

---

Product Manual

# LDL/VLDL and HDL Purification Kit (Ultracentrifugation Free)

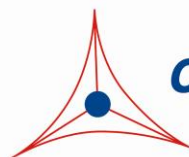
Catalog Number

STA-608

10 preps

**FOR RESEARCH USE ONLY**  
Not for use in diagnostic procedures

---

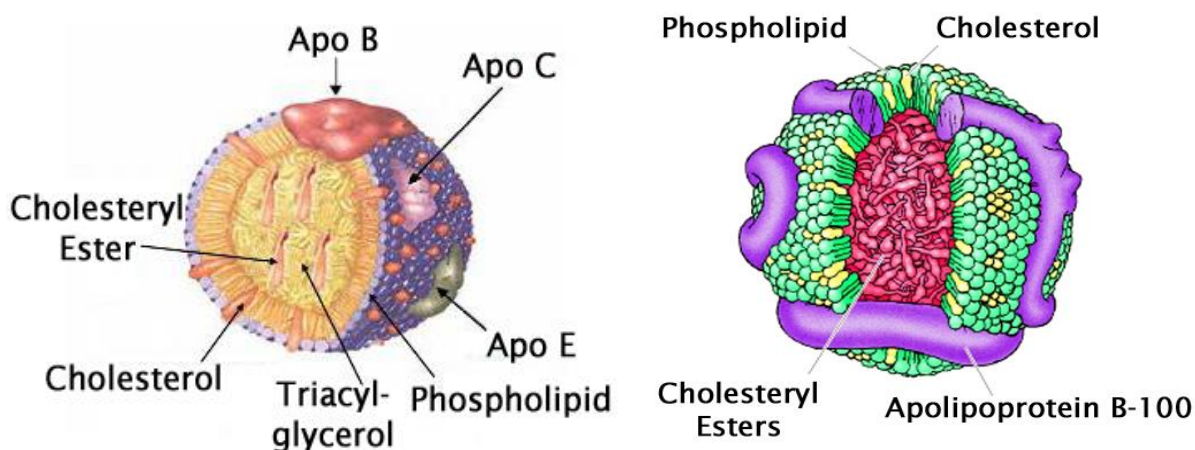


**CELL BIOLABS, INC.**  
*Creating Solutions for Life Science Research*

## **Introduction**

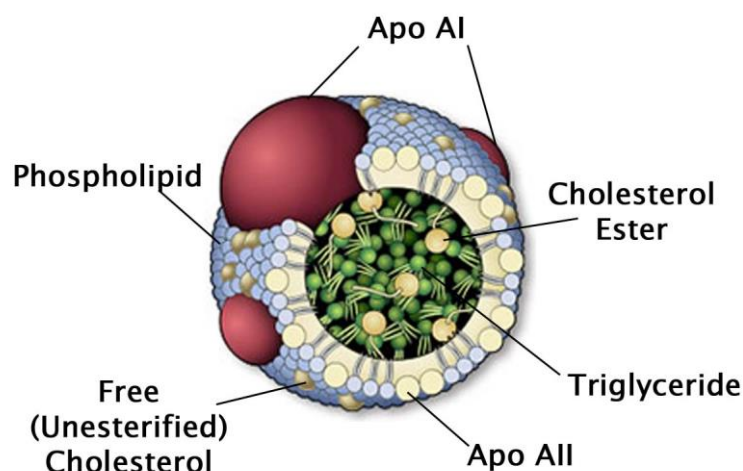
Lipoproteins are submicroscopic particles composed of lipid and protein held together by noncovalent forces. Their general structure is that of a putative spheroidal microemulsion formed from an outer layer of phospholipids, unesterified cholesterol, and proteins, with a core of neutral lipids, predominately cholesteryl esters and triacylglycerols (TAG). Very low density lipoprotein (VLDL), a spherical particle with a diameter of 30-100 nm, is the major plasma vehicle for TAG and is the precursor to Low density lipoprotein (LDL). Each VLDL contains one molecule of a hydrophobic protein known as apolipoprotein B-100 (Apo B), as well as multiple copies of apolipoprotein E and apolipoprotein C (Figure 1 left).

