

# Allergy boom: Are we too clean?

*Hygiene is a Western byword but it may lower our ability to resist infection*

STORIES BY STEVE BUIST

Forty or 50 years ago, it would have taken a lot of searching to find a child with a life-threatening food allergy.

Today, the problem has become prevalent enough that school boards have had to develop policies to help make lunch rooms safe for children who could die from even the tiniest exposure to a peanut product.

Across Canada and the United States, the number of people with allergies and asthma is skyrocketing at an alarming rate.

"This is not an imagined thing," said Dr. Judah Denburg, a McMaster University professor who specializes in immunology.

"There is a true, epidemic increase in the prevalence of allergies."

Denburg is also scientific director of Canada's newly-created AllerGen network, part of the Network of Centres of Excellence funded by the federal government.

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Based at McMaster, the AllerGen network will draw together more than 100 researchers from across the country to increase understanding of allergies and move toward better treatments and prevention.

About one in three Canadians suffers from some type of allergy, including asthma, and the rate continues to rise.

One British study showed that hospital admission rates for certain types of severe allergic reactions increased six to seven times in a 10-year period between 1990 and 2000.

An American study showed that the prevalence of children with peanut allergies doubled in just the five years between 1997 and 2002.

"We need to understand why this is happening," said Denburg.

One possible explanation is that we've become too clean.

It's called the hygiene hypothesis, and while it doesn't explain everything neatly, it's a good place to start.

The hygiene hypothesis suggests that as Western environments become cleaner and we move away from traditional agricultural roots, our ability to develop resistance to allergies has decreased.

There are fewer microbes in the meat we buy and the milk we drink and the air we breathe. While that's healthy for other reasons, it may increase a person's sensitivity to allergies.

From conception through the first year of life, the natural tendency of the immune system — "the default setting from the factory," in Denburg's words — is to be allergic.

"If you're exposed to infectious agents, dirt or barns or other types of natural stimulation, that's good for the immune system," said Denburg.

That stimulation lessens the chance that the immune system will overreact to intruding particles.

"Allergies are a kind of overreaction," Denburg added.

Supporting evidence for the hygiene hypothesis comes from comparing allergy prevalence to family size.

The further a child is down the birth order, the less prone the child will be to allergies.

"In every study that's been done, first-borns have more allergies," said Denburg.

"If you're the third or fourth (born in a family), you're stimulated much more by your environment and by infections ping-ponging between you and your brothers and sisters than if you're the first-born."

Other studies have shown that children who attend day care are more resistant to allergies.

But these factors alone don't explain everything.

Even identical twins, for instance, can differ in their allergy sensitivity, suggesting that there's a complex relationship between genes and the environment at work.

In fact, no other part of the body is more attached to the external world. The immune system is the link between our inside and our outside.

"The food we eat, the water we drink and the air we breathe impinge on our immune system directly," said Denburg.

And there may be other links that are less obvious, such as the relationship between the im-



RON POZZER, THE HAMILTON SPECTATOR

McMaster University professor Dr. Judah Denburg says first-borns have more allergies.

une system and psychological factors.

It's known that depressed people are more susceptible to illness and infection.

But is the opposite true? Can you test to see if happy people have stronger immune systems?

"People are beginning to do that," said Denburg.

"It's clear that there's a whole psycho-neuroimmune connection," added Denburg. "We don't want to ignore the connection between the brain and

the immune system."

That's why the AllerGen network will draw together researchers who may not have an obvious direct connection, such as immunologists and brain imaging specialists.

Researchers can now use sophisticated techniques to begin trying to figure out what are the precise molecular sequences that provoke an allergic response.

It could lead to treatments some day that help stimulate

the immune system early in life to dampen the response, or perhaps an altered peanut that is harmless to the child with a food allergy, or maybe a vaccine that fights off asthma sensitivity.

"Compared to where we were even five years ago, we've come leaps and bounds," said Denburg. "We're in infancy in terms of delivery, perhaps, but not infancy in terms of ideas."

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## Intruder alert! Allergies are an overreaction to foreign bodies

The immune system is the body's version of the border police.

What makes the immune system extraordinary is that it carries around a memory of your body's transactions with the outside world.

"It's like a roving brain," marvelled Dr. Judah Denburg, a McMaster University professor who specializes in immunology.

The immune system has two major functions.

The first is to constantly be on the lookout for harmful intruders that might be trying to sneak in, like terrorists at the border.

"We call that immune surveillance," said Denburg. "It's like policing."

Immune cells are constantly circulating through the body, bumping into other cells, then comparing the nooks and cran-

nies on the surface of those cells to make sure they match the body's blueprint.

When a foreign object is found, a series of events unfolds.

If you picture an intruder — say, a piece of ragweed pollen or a germ — as a key, the immune system builds a lock that fits the key and then stores that lock away in its memory. Those locks are known as antibodies.

The next time a key with that same shape enters the body, the immune system remembers that it has a lock that fits that same shape and starts producing antibodies in bulk, which get pumped through the body.

Those floating antibodies are like the 911 call that tells the immune system's police officer cells to be on the lookout for that particular key and then destroy it on sight.

For many years, that was the conventional thinking in immunology, until people realized there was a simple question that couldn't be explained: how did your body know that the invading particle was foreign in the first place?

Now, researchers believe that your body's genes come preprogrammed, through millions of years of evolution, with the ability to recognize every possible key shape that can exist.

It's as if the immune system already comes armed with a list of every possible terrorist suspect already in the database.

Of course, it's also important that the response of the immune system to the intruder matches the scope of the threat. You don't want to shoot off a bazooka to take down a mosquito.

That's essentially what's happening with an allergy.

"If your immune system didn't develop properly, you may overreact to things," said Denburg. "Allergies are a kind of overreaction."

Allergic reactions are exhibited in a variety of ways — asthma, for example, is a form of allergic response in the lungs, eczema is the response that shows up in skin, and anaphylaxis is an allergic reaction carried through the bloodstream.

Sometimes, the immune system is out of whack and the roving police officers mistakenly think the body's own cells are foreign objects and attack them. These are classified as autoimmune diseases, which include lupus, rheumatoid arthritis and multiple sclerosis.

Like the epidemic increase in allergies in the industrialized world, it's not surprising the number of people with autoimmune diseases has risen dramatically.