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Is modern life ravaging our immune systems?

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Allergy research giving weight to hygiene theory

By Rob Stein
THE WASHINGTON POST

March 4, 2008

First, asthma cases shot up, along with hay fever and other common allergic reactions, such as eczema. Then pediatricians started seeing more children with food allergies. Now experts are increasingly convinced that a suspected jump in lupus, multiple sclerosis and other afflictions caused by misfiring immune systems is real.

Although the data are stronger for some diseases than others, and part of the increase may reflect better diagnoses, experts estimate that many allergies and immune-system diseases have doubled, tripled or even quadrupled in the past few decades, depending on the ailment and the country. Some studies now indicate that more than half of the U.S. population has at least one allergy.

The cause remains the focus of intense debate and study, but some researchers suspect the concurrent trends all may have a common explanation rooted in aspects of modern living – including the “hygiene hypothesis” that blames growing up in increasingly sterile homes, changes in diet, air pollution, and possibly even obesity and increasingly sedentary lifestyles.

“We have dramatically changed our lives in the last 50 years,” said Fernando Martinez, who studies allergies at the University of Arizona. “We are exposed to more products. We have people with different backgrounds being exposed to different environments. We have made our lives more antiseptic, especially early in life. Our immune systems may grow differently as a result. And we may be paying a price for that.”

Along with a flurry of research to confirm and explain the trends, scientists have also begun testing possible remedies. Some are feeding high-risk children gradually larger amounts of allergy-inducing foods, hoping to train the immune system not to overreact. Others are testing benign bacteria or parts of bacteria. Still others have patients with MS, colitis and related ailments swallow harmless parasitic worms to try to calm their bodies' misdirected defenses.

“If you look at the incidence of these diseases, a lot of them began to emerge and become much more common after parasitic worm diseases were eliminated from our environment,” said Robert Summers of the University of Iowa, who is experimenting with whipworms. “We believe they have a profound symbiotic effect on developing and maintaining the immune system.”

Although hay fever, eczema, asthma and food allergies seem quite different, they are all “allergic diseases” because they are caused by the immune system responding to substances that are ordinarily benign, such as pollen or peanuts. Autoimmune diseases also result from the body's defense mechanisms malfunctioning. But in these diseases, which include lupus, MS, Type 1 diabetes and inflammatory bowel disease, the immune system attacks parts of the body such as nerves, the pancreas or digestive tract.

“Overall, there is very little doubt that we have seen significant increases,” said Syed Hasan Arshad of the David Hide Asthma and Allergy Research Centre in England, who focuses on food allergies. “You can call it an epidemic. We're talking about millions of people and huge implications, both for health costs and quality of life. People miss work.

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Severe asthma can kill. Peanut allergies can kill. It does have huge implications all around. If it keeps increasing, where will it end?”

One reason that many researchers suspect something about modern living is to blame is that the increases show up largely in highly developed countries in Europe, North America and elsewhere, and have only started to rise in other countries as they have become more developed.

“It’s striking,” said William Cookson of the Imperial College in London.

The leading theory holds that as modern medicine beats back bacterial, viral and parasitic diseases, immune systems may fail to learn how to differentiate between real threats and benign invaders, such as ragweed pollen or food. Or perhaps because they are not busy fighting real threats, they overreact or even turn on the body’s own tissues.

“Our immune systems are much less busy,” said Jean-Francois Bach of the French Academy of Sciences, “and so have much more strong responses to much weaker stimuli, triggering allergies and autoimmune diseases.”

Several lines of evidence support the theory. Children raised with pets or older siblings are less likely to develop allergies, possibly because they are exposed to more microbes. But perhaps the strongest evidence comes from studies comparing thousands of people who grew up on farms in Europe with those who lived in less-rural settings. Those reared on farms were one-tenth as likely to develop diseases such as asthma and hay fever.

“The data are very strong,” said Erika von Mutius of Ludwig-Maximilians University in Munich. “If kids have all sorts of exposures on the farm by being in the stables a lot, close to the animals and the grasses, and drinking cow’s milk from their own farm, that seems to confer protection.”

While the evidence for the hygiene theory is accumulating, some say it remains far from proven.

“That theory is so full of holes that it’s clearly not the whole story,” said Robert Wood of the Johns Hopkins School of Medicine.

It does not explain, for example, the rise in asthma, since that disease occurs much more commonly in poor, inner-city areas where children are exposed to more cockroaches and rodents that may trigger it, Wood and others said.

Several alternative theories have been presented. Some researchers blame exposure to fine particles in air pollution, which may give the immune system more of a hair trigger, especially in genetically predisposed individuals. Others say obesity and a sedentary lifestyle may play a role. Still others wonder whether eating more processed food or foods processed in different ways, or changes in the balance of certain vitamins that can affect the immune system, such as vitamins C and E and fish oil, are a factor.

But many researchers believe the hygiene hypothesis is the strongest.

Some have begun to try to identify specific genes that may be involved, as well as specific components of bacteria or other pathogens that might be used to train immune systems to respond appropriately.

“If we could mimic what is happening in these farm environments,” von Mutius said, “we could protect children and prevent asthma, allergies and other diseases.”

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