Two major studies by leading research groups published on Wednesday independently identified mutations in a single gene that protect against heart attacks by keeping levels of triglycerides — a kind of fat in the blood — very low for a lifetime.

The findings are expected to lead to a push to develop drugs that mimic the effect of the mutations, potentially offering the first new class of drugs to combat heart disease in decades, experts say. Statins, which reduce LDL cholesterol, another cause of heart disease, became blockbusters in the late 1980s. Since then, there have been no major new drugs approved for lowering heart disease risk. But experts caution that drug development takes years and that there are no guarantees that new treatments will work as hoped.

Heart attacks are the leading killer in the United States, and about 720,000 Americans a year have them. Although statins are effective in reducing heart attack risk, many users still have high levels of triglycerides and go on to have heart attacks. So the results of the new studies are good news, said Dr. Daniel J. Rader, the director of the Preventive Cardiovascular Medicine and Lipid Clinic at the University of Pennsylvania, who was not involved in the research.

“We’ve been looking for something beyond statins,” Dr. Rader said. “After we have put people on high-dose statins, what else can we do? Essentially nothing.”

Experts differ in their estimates of how many Americans might be candidates for a triglyceride-lowering drug. If the eligible group included all adults with triglyceride levels of 200 or more — the normal level is 150 or less — that would
mean about 20 percent of adult Americans. If it were just those with the highest levels, above 500, then 2 percent to 3 percent of adults would qualify.

The discovery announced on Wednesday was hinted at in 2008 in a much smaller study of the Amish conducted by researchers from the University of Maryland’s medical school. One in 20 Amish people has a mutation that destroys a gene, involved in triglyceride metabolism, compared with one in 150 Americans generally. The scientists were intrigued but did not have enough data to nail down the gene’s role in heart attacks.

Sam, a 55-year-old Amish farmer who declined to have his last name published, saying he was uncomfortable about being conspicuous, has such a beneficial mutation. He recalls little heart disease in his family. On a cold day last fall, as an icy rain fell outside, he sat at a small wooden table in his daughter’s house and laid out a sheet of paper that showed he had a triglyceride level of 45. The average in the United States is 147.

“It’s nice that something came out that is positive,” he said.

Triglycerides have long puzzled researchers, although they are routinely measured along with cholesterol in blood tests and are often high in people with heart disease. Many experts were unconvinced they caused heart attacks. Clinical trials of drugs that lowered triglycerides by a small amount added to doubts about their role: The drugs had no effect on heart attack rates.

As for triglycerides themselves, “do they just keep bad company or are they independently doing something to risk?” asked Dr. Robert Hegele, a heart disease expert at Western University in London, Ontario, who was not involved in the new studies.

Those studies, published in The New England Journal of Medicine and funded by the National Institutes of Health and the European Union, provide “a very, very strong type of evidence,” Dr. Hegele said, that triglycerides are in fact a cause of heart attacks.

The work began several years ago when researchers at the Broad Institute of Harvard and M.I.T. started searching through an enormous data set — drawn from
70 studies involving 200,000 people — to see if there were tiny genetic changes near or in genes that seemed to lead to very high or very low amounts of triglycerides in the blood. They also asked whether people who happened to have a higher or lower triglyceride level also had a higher or lower incidence of heart attacks.

The researchers discovered that people with a genetic predisposition to higher triglyceride levels had more heart attacks and those with genetically lower triglyceride levels had fewer.

Their study, published last year in Nature Genetics, did not isolate individual genes, though. It just pointed to signposts on the long stretch of 30 million DNA letters that were near the genes. So the investigators began a hunt for the genes themselves.

To that end, they mapped the genes of 3,734 Americans, about 2,500 of whom were white and the balance African-American. The researchers reported the results of that effort on Wednesday.

One gene, APOC3, stood out. The scientists found four mutations that destroyed the function of this gene. The Amish study had discovered that people with such a mutation could drink a big, rich milkshake, loaded with fat, and their triglyceride levels did not budge. For everyone else, they spiked. The new studies show what that means for people’s health.

“Those who carry the gene mutations have a 40 percent reduction in triglyceride levels and a 40 percent lower risk of heart disease,” said Dr. Sekar Kathiresan of Massachusetts General Hospital and the Broad Institute. He is the lead researcher on the gene project.

Now, he added, “there is a route to heart attacks that is independent of LDL,” the form of cholesterol associated with heart disease.

The other study, led by Dr. Anne Tybjaerg-Hansen of Copenhagen University Hospital, used data from 75,725 subjects to learn whether low triglyceride levels were linked to a reduced heart attack risk. They were. The researchers also asked whether people who had mutations destroying the APOC3 gene had fewer heart
attacks. They did. Those with such mutations had a 44 percent reduction in triglycerides and a 36 percent lower heart attack risk.

The Danish data, Dr. Kathiresan said, “are eerily consistent with our data.”

“It is incredible how reproducible the finding is,” he added. Yet the two groups worked independently, with The New England Journal of Medicine coordinating publication of their studies.

For the University of Maryland scientists who conducted the 2008 Amish study, the new finding shows that their hypothesis about the gene was correct. Those with the mutation had less calcification of their arteries, an indication that they had less heart disease. But the Maryland group was not able to say if those people also had fewer deaths from heart disease. Toni Pollin, the lead researcher for the study, explained: “To really find out if it is related to heart disease, we’d need to follow people over time. And the Amish use hospitals a lot less than other people, so it is hard to document the cause of death.”

A small California company, Isis, also hit upon the gene when it was looking for ways to make triglyceride levels plunge in the small group of people with disorders leading to triglyceride levels so high they can be fatal. They made a drug that counteracts the gene and began testing it. It slashed triglyceride levels by 71 percent.

“It is the most important drug in our pipeline,” said Dr. Stanley Crooke, the chief executive of Isis. “Trust me, these data are really exciting.”

The company has no plans to test whether its drug prevents heart attacks in the general population. That sort of huge study, lasting years, would require the resources of a much larger company.

But heart researchers see the Isis drug as, at least, proof that it is possible to come up with drugs in what could be a new class of pharmaceuticals to protect against heart disease.