LDL is the major transport protein for cholesterol in human plasma. LDL, like VLDL, is also a spherical particle with a diameter of 20-25 nm. Each LDL particle contains cholesteryl esters in its core which are surrounded by a hydrophilic coat composed of phospholipids, cholesterol, and one molecule apolipoprotein B-100 (Figure 1 right).



**Figure 1: Structure of VLDL (left) and LDL (right).**

High Density Lipoprotein (HDL) is also a spherical particle with diameter of about 10 nm (Figure 2). HDL contains the Apolipoprotein AI and AII molecules. HDL and LDL cholesterol levels in the blood are important indicators of many disease states. High blood levels of LDLs are associated with health problems and cardiovascular disease. For this reason, LDL is often referred to as the “bad cholesterol.” LDL particles that accumulate within arteries can form plaques over time, which can increase chances of a stroke, heart attack, or vascular disease. HDL particles are able to remove cholesterol from within arteries and transport it back to the liver for re-utilization or excretion, which is the main reason why the cholesterol carried within HDL particles is sometimes called "good cholesterol." Monitoring circulatory levels of different lipoproteins is critical to the diagnosis of lipid transport disorders such as atherosclerosis.



**Figure 2: Structure of HDL.**

The LDL/VLDL and HDL Purification Kit uses Dextran Sulfate to selectively and separately precipitate LDL/VLDL and HDL fractions. The kit allows for the purification of LDL/VLDL and/or HDL without the need for ultracentrifugation. The various lipoprotein particles are highly purified through a series of precipitation and low speed centrifugation steps. Each kit provides sufficient reagents to perform up to 10 preps, and each preparation can purify up to 10 mL of serum or plasma samples with a yield of ~600 µg of LDL/VLDL per mL and ~4500 µg of HDL per mL for human samples (expected yield will vary by species).

### **Related Products**

1. STA-212: Malondialdehyde (MDA) Modified Human Low Density Lipoprotein (LDL)
2. STA-214: Copper (Cu<sup>++</sup>) Oxidized Human Low Density Lipoprotein (LDL)
3. STA-358: Human Oxidized LDL ELISA Kit (OxPL-LDL Quantitation)
4. STA-362: Human Apo AI ELISA Kit
5. STA-368: Human Apo B ELISA Kit
6. STA-369: Human Oxidized LDL ELISA Kit (MDA-LDL Quantitation)
7. STA-389: Human Oxidized LDL ELISA Kit (HNE-LDL Quantitation)
8. STA-390: Total Cholesterol Assay Kit (Fluorometric)
9. STA-391: HDL and LDL/VLDL Cholesterol Assay Kit

### **Kit Components**

1. Dextran Solution (Part No. 260801): One 8 mL bottle
2. Precipitation Solution A (Part No. 260802): One 30 mL amber bottle
3. Bicarbonate Solution (Part No. 260803): One 4 mL bottle

4. 10X Precipitation Solution B (Part No. 260804): One 10 mL bottle
5. Tris Solution (Part No. 260805): One 50 mL bottle containing 20 mM Tris, pH 7.5
6. NaCl Solution (Part No. 260806): One 6 mL bottle containing 5% NaCl
7. 10X Precipitation Solution C (Part No 260807): One 20 mL bottle
8. Dextran Removal Solution (Part No. 260808): One 10 mL bottle
9. 5X HDL Wash Solution (Part No. 260809): One 12 mL bottle

### **Materials Not Supplied**

1. Serum or Plasma Samples
2. PBS
3. Microcentrifuge or Centrifuge
4. 10  $\mu$ L to 1000  $\mu$ L adjustable single channel micropipettes with disposable tips

### **Storage**

Upon receipt store Dextran Removal Solution at room temperature. Store all other components at 4°C.

