High density lipoproteins for targeted delivery of compounds to prevent, image and treat cardiovascular diseases

Heart disease is the leading cause of death in the United States, claiming more than 600,000 lives annually in America alone. Coronary heart disease, or atherosclerotic heart disease, is the most common form of heart disease and is caused by the buildup of plaque and fatty deposits in arterial walls. Over time this causes narrowing and hardening of the arteries, increasing the risk for more severe complications including heart attack and stroke.

Current treatment options for reducing atherosclerotic plaques are inadequate and invasive

Nearly 40 million Americans are prescribed cholesterol lowering medications to reduce their risk of heart attack and stroke. When effective, these drugs can lower cholesterol and slow new plaque formation but aren’t able to fully reverse plaques that already exist. Unfortunately, for some patients these drugs are ineffective or aren’t well tolerated. In addition, outside of invasive surgical procedures, there are few treatment options to specifically target and significantly remove atherosclerotic plaques that have already formed.

One major hurdle in the treatment of patients with atherosclerotic heart disease is finding a way of delivering drugs to the plaque regions while avoiding uptake in other tissues and organs like the liver.

High density lipoprotein for targeted drug delivery to atherosclerotic plaques

This technology is a synthetic lipid-replete high density lipoprotein (sHDL) mimetic that can incorporate other molecules, such as imaging agents or drug compounds, for targeted delivery to atherosclerotic plaque regions. This technology has been tested in vitro and in vivo. The sHDL mimetic was able to deliver incorporated compounds to atherosclerotic plaque regions in mice and allowed compound uptake in macrophages while avoiding delivery to the liver.

How this technology improves on existing therapeutics

Being able to target the delivery of compounds to atherosclerotic plaques helps open up new therapeutic options for patients with atherosclerotic heart disease. This will allow for better use of new and existing classes of drugs that function within atherosclerotic plaques while lowering the risk of side-effects caused by uptake in other tissues and organs.
Applications

• Targeted delivery of drugs to atherosclerotic plaques
• Targeted delivery of imaging agents to plaque regions allowing for noninvasive diagnostic procedures

Advantages

• No other delivery vector available that can target atherosclerotic plaques
• Limited uptake of incorporated compounds in off-target tissues such as the liver
• Potential for lower dosing and reduced side-effects

Inventors

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