

FAST FACTS

THREE WAYS TO BOOST YOUR IMMUNE SYSTEM WITH **YOUR NATURAL DEFENSES**

1. **TAKE CARE OF YOUR SKIN**

Your skin is the external barrier, the immune system's first line of defense. Your skin maintains the entire immune system within its borders and keeps foreign elements and pathogens at bay.

Not merely a surface layer, your skin is an incredibly complex organ that is interconnected with your nervous system and your immune system. The skin protects the body's storehouses of folate, a B-complex vitamin that is an important part of cellular growth, helping the body replicate DNA when cells divide. The skin is where the manufacturing of vitamin D takes place: when our bodies

are exposed to certain types of sunlight, they convert cholesterol to vitamin D.

And don't forget those bodily fluids that, along with the skin, also form a first line of defense: tears flush out the eyes, and your saliva contains enzymes that are part of the immune system.

Feeling lousy during a cold can be viewed as a good sign that your immune system is operating in high gear. For instance, the act of coughing and sneezing is your body involuntarily ejecting pathogens from your respiratory tract (although some scientists suggest that the viruses themselves stimulate coughing and sneezing as a way to find freedom on the airwaves and locate new hosts to conquer and infect).

2. **OPTIMIZE YOUR IMMUNE SYSTEM ORGANS**

While the brain, heart, and lungs receive a good deal of attention, you certainly don't want to neglect those organs that are integral to a highly functioning immune system. These essential organs are organized as the lymphatic system, coordinating the creation,

specialization, and distribution of white blood cells, called lymphocytes, that fight infection.

Approximately five hundred lymph nodes are located throughout your body, and they link with each other by way of lymphatic vessels. The lymph is a clear waterlike fluid that transports lymphocytes and other substances for use throughout the body.

Try fighting off pathogens without your thymus. This organ is where your lymphocytes come to learn their specialized and intricate tasks, before entering the bloodstream in service to the system. Make a fist. Now you know the size of your spleen, located in the upper abdomen above the stomach and under the rib cage. The spleen plays an important role in filtering out foreign substances and forming lymphocytes.

The blood vessels that carry the blood cells and the bone marrow where they are created round out the major organs making up the highly intricate lymphatic network. Bone marrow is a supple type of tissue found in the hollow interior of your bones, and the marrow in large bones produces new blood cells.

While bone marrow makes up less than 5 percent of body weight, it certainly carries its weight in the overall immune system. All the cells of the immune systems are initially derived from this source. It all begins with the bone marrow.

3. TAKE SPECIAL CARE OF YOUR CELLS

Who has the best cellular coverage? Your immune system just might be the winner when it comes to putting cells to work for the detection, defense, and disposal of pathogens and other foreign invaders. Without the estimated 10 trillion (or more) cells, your body would suffer a lot of dropped calls when it comes to fighting off viruses, bacteria, and other infections. And when cells wear out and die, they are replaced by new cells.

While red blood cells carry oxygen to body tissue using the bloodstream, white blood cells carry the day when it comes to the immune system and the complex functions of immune response. These white blood cells are also called leukocytes, which is Greek for “white cells.”

When the T lymphocyte white blood cells (or T cells) that are educated in the thymus detect a foreign invader, they set off the immune response to the particular antigen (antigen is short for the antibody generation that follows the immune response).

Those antibodies are made from proteins created by the B lymphocyte cells (or B cells), and they are soon at work attaching themselves to the antigens and inhibiting their progress. Or there may be an all-out response to the pathogen that results in inflammation. That’s when some really specialized cells, such as neutrophils and macrophages, show up.

Neutrophils like to congregate around the site of an infection, but they can never be accused of loitering. They set to work immediately, ingesting and killing the invading microbes. Macrophage (literally “big eater”) cells are scavengers that like to engulf and digest pathogens, removing all the debris to the landfill.

Given all that your immune system cells do to protect you, it seems only fair that you should take care of them so they can work at optimal performance levels.

Chapter 2

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- Do vaccines work?
- Measles, mumps, and tetanus
- How not to get the flu
- Asthma and your immune system
- Chicken pox or shingles?
- The most fascinating virus
- How we catch colds

How do vaccines work?