### **Preparation of Reagents**

- 1X Precipitation Solution B: Dilute the 10X Precipitation Solution B to 1X with deionized water. Stir to homogeneity. Store unused solution at 4°C.
- 1X Precipitation Solution C: Dilute the 10X Precipitation Solution C to 1X with deionized water. Stir to homogeneity. Store unused solution at 4°C.
- HDL Resuspension Buffer: Dilute Dextran Solution 1:100 and Precipitation Solution A 1:10 in Tris Solution. For example, add 50  $\mu$ L of Dextran Solution and 0.5 mL of Precipitation Solution A to 4.45 mL of Tris Solution. Stir to homogeneity. Prepare only enough for immediate use and do not store unused buffer.
- 1X HDL Wash Solution: Dilute the 5X HDL Wash Solution to 1X with deionized water. Stir to homogeneity. Store unused solution at 4°C.

### **Purification Protocol**

*Note: The purification protocol below is written for a 10 mL sample size. For smaller sample volumes, scale down each step proportionally.*

#### **I. Dextran Precipitation**

1. To 10 mL of serum or plasma on ice, add 50  $\mu$ L of Dextran Solution and 500  $\mu$ L of Precipitation Solution A. Incubate 5 minutes on ice.
2. Spin at 6000 x g 10 minutes at 4°C.

3. Remove the supernatant, which contains HDL, for use in section III below. Use the remaining pellet which contains LDL and VLDL for section II below.

*Note: The HDL-containing supernatant may be stored at 4°C for future processing.*

## **II. LDL/VLDL Purification**

1. Resuspend the pellet from section I above with 400  $\mu$ L of Bicarbonate Solution and spin at 6000 x g 10 minutes at 4°C.
2. Transfer the supernatant to a new tube. Discard the pellet.
3. Add 10 mL of 1X Precipitation Solution B to the supernatant. Mix thoroughly by pipetting up and down.
4. Spin at 6000 x g for 10 minutes at 4°C.
5. Discard the supernatant and resuspend the pellet with 200  $\mu$ L of NaCl Solution.
6. Add 10 mL of 1X Precipitation Solution C. Mix thoroughly by pipetting up and down.
7. Spin at 6000 x g for 10 minutes at 4°C.
8. Repeat steps 5-7.
9. Resuspend the pellet in 200  $\mu$ L of NaCl Solution (final volume about 500  $\mu$ L).
10. Add 80  $\mu$ L of Dextran Removal Solution. Mix thoroughly by pipetting up and down and incubate 1 hour at 4°C.
11. Spin at 6000 x g for 10 minutes at 4°C.
12. Recover the supernatant (purified LDL/VLDL) and transfer to a new tube.
13. Dialyze the purified LDL/VLDL in PBS and determine the protein concentration.

