

APOB - CHOLESTEROL - FAT

Apolipoproteins (ApoA & ApoB)= proteins that bind to lipids (oil-soluble fats, cholesterol, and fat-soluble vitamins) to form lipoproteins (part fat & part protein) which transport them throughout the body in the blood, cerebrospinal fluid, and lymph system.

- HDL and LDL cholesterol have [the same cholesterol](#), so their carriers differ.
- Number of apoB & *LDL particles* and their precursors matter more than the LDL cholesterol DUE TO PARTICLES ENTERING THAT DEPOSITED IN THE ARTERIAL WALL.
- Conversely, HDL particles can venture into atherosclerotic plaques & absorb the *LDL particles* trapped which prevents further plaque formation/decreases CHD – why HDL can be “good.”

2 Types of *LDL particles*.

- Large and buoyant. = less hazardous & carries more cholesterol.
- Small and dense = more atherogenic (contributive to atherosclerosis) and carries less cholesterol.
- Total LDL cholesterol may be ideal @ 100 – 110 mg/dl, but possessing a greater quantity of denser *LDL particles* means a higher risk for CV events.
- LDL cholesterol levels predict higher CV risk only 40% of the time.
- ApoB concentration + sum of all LDL particles and their precursors higher CV risk 70% of the time.

Good: fats [increase large & buoyant LDLs](#) and decrease small & dense LDLs.

Bad: refined CHO [increases small & dense LDLs](#).

- Having more large & buoyant LDLs [exhibit a pattern A](#) type of cholesterol profile & a lower risk of atherosclerosis.
- Having more small & dense LDLs [exhibit a pattern B](#) cholesterol profile & a higher risk of atherosclerosis, including elevated markers for metabolic disease risks.
- That means a person can have a normal LDL cholesterol level but a pattern B cholesterol profile.
- For most, the overall LDL particle number is more relevant than LDL size.

Coronary Heart Disease: A Multifactorial Disease

- Insulin resistance strongly correlates with Type 2 diabetes which [doubles the risk](#) of death from heart disease or stroke.
- Two types: 1) hyperinsulinemia/high blood insulin and 2) insulin resistance where the body cannot sufficiently respond to insulin:
 - Hyperinsulinemia promotes the formation of the small & dense LDLs vs. the large & buoyant.

- High insulin causes the destruction of HDL particles and blood TG production which leads to more **small & dense, atherogenic** LDL particles.

In total, CHD is increased by all three: LDL cholesterol, particle concentration, and insulin resistance.

- Look at LDL particle numbers or apoB numbers that = total number of a person's non-HDL lipoprotein particles.
- Non-HDL particles = VLDL, IDL, and LDL particles. VLDL and IDL are precursors to LDL particles, so a high non-HDL particle number suggests high LDL particles.
- Non-HDL cholesterol - "poor man's apoB" test - is covered by insurance and looks at all cholesterol carried in the non-HDL lipoproteins.

FAT FUNCTIONS

Trans fats

- Byproduct of hydrogenation, which turns healthy oils into solids to prevent them from becoming rancid.
- Increases the amount of harmful LDL and decreases the amount of beneficial HDL cholesterol.

-Saturated fats

- Solid at room temperature from red meat, whole milk, whole-milk dairy foods, cheese, coconut oil, and many commercially prepared baked goods and other foods.
- Nutrition experts recommend limiting SF to <10% of daily calories.
- Recent research: a meta-analysis of 21 studies = not enough evidence to conclude that SF increases the risk of CHD and that replacing it with PUFAs, and high-fiber CHO may reduce the risk of CHD.

Monounsaturated fats

liquid at room temperature. - Olive, peanut, & canola oil, avocados, most nuts, & high-oleic safflower and sunflower oils.

Polyunsaturated fats

- Omega-3 FAs = fatty fish, like salmon, mackerel, sardines, flaxseeds, walnuts, canola oil, and un-hydrogenated soybean oil.
- Omega 6 FAs & linoleic acid = vegetable oils like safflower, soybean, sunflower, walnut, and corn oils.