HEART HEALTH · CHOLESTEROL

IT ALL ADDS UP

THE COAST AT SUNSET · LA JOLLA

Cholesterol damage is not one bad lab result. It is the total you have collected since your twenties. **Start subtracting sooner, buy back more years.**

BY DR. DAMIAN RASCH, D.O.
BOARD-CERTIFIED INVASIVE CARDIOLOGIST

When I talk with patients about cholesterol, the conversation is almost never about a single number on one lab report. It is about the total amount of LDL your bloodstream has been exposed to over a lifetime. Doctors call that **cumulative LDL burden**: the area under your LDL curve from age 20 to 80, not its height on any one day.

Picture two patients, both at 180 at age 30. One never treats it and collects decades of damage. The other reaches 50 within six months and begins erasing damage she would have spent fifty years collecting. The gap between those futures is enormous, and we can measure it.

22%

FOR EVERY 39 POINTS

Fewer heart attacks, strokes and heart deaths for every 39 mg/dL removed.

170,000

PEOPLE STUDIED

Pooled across 26 randomized trials. Not one study, and not one opinion.

0

FLOOR FOUND SO FAR

No LDL level has been found below which lowering stops helping you.

So what is cholesterol actually doing in there?

INSIDE THE ARTERY WALL

START WITH THE PARTICLE. Low-density lipoprotein, or **LDL**, is the little package that carries cholesterol around in your blood. When your LDL is high, more of those packages are in circulation, and more of them slip into the inner lining of your artery walls. Doctors call that process **atherogenesis**. It is the foundation of heart disease.

Once LDL particles lodge in the wall, they oxidize, which is a bit like rusting. Your immune system notices the rust and sends cleanup cells called macrophages. Those cells swallow the oxidized particles, swell up into what we call foam cells, and pile into a fatty streak.

Over years the streak matures into a **plaque** that narrows the artery. If its surface tears open, a clot forms on the spot and can block the vessel entirely. That is a heart attack, or a stroke.

All of this runs faster when LDL is high. More LDL for longer means more particles in the wall and more plaque. Every point you take out shows up as fewer heart attacks and strokes.

The damage is an area under a curve, and the curve runs sixty years.

DR. DAMIAN RASCH, D.O.

THREE THINGS THAT FOLLOW

If cholesterol adds up, then these are true too

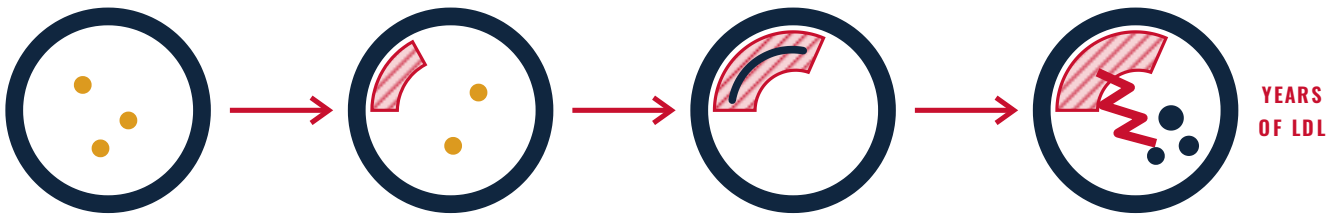
1. **TIMING COUNTS**
   Exposure is measured in years, so when you start counts as much as where you finish.

2. **DEPTH COUNTS**
   The area under the curve shrinks with every point of LDL you remove. Half measures buy half the benefit.

3. **AGE CHANGES THE READING**
   A normal lab at 30 is not the same thing as a normal lab at 60, and it should not be read the same way.