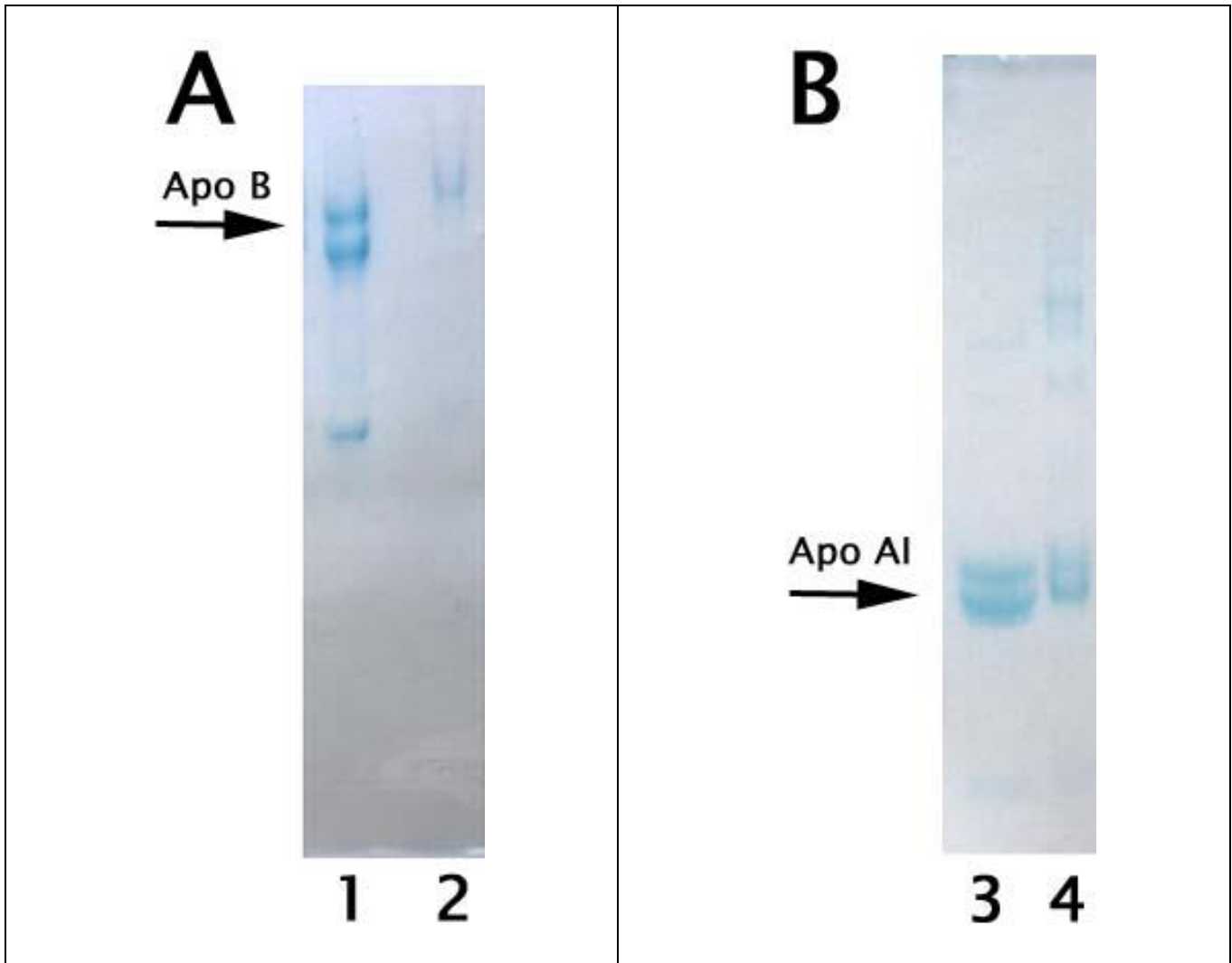
## **III. HDL Purification**

1. To 10 mL of supernatant from section I above, add 600  $\mu$ L of Dextran Solution and 1.5 mL of Precipitation Solution A. Incubate for 2 hours at room temperature.
2. Spin 18,000-20,000 x g for 30 minutes at 4°C.
3. Discard supernatant and resuspend pellet in 5 mL of HDL Resuspension Buffer (see Preparation of Reagents Section). Mix thoroughly by pipetting up and down.
4. Spin 6000 x g for 10 minutes at 4°C.
5. Discard supernatant and resuspend pellet in 6 mL of 1X HDL Wash Solution (see Preparation of Reagents Section).
6. Shake for 30 minutes at 4°C. Shaking speed should be sufficient to dissolve pellet, but not so vigorous that bubbles form.
7. Spin 6000 x g for 10 minutes at 4°C.
8. Transfer the supernatant to a new tube and add 900  $\mu$ L of Dextran Removal Solution. Mix thoroughