



The Future of Vaccines

Susan Bernstein | August 1, 2016

You may think of a vaccine as a shot that protects you from infections like the flu or measles. But in the near future, you may be able to get vaccines to treat brain tumors or breast cancer. You could even get one to prevent a heart attack.

These new vaccines are on the rise, says Klaus Ley, MD, head of the division of inflammation biology at the La Jolla Institute for Allergy and Immunology. He's working on one to treat a dangerous buildup of plaque in your heart's arteries. Doctors call it atherosclerosis. "People who are at risk for a heart attack, even though their cholesterol is normal, may benefit from this vaccine," he says. Researchers need to think in new ways to make this leap in treatment happen.

Then and Now

Most of today's vaccines attack viruses or toxins in your body, Ley says. They use a dead or weak virus to trick your immune system into thinking you're under attack from bad cells. Your body keeps watch for these cells to protect you from future infections.

These new vaccines adjust your immune system to prevent or treat a disease. Some "wake up" your body's defenses even more. Cancer is the top target, says Elizabeth Mittendorf, MD, PhD, associate professor of breast surgical oncology at the Anderson Cancer Center in Houston. One vaccine, called sipuleucel-T (Provenge), treats advanced prostate cancer. It's made from cells from your own immune system. Doctors take out some of your cells, tweak them, then put them back in your body to go after your cancer.

Cancer vaccines crank up your immune system by ordering it to make more T cells that can attack and kill your tumor. The medicine can even help those cells look for the right targets.

Other vaccines act like cancer-fighting smart bombs. Scientists are testing a treatment that uses a cold virus called Delta 24 to fight any cancer cells left behind after removal of a brain tumor called glioblastoma.

Melanoma, a deadly form of skin cancer, could some day be treated by one of these kinds of vaccines. Other kinds may keep cancer from starting in the first place. "It's better to prevent the occurrence of the cancer than have to try and treat it," Mittendorf says. These treatments could be the same for everyone, or customized.

Cooling Inflammation

Another vaccine that may be on the way would act more like an allergy shot, Ley says. It'll try to train your immune system to ignore cells it would normally fight with inflammation. That reaction causes plaque to build up in your arteries and raise your LDL "bad" cholesterol, which can lead to heart attacks or strokes, he says.

This possible vaccine may soon teach your immune system not to do that. If it works out, people could use it along with drugs that lower cholesterol and a healthy lifestyle to get extra protection against heart disease, Ley says.

Prevent RA?

Researchers are working on a vaccine to prevent harmful inflammation in people with rheumatoid arthritis.

The vaccine would stop your body from making a protein called "complement factor D," or "CFD," says Nirmal K. Banda, PhD, associate professor of medicine at the University of Colorado at Denver. The disease could be prevented if this vaccine can get made.

That's pretty tricky. CFD is part of a system you need to protect you against all bacteria, some of which are good. So, any RA vaccine would need to be very targeted, Banda says. "In trying to develop this vaccine, we want to block only one piece of the [system], leaving 99% of it intact to fight infections," he says.

Banda, and others working on the next generation of vaccines, are hoping for a breakthrough. When it happens, treatment of today's diseases may never be the same.