FIGURE 1

HOW A HEALTHY ARTERY TURNS INTO A HEART ATTACK



HEALTHY
LDL flows past

FATTY STREAK
Particles lodge and rust

PLAQUE
Narrowed, with a cap

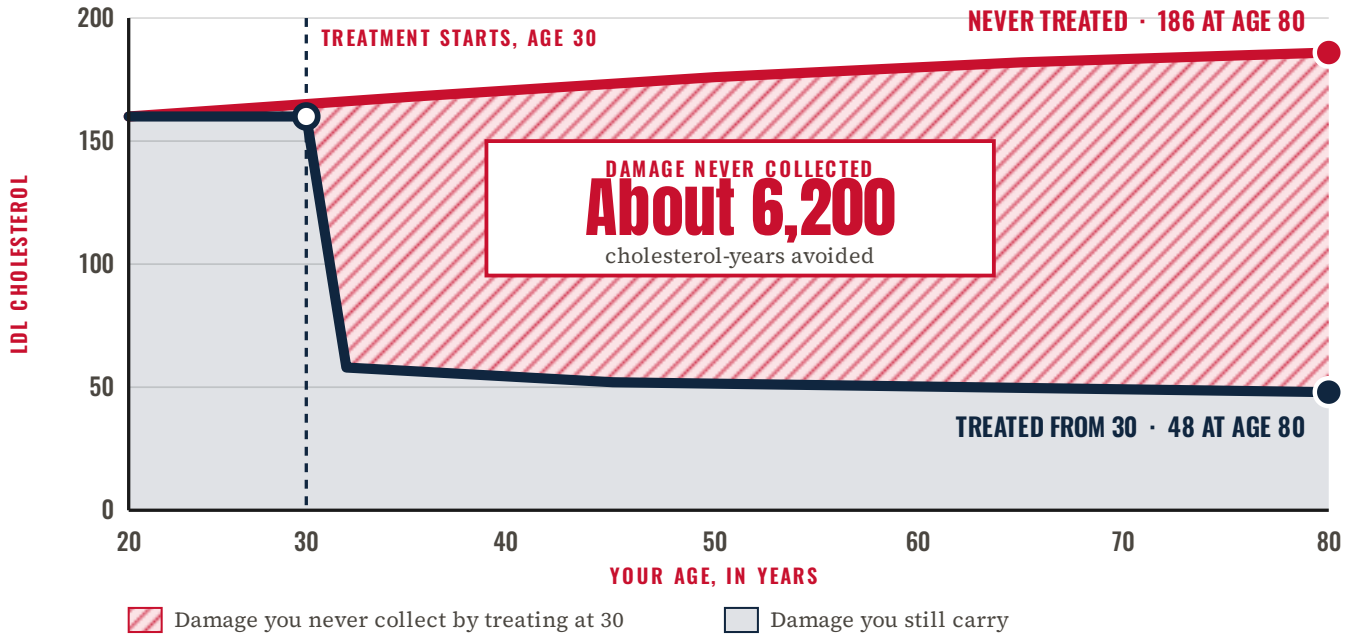
RUPTURE
A clot blocks the vessel

How much difference does starting early really make?

SIXTY YEARS UNDER THE CURVE

FIGURE 2

TWO LIFETIMES, ONE STARTING POINT



How to read this. Both people start at 160. The only thing that differs is when treatment began. What predicts a heart attack is not either endpoint. It is the shaded territory each line encloses. Illustrative model, not data from one trial.

Someone whose LDL stayed at 80 for sixty years has a much smaller lifetime load than someone whose LDL sat at 180 for those same sixty years.

This is why I tell younger patients that treating now is not about preventing a heart attack next year. It is about preventing one at 65, or 75, or 85.

THE SAME DECISION, TAKEN AT THREE DIFFERENT AGES

25

55 YEARS STILL AHEAD

Treating here removes the biggest slice of lifetime damage available to anybody. The heart attack you prevent is scheduled for the 2070s.

45

35 YEARS STILL AHEAD

Two decades are already banked and cannot be handed back. Everything from today forward is still fully preventable.

65

15 YEARS STILL AHEAD

Still worth doing, and the short-term benefit is large. The lifetime arithmetic is working with a shorter runway.

Are we sure it is the cholesterol causing the harm?

HOW WE KNOW

FIGURE 3

SEVENTY YEARS OF WATCHING

THE CATCH WITH WATCHING. Studies that watch people have one weakness. They show a link, and a link is not proof of cause. People with low cholesterol might be healthier for some other reason nobody measured.

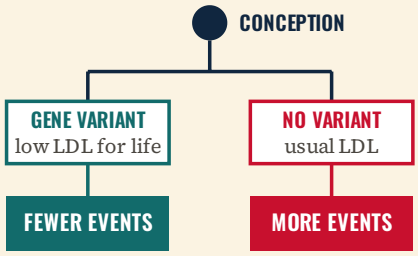
Researchers found a way around it. Some people are born with a variant in a gene called **PCSK9** that keeps their LDL low for life.

Nobody chooses those genes. They are handed out at conception, before diet, before exercise, before income or insurance. So they answer the question cleanly. What happens to people whose LDL has been low since birth?

