

Understanding LDL-C, ApoB, and Lp(a)

Different tests answer different questions. The same LDL-C can represent a very different number of atherogenic particles.



The most important idea

There is no single cholesterol level that is 'safe' or 'normal' for everyone. Cardiovascular risk rises with the number of atherogenic particles and with cumulative exposure over time; treatment goals therefore depend on the whole person, not only the laboratory reference range.

LDL-C

Low-density lipoprotein cholesterol

CHOLESTEROL CARGO

- Measures the total cholesterol carried inside all LDL particles.
- Does not tell us how many LDL particles are circulating.
- The same LDL-C can therefore occur with different particle numbers and different cardiovascular risk.

ApoB

Apolipoprotein B

PARTICLE NUMBER

- Each LDL, VLDL, IDL, remnant and Lp(a) particle carries one ApoB molecule.
- ApoB therefore estimates the total number of circulating atherogenic particles.
- Higher ApoB means more particles can enter and become retained in the artery wall - even when LDL-C is the same.

Lp(a)

Lipoprotein(a)

INHERITED RISK

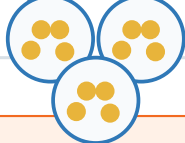
- An LDL-like ApoB particle with an extra apolipoprotein(a) attached.
- Its level is mainly genetically determined and is usually stable through adult life.
- Higher Lp(a) adds cardiovascular risk independently of LDL-C and is also linked to calcific aortic valve disease.

Same LDL-C does not always mean the same risk

Both patients have the same LDL-C: the total cholesterol carried in LDL is the same. Patient B has more LDL particles (higher ApoB), so cardiovascular risk is higher.

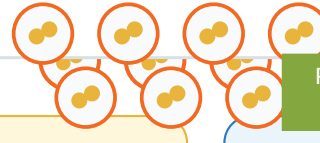
Patient A: fewer LDL particles

Each particle carries more cholesterol



Patient B: more LDL particles

Each particle carries less cholesterol



Same LDL-C

Total cholesterol

The cholesterol carried in all lipoproteins combined. Useful overview, but too broad to define atherogenic risk by itself.

Triglycerides

Often reflect triglyceride-rich lipoproteins such as VLDL. High levels can signal remnant-particle burden and metabolic risk.

HDL-C

A useful risk marker, but HDL does not contain ApoB. Raising HDL-C itself does not cancel the risk from excess ApoB particles.

Patient B: higher ApoB and higher risk

What can treatment change?

Approximate average lipid effects from clinical trials and dietary studies. Individual responses vary.



Important: Percentages are approximate and cannot simply be added together. Combination effects are usually multiplicative and depend on the starting level, dose, genetics and adherence.

Treatment	LDL-C	ApoB	Lp(a)	Total-C	What it does
Portfolio-style diet	~13-17% ↓*	~15% ↓	Little / no meaningful change	~9-10% ↓	Plant protein, viscous fibre, nuts and plant sterols; ordinary heart-healthy diets often lower LDL-C less.
Statin	~30-55% ↓	~20-45% ↓	May rise ~10-20%	~20-35% ↓	Reduces hepatic cholesterol synthesis and increases LDL-receptor clearance. Strong outcome evidence.
Ezetimibe	~18-20% ↓	~14% ↓	Usually little change; ~0-7% ↓	~13-14% ↓	Reduces intestinal cholesterol absorption. Common add-on to a statin.
Statin + ezetimibe	~45-65% ↓	~35-55% ↓	Little extra effect	~30-45% ↓	Combination acts at two sites. Effects vary by statin and are not simply additive.
Bempedoic acid	~17-21% ↓	~12-15% ↓	~0% (-2 to +2%)	~11% ↓	Oral non-statin option; useful when statins are not tolerated or more LDL lowering is needed.
PCSK9 inhibitor	~55-60% ↓	~49-54% ↓	~20-30% ↓	~36-38% ↓	Alirocumab/evolocumab potentially increase clearance of LDL/ApoB particles; injected.
Inclisiran	~50% ↓	~39-45% ↓	~20-25% ↓	~30-33% ↓	siRNA therapy that lowers hepatic PCSK9 production; infrequent dosing after initial doses.

What diet can do

A well-designed Portfolio-style diet lowers LDL-C by about 13-17% on average and ApoB by about 15%. In a short tightly controlled feeding trial, LDL-C fell by about 29%. Diet has little meaningful effect on genetically determined Lp(a).

What about Lp(a)-specific drugs?

Targeted Lp(a) drugs can lower the blood level by 80-90% in trials, but there is still no approved targeted Lp(a) therapy. A 2026 Phase 3 pelacarsen outcomes trial lowered Lp(a) but did not reduce cardiovascular events; other approaches remain under study.

The aim is not simply to make a blood test look 'normal'.

The aim is to reduce lifetime exposure of the arteries to atherogenic particles. A person who has already developed atherosclerosis will usually need a lower LDL-C and ApoB than someone at lower overall risk.

Sources: De Oliveira-Gomes et al., Circulation 2024; Gaudet et al., Circulation Research 2026; Alhomoud, Frontiers in Medicine 2025. Diet estimates: Portfolio Diet controlled trials/meta-analysis. 2026 update: Lp(a)HORIZON topline results, 4 Sep 2026.

* Portfolio diet: typical 13-17% LDL-C reduction; short metabolically controlled studies achieved ~29%. Total-C and ApoB estimates vary by study.