The Brain Damage Fix

Can scientists create a vaccine for Alzheimer's?

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African Americans are twice as likely as whites to develop late-onset Alzheimer's disease (AD) but are less likely to be diagnosed. This illness is the most common form of dementia and affects an estimated 5.4 million Americans. What's more, although Alzheimer's isn't a normal part of aging, the risk of developing the disease rises with advancing age, and in the United States, the population of people age 65 and older is quickly doubling.

This is one reason why the National Institutes of Health (NIH) recently boosted its funding for Alzheimer's research to $1.3 billion. Now, scientists are studying a vaccine they say could be tested within the next three to five years. Real Health asked one researcher, Eliezer Masliah, MD, director of the Division of Neuroscience of the National Institute on Aging, a part of the NIH, about the possibility of producing a vaccine that could be used to immunize patients in the early stages of AD or those who are still healthy but at risk of developing the illness.

In terms of the current research being conducted, how feasible is it that scientists will be able to develop a vaccine for Alzheimer's?

I think there's been considerable progress [to produce a vaccine for Alzheimer's] in the last few years. A lot of that progress has come not only from the vaccine itself but also from developing new approaches for clinical trials and developing new biomarkers [molecules in the body that measure health] to assess the effect of those vaccines in the clinical trials. But, of course, we have to be cautious. In the past, we've had a number of clinical trials testing vaccines that have failed. But I'm optimistic in the sense that there have been considerable advances in the development of the vaccines and considerable success developing biomarkers, new tools and clinical trials.

What are some of the major challenges researchers face in developing a vaccine for Alzheimer's?

Well, it all depends on what kind of vaccine we're talking about. There are vaccines that use the body's immune system to produce antibodies. [Antibodies are special proteins that identify and neutralize unwelcome bacteria and viruses that invade the body.] We call those active vaccines. We also create other vaccines from antibodies we produce in the lab that we can inject into patients. We call these passive vaccines, and then there is a different type of immunization or vaccination that involves cells, and we call that cellular vaccination or immunization. There are different challenges for each type of vaccine.

The challenge with active immunization is that we must activate the patient's immune system to produce the antibodies. In patients with Alzheimer's disease, often their immune system is defective and old, or senescent. Therefore, their capacity to produce antibodies is reduced, so that's one challenge. With passive immunization, we overcome that challenge by producing antibodies in the lab to inject into patients, so we don't need to worry about that challenge. But passive immunization requires the production of a lot of those antibodies, and that's very expensive and difficult to do. We must constantly infuse those antibodies into patients for the rest of their lives, and those are big challenges. In addition, passive immunization is more invasive.

What about the cellular vaccine?

Well, that type of vaccine has been explored to a very small extent in the Alzheimer's field. There is really very little work that has been done on this type of vaccine. There have been a number of cancer vaccinations that have used cells. But for Alzheimer's, a cellular vaccine is still in its infancy, and there's not much information about those right now. One of the concerns with this type of vaccine is that we might activate the immune system in a way that it would prompt it to become highly activated, and this might have the opposite effects to what's expected. That's always a concern.

How might a vaccine for Alzheimer's disease be administered in a way that would make the most sense and be the most effective?

When these vaccines were developed, we were targeting patients with moderate dementia, in some cases severe dementia, and we found out that they were not effective. I think that—and again, we have to be very cautious—most of the data nowadays is pointing to the fact that vaccines targeting the proteins that accumulate in the brain, called A beta [or amyloid beta], would have to be administered very early.

When I say early, I'm talking about before the clinical onset of the disease. At this preclinical stage of the disease, researchers conduct a primary or secondary prevention trial or treatment. If with these vaccines we target other proteins, such as tau proteins, that accumulate in the brain of some patients with Alzheimer's—proteins that build at a much slower rate and over a longer period of time—we might be able to interrupt the progression of the disease at later stages. But in general, vaccination would have to be done prior to the first phase of AD. The bottom line is the earlier we intervene the better.

Is there anything else in Alzheimer's vaccine research that you think is key?

Well, just to say that the advantage of a vaccine is that it addresses a number of mechanisms of Alzheimer's disease—not only the proteins that are accumulating. An Alzheimer's disease vaccine could also address, for example, the problem of protein clearance and protein metabolism. It could specifically address the proteins that accumulate in the brain. There are a number of different mechanisms of action, but there's still a lot of work that needs to be done in this field. In addition, I'd like to add just a word of caution because we don't know yet if a vaccine would work or not. Still, there is considerable excitement in the field.