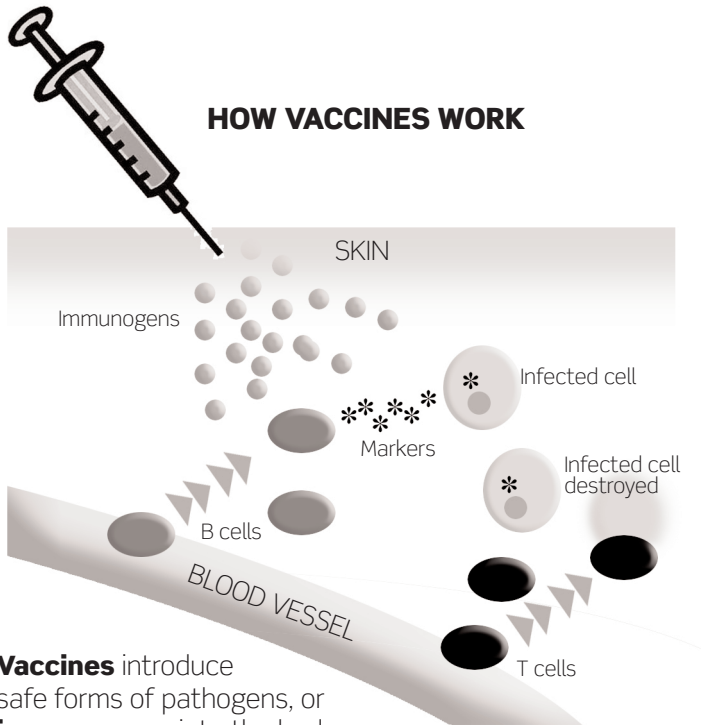
There are vaccines that give you lifelong protection, and there are other vaccines that do not.

Everyone has had the measles, mumps, and rubella vaccines in childhood. These vaccines work so well that immunity to the viruses or bacteria they address is lifelong.

Why? It depends on the organism, the bacteria or virus that infects you. Measles, mumps, and rubella are very stable viruses—every generation is essentially very similar to the previous generation. Those who get the measles now essentially have the same version of the virus that existed in Roman times.

When you have the measles and your antibody response kicks in, it kills the virus. The virus is no longer in your body. It never comes back, since your immune system has memory cells. Those cells stay in places such as your bone marrow for the rest of your life.

If you go to an exotic country and the measles virus lands on you, the memory cell in your body remembers that you once had the measles or the measles vaccine. The memory cell essentially wakes



Vaccines introduce safe forms of pathogens, or **immunogens**, into the body. **Immune B cells** recognize the immunogens and produce antibodies, which bind to foreign particles and mark them for destruction. **T cells** divide rapidly, identify the body's infected cells, and kill them.

ADAPTED FROM INTERNATIONAL AIDS VACCINE INITIATIVE

up your body and makes more measles antibodies. That's why you have a lifelong response.

Tetanus, which causes lockjaw, is another great example. Everyone gets a tetanus vaccination in the United States, at about two months old. If you had a tetanus vaccine at any time, you will have at least partial protection for the rest of your life.

The first time tetanus vaccines were used was during World War II, and the US Army was the only army that gave their soldiers this vaccination. Tetanus are bacteria that live in the soil, so if you are fighting a war, you're going to get a lot of wounds and possible contamination with tetanus bacteria. But because of this effective vaccine, the United States had no cases of tetanus during the War.

What about the flu? Why doesn't our immune system adapt to each new strain?

With influenza, the flu, it works the other way. Influenza viruses are genetically unstable. They

change every year, and thus you have to get a new flu vaccine each year. There are usually two new flu strains every year, so the immune response to the flu has better odds if you have the flu shot.

But the vaccine only lasts for that year, because the next year, a new flu strain or two arrives, so the antibodies made for this year's strain don't protect you against the next.

Interestingly, all the flu strains start in Southeast Asia. They migrate from Southeast Asia through Europe and then to the West Coast. And then they move across the country. It takes approximately a year for them to get to the East Coast.

Is there a way to stop the flu from getting through?

There is no way to stop the flu, short of halting all international air travel. Our global economy allows us to fly all over the world, and the flu virus loves to ride along on those trips. The flu is spread by

humans, especially airline personnel who hop from destination to destination. They are an ideal mode of transmission for the virus.

Once the flu has arrived, closing schools is not such a bad idea. That way school-age children don't get sick at school and bring the flu home. We can learn from the British in World War II: Because of bombings, children were sent out from London to live with rural families. They didn't get the flu because they weren't interacting with other children.

Why is the flu so dangerous for the elderly and the very young?

The elderly truly are at the front line. The flu virus grows in the lining of the lungs, and the lungs' capacity to fight off the virus diminishes as we age. Add to that the fact that 40 percent of the generation born in the 1920s and 1930s smoked. Even if they smoked for ten years and quit, there is still damage to lungs.