The answer is not subtle. They have far less heart disease, by about the margin statin trials deliver. Lower LDL causes lower risk.

A TRIAL YOU WERE ENTERED IN AT CONCEPTION

Why genetics settles what observation could not



The assignment happens before birth, so lifestyle cannot be the hidden explanation. And the exposure runs eighty years, not the five a trial can afford.

1 THE LINK
Seventy years of watching, in millions of people. Higher cholesterol, more deaths, all the way up the range.

2 THE CAUSE
Gene variants handed out at conception cannot be explained away by lifestyle.

3 THE AGREEMENT
Genetics predicts the benefit drug trials deliver. Three methods, one answer.

If I lower it, what does that actually buy me?

THE 22% RULE

THE HEADLINE FINDING

22%

fewer heart attacks, strokes and heart deaths for every **39 points** of LDL you take out. At any starting number, at any age.

26 RANDOMIZED TRIALS · 170,000 PEOPLE

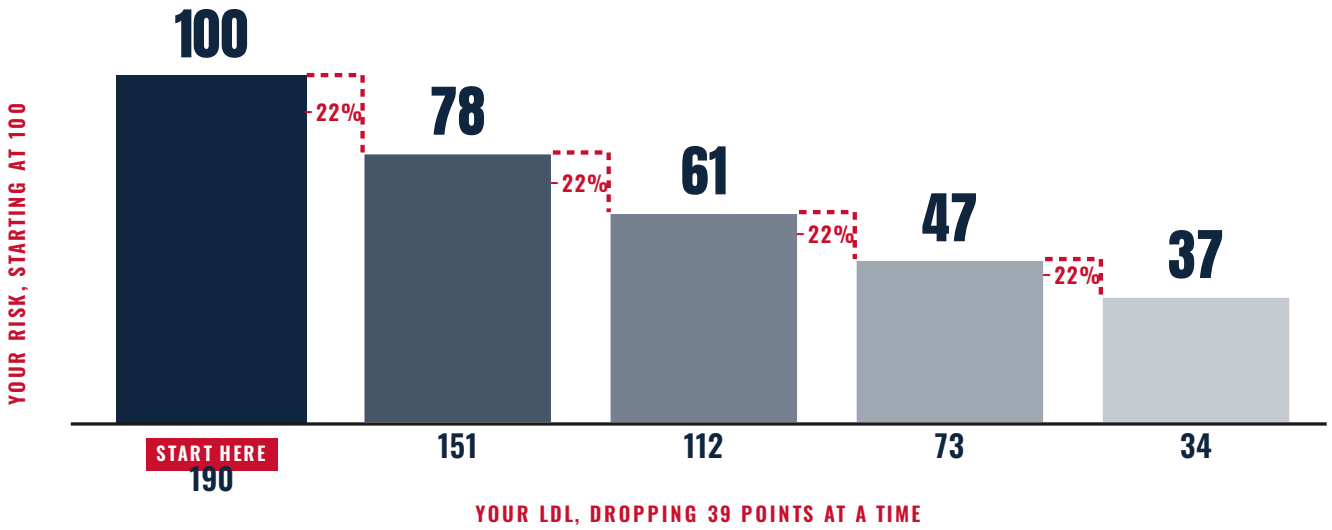
One of the most useful things I bring into a clinic conversation comes from researchers who pooled 26 major statin trials covering more than 170,000 people. They asked one question. For every unit of LDL we remove, how much does risk fall?

The answer came back the same every way they sliced it. Take out 39 mg/dL of LDL and the risk of a heart attack, a stroke, or death from heart disease drops about 22 percent. It held across different statins, countries, starting numbers, ages and both sexes.

In plain terms, moving from 150 down to 70 cuts your risk of a major event by roughly 45 percent. And the discount never runs out. From 200 to 150, from 120 to 70, from 70 to 40, the proportional benefit is the same each time. That is what retired the old worry about very low cholesterol.

FIGURE 4

THE DISCOUNT APPLIES AGAIN AT EVERY STEP DOWN



Four steps of 39 points leave you with roughly a third of the risk you started with, and the slope never flattens.

