Cholesterol-Fighting Vaccine Targeting PCSK9

Published date: Feb. 20, 2016

Technology description

Background

According to the American Heart Association, LDL cholesterol is considered the "bad" cholesterol because it contributes to plaque, a thick, hard deposit that can clog arteries and make them less flexible. If a clot forms and blocks a narrowed artery, a heart attack or stroke can result. The Centers for Disease Control and Prevention report that 73.5 million adults in the US have high LDL cholesterol. Less than half of the adults with high LDL cholesterol are getting treatment to lower their levels. One method of treatment to lower LDL cholesterol levels is statins. Statin therapy has some risks and 20% of high risk patients with hypercholesterolemia do not achieve adequate control of LDL cholesterol with just statins.

Another method of treatment is with monoclonal antibodies (mAbs) that target PCSK9, a protein that acts as a negative regulator of LDL receptors. LDL cholesterol is removed from circulation when it interacts with LDL receptors. Unfortunately, the mAbs method of treatment is expensive, costing patients $7000-$12,000 per year. Another limitation is that most mAbs require frequent administration (once or twice a month) and at high doses to produce therapeutic effects. This can result in tolerability issues and poor compliance. Accordingly, it would be a significant therapeutic benefit to produce a vaccine that actively immunizes patients against PCSK9 and effectively and safely lowers LDL cholesterol.

Technology Description

Researchers from the University of New Mexico (UNM) and the National Institutes of Health (NIH) have developed a Virus-like Particle (VLP) based vaccine that targets the LDLR binding domain of PCSK9. The vaccine is useful in the prevention, treatment, or alleviation of PCSK9-related disorders, cardiovascular diseases, and other diseases and conditions, including dyslipidemias. In particular, the vaccine can be used as a treatment for elevated levels of cholesterol. The vaccine has been tested in mice and macaques (monkeys) providing proof-of-principle evidence that the vaccine effectively lowers lipid levels and works synergistically with statins.

Publications

A cholesterol-lowering VLP vaccine that targets PCSK9
Vaccine strategies for lowering LDL by immunization against proprotein convertase subtilisin/kexin type 9

News Articles

UNM, NIH researchers develop vaccine to treat high cholesterol
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Advantages

Use of virus-like particle based vaccines targeting PCSK9 peptide can be more cost effective, reach a broader population and provide long-term treatment
Can lead to a widely applicable vaccine-based approach for controlling hypercholesterolemia and cardiovascular disease
More efficient than the passive immunity strategies

Institution

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