gives off smoke and the smoke is the first sign of fire that people tend to notice. The T and B cells latch onto specific antigens, trace them back to their source – the harmful microbes, and if all works as hoped, subdue the disease.

Macrophages do not need specific antigens to fight invading pathogens as the T and B cells do, so Gause says, "If these macrophages can be effectively trained to fight invaders for which traditional vaccines have been ineffective, they could offer an additional front for fighting infectious diseases. In fact, while it is too soon to say that this approach might work against viral invaders such as HIV or Ebola, it could well be worth trying."

Provided by Rutgers University

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