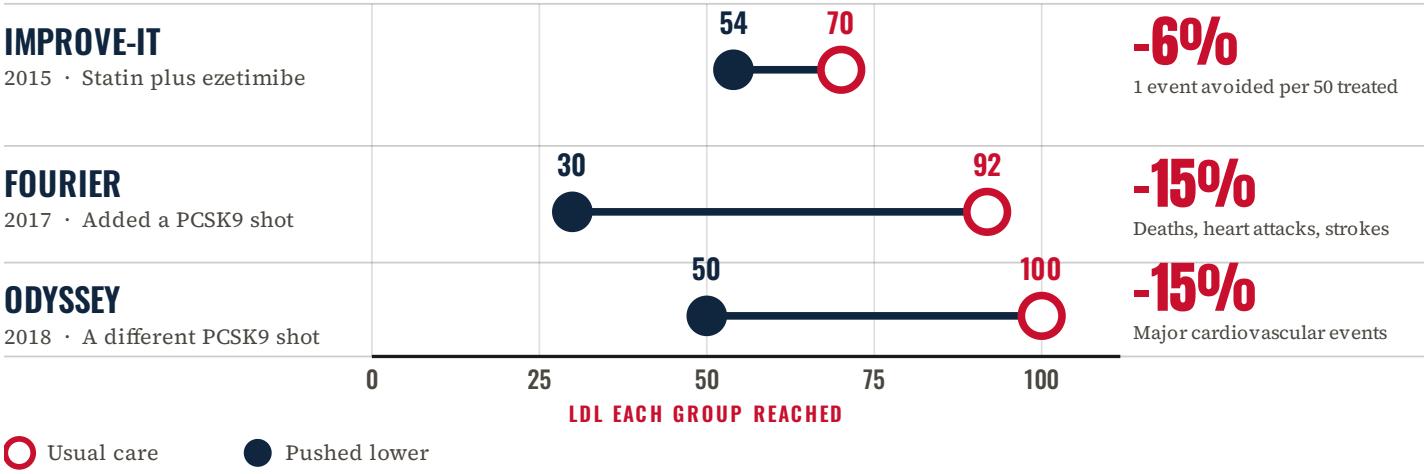
Is getting below 70 low enough?

THREE TRIALS THAT SETTLED IT

For years cardiologists argued about whether pushing LDL under 70 bought anything at all, or whether 70 was a sensible floor. Three trials answered it.

FIGURE 5

WHERE EACH TRIAL LANDED, AND WHAT IT PREVENTED



IMPROVE-IT. Patients who had just had a heart attack were given a statin alone, or a statin plus **ezetimibe**, a pill that blocks cholesterol from being absorbed in the intestine. The combination group landed at 54 instead of 70. Over seven years they had 6 percent fewer deaths, heart attacks and strokes. That works out to one event prevented for every 50 people treated.

FOURIER. This one tested a **PCSK9 inhibitor**, an injection that lets the liver pull far more LDL out of the blood, added on top of a statin in people who already had heart disease. The treated group reached 30 while the comparison group sat at 92. Their risk of death, heart attack, stroke or a stent dropped 15 percent.

ODYSSEY. A second PCSK9 injection, tested in people who had recently had a heart attack. Going from 100 down to around 50 cut major events by 15 percent.

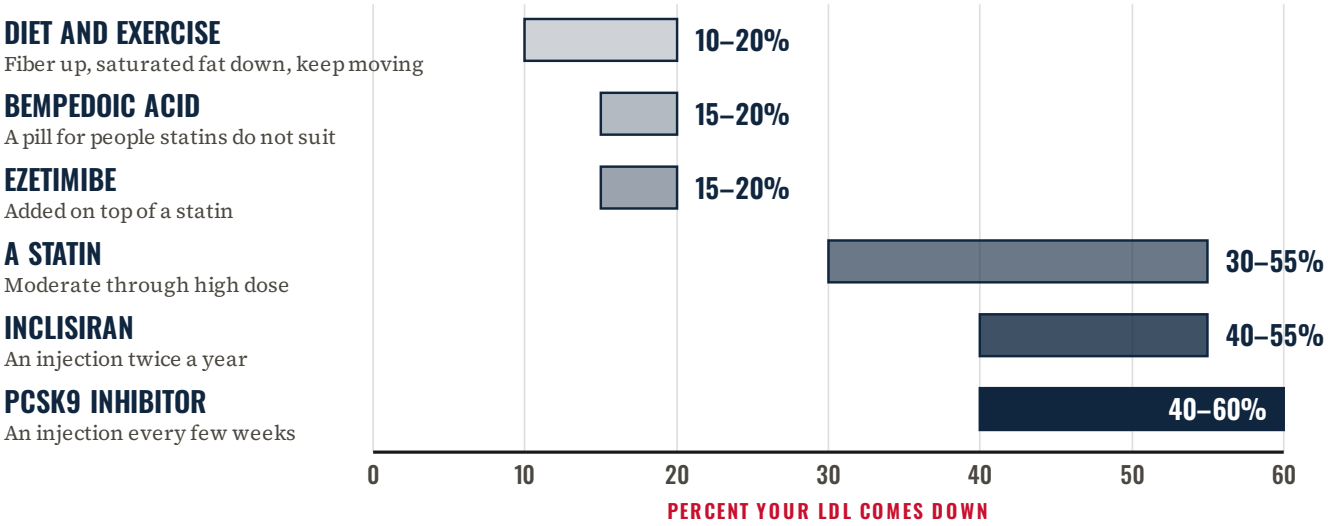
Both PCSK9 trials showed the same two things. Getting well below 50 was safe, and it kept paying. That is the evidence behind my willingness to keep going once a patient is already on a statin and still above target.

What actually lowers it, and by how much?

YOUR TOOLKIT

FIGURE 6

HOW FAR EACH ONE MOVES YOUR NUMBER



Add-on treatments take their percentage off whatever you have already reached, which is why they stack.

CAN IT GET TOO LOW?

Patients ask me this constantly, and it is a fair question. The old worry had a name, the J-curve. Very low cholesterol was thought to raise your odds of cancer, infection or bleeding.

Decades of research across millions of treated patients have not turned up that harm. I have looked after many people sitting in the 20 to 40 range on combination therapy and have not seen more cancer, infections or bleeding. The immune system does not quit at an LDL of 30. The evidence says the opposite: lower is safer.

FOUR WAYS IN, ONE PATHWAY

Why these medicines stack instead of overlapping

Statins slow the enzyme your liver uses to make cholesterol.

Ezetimibe blocks the doorway cholesterol uses to get in from your intestine.

PCSK9 inhibitors stop a protein from destroying the liver's cholesterol-clearing receptors, so more stay on duty.

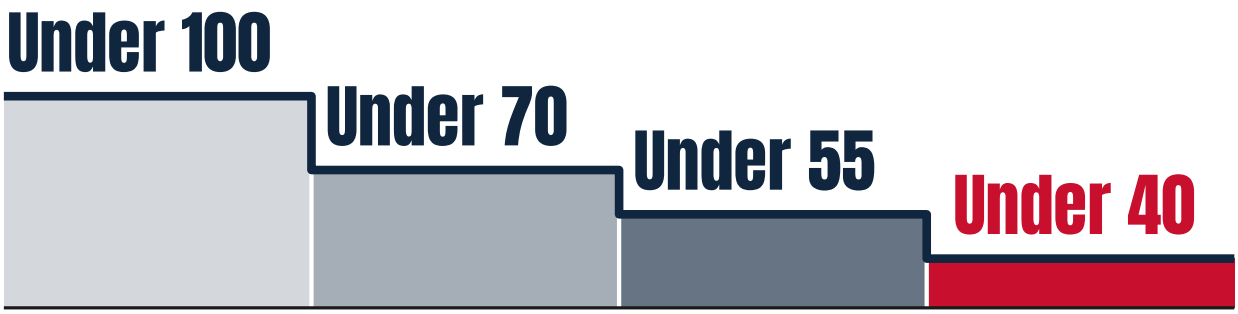
Different doors on one pathway, which is why combining them beats pushing any single one to its ceiling.

So what should my number be?

WHAT'S MY NUMBER?

FIGURE 7

THE HIGHER YOUR RISK, THE LOWER WE AIM



UNDER 40, WITH RISK FACTORS

High blood pressure, smoking or extra weight, and no event yet. Aim under 100. The clock is running and you have a lot of clock left.

DIABETES, OR OVER 40 WITH RISK FACTORS

No heart disease yet. Aim under 70, built on a high-dose statin.

KNOWN HEART DISEASE, OR FH

A prior heart attack or stroke, blocked leg arteries, or inherited high cholesterol. Aim under 55.

HIGHEST RISK OF ALL

Repeat events, or disease in several arteries. Aim under 40, which in practice means combination treatment from day one.

INHERITED HIGH CHOLESTEROL

About 1 in every 250 to 500 people carries a gene change called **familial hypercholesterolemia**. Untreated, LDL often runs between 200 and 400 from childhood, and men in these families tend to have heart attacks in their forties or fifties, women about a decade later.

In these patients I do not wait to see how one statin does. I start high-dose atorvastatin or rosuvastatin, add ezetimibe within weeks if we are not at target, and add a PCSK9 injection or inclisiran if we are still above 55.

A HEART ATTACK BEFORE 55

If a man has a heart attack before 45, or a woman before 55, that is its own signal. Their arteries have already proven what they will do at a young age.

Preventing the second one calls for intensive treatment regardless of what the starting number was. I use combination therapy from the beginning rather than climbing one rung at a time.

What if the statin makes me ache?

IF STATINS BOTHER YOU

Muscle aching is the most common worry patients bring me about statins, and it deserves a straight answer rather than a brush-off.

The medical name is **statin-associated muscle symptoms**. True cases, meaning aching that shows up on the drug and settles when you stop it, affect 2 to 10 percent of people.

Plenty of patients tell me the aches carried on after they stopped the statin. When that happens the medicine was not the cause.

Either way there is almost always a route to your target. The table on the right is the order I work through.

WORTH CHECKING FIRST

Three ordinary things that mimic statin aches

A **LOW VITAMIN D**
Common, easy to measure, and easy to correct.

B **AN UNDERACTIVE THYROID**
Produces exactly this kind of aching and fatigue.

C **OVERUSE OR A NEW ROUTINE**
A new exercise routine begun around the same time as a new pill gets blamed on the pill.

IF THIS HAPPENS, WE TRY THIS NEXT

Nobody has to choose between aching and an untreated cholesterol

Aching on atorvastatin	→	**Switch to rosuvastatin or pravastatin**
Aching on a second statin too	→	**Lower the dose, or take it every other day**
No statin is tolerable at all	→	**Ezetimibe plus a PCSK9 injection**
Aching continues after stopping	→	**Look for another cause, then restart**

Tell me about the aching. Do not quietly stop the pill and let me find out a year later.

DR. DAMIAN RASCH, D.O.

FIVE QUESTIONS WORTH ASKING AT YOUR NEXT APPOINTMENT

- What is my LDL target, and why that one for me?
- How far am I from it right now?
- What would we add to close the gap?
- When do we recheck the number?
- Should my children be tested too?

DO THIS MONTH

FIVE SMALL MOVES

None of these takes more than a few minutes, and every one moves the number that decides how the rest of this goes.

1 ASK FOR THE LDL NUMBER

Not "my cholesterol was fine." The LDL figure itself, written down, with the date beside it.

2 ASK WHAT YOUR TARGET IS

Under 100, 70, 55 or 40 depends on your own risk, not on the lab's normal range.

3 PICK A TIME AND KEEP IT

Same time daily, tied to something you already do. Steady beats perfect.

4 CHANGE ONE MEAL

More fiber, less saturated fat, in the meal you eat most often. One meal is a habit. Five is a diet nobody keeps.

5 BOOK THE RECHECK

Before you leave the office. Six to twelve weeks after any change, so we find out whether it worked.

AND ONE THING NOT TO DO

Do not stop a statin quietly and wait to see whether anybody notices. I would far rather hear about an ache at week three than discover at your next visit that the bottle has been sitting in a drawer since spring.

Nearly every problem with these medicines has a workaround, and most of them take one phone call. The only version I cannot fix is the one nobody tells me about.

BRING TO YOUR VISIT

Four things that make the appointment worth more

Your last lab report, or the number and the date.

Every bottle you take, including supplements and anything another doctor started.

A note of any aching, when it began and what you were taking at the time.

Your family history. A parent or sibling with an early heart attack changes what I aim for.

The things patients ask me most

YOUR QUESTIONS

Can my cholesterol get too low?

No level has been found where lowering stops helping. Trials have shown safety down in the 20s and 30s using combination treatment. The immune system, blood clotting and everything else keep working. The heart benefit clearly outweighs a harm nobody has been able to find after decades of looking.

Why not just fix my diet?

Diet changes bring LDL down 10 to 20 percent, which is real and usually not enough on its own for someone with high cholesterol or existing heart disease. Medication moves it 30 to 60 percent. I recommend both. They work on different parts of the problem.

Do statins really cause muscle pain?

Less often than most people expect, around 2 to 10 percent. When it does happen, switching statins, lowering the dose, or moving to a different class of drug usually solves it. Many aches blamed on a statin carry on after the statin stops, which points somewhere else.

Do I need a PCSK9 shot if I take a statin?

Not everybody does. If your risk is high or you already have heart disease, and you are still above target on a statin plus ezetimibe, a PCSK9 injection takes off another 40 to 60 percent. If your risk is lower and you are already at goal, you do not need it.

What is cumulative burden again?

The total amount of LDL your blood has carried across your whole life. Someone at 80 for sixty years has a lighter lifetime load than someone at 180 for the same sixty years. It is why treating early prevents more than treating late. Every year of exposure counts.

Is low cholesterol bad for my brain?

Your brain does need cholesterol, and it makes nearly all of its own rather than taking it from your bloodstream. Large studies have not found more dementia or cognitive decline in people on statins or with very low LDL. Stroke is by far the bigger threat to your brain.

How do genes prove anything?

Some people inherit a variant that keeps LDL low for life. Nobody picks their genes, so the comparison is not muddied by diet, exercise or income. Those people have fewer heart attacks and fewer deaths. That is how we know low LDL causes lower risk rather than merely traveling with it.

When should someone start treatment?

If you have coronary disease, a prior heart attack or stroke, or inherited high cholesterol, the answer is now. For younger patients with no event yet, I want the number under 100. Getting there early prevents more disease than waiting until it climbs into the 160s or until a first event forces the conversation.

A SHORT GLOSSARY, IN PLAIN WORDS

LDL. The particle that carries cholesterol through your blood and drops it into artery walls.

Cumulative burden. Your lifetime total of LDL exposure, not today's reading.

Plaque. The fatty, fibrous lump that builds inside an artery wall over years.

PCSK9. A protein that destroys the liver's cholesterol-clearing receptors. Blocking it leaves more of them working.

FH. Familial hypercholesterolemia, inherited high cholesterol present from birth.

SAMS. Muscle aching that starts on a statin and settles once it is stopped.

THE BOTTOM LINE

START SOONER. AIM LOWER.

The case that lower LDL means fewer deaths is about as settled as anything gets in medicine. It comes from seventy years of watching populations, from genetics that separates cause from coincidence, and from a pooled analysis showing 22 percent fewer events for every 39 points removed.

No floor has been found below which lowering turns harmful. The relationship runs straight down. Cumulative burden explains why starting early and aiming low buys so much more life than waiting. Every year of high LDL builds plaque. Every year of low LDL slows it, and sometimes turns it back.

WHY EARLIER BEATS HARDER LATER

A 35-year-old with an LDL of 200 who starts treatment now prevents thirty years of arterial damage compared with waiting until 65. That difference shows up as years of life.

It is the reason I want every adult screened, whether or not they already have heart disease. Somebody at 130 at age 25 is on a different trajectory from somebody found at 40. Those years compound.

In my practice I combine treatments to reach the target your own risk calls for. Known heart disease, under 55. High risk without an event yet, under 70. Inherited high cholesterol, I treat from the day of diagnosis as though disease were already present, since over a lifetime it will be.

The tools exist, the evidence behind them is strong, and the lives saved are real.

TAKE THIS PAGE TO YOUR DOCTOR

Two questions that change the conversation

1. **WHAT IS MY TARGET?**
   Not the lab's normal range. The number that belongs to your own risk.

2. **WHAT GETS ME THERE?**
   Which combination closes the gap between where you are and where you should be.

The full article, with every study linked, is at **damianrasch.com/ldl-death-risk**.

Where every number in this guide came from

THE EVIDENCE

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ABOUT THE AUTHOR

Dr. Damian Rasch, D.O.

Board-certified invasive cardiologist practicing in Encinitas and La Jolla, California, with a clinical focus on preventive cardiology, advanced lipid management and cardiovascular imaging.

READ IT ONLINE

damianrasch.com/ldl-death-risk

Published 1 April 2026. Updated 27 June 2026.
Set in Anton, Oswald and Source Serif 4.
Photographs from the author's library and Pexels.

The above information was composed by Dr. Damian Rasch, drawing on individual insight and bolstered by digital research and writing assistance. The information is for educational purposes only and does not constitute medical advice. It is not a substitute for consultation with your own physician. Figure 2 is an illustrative model of cumulative exposure rather than data from a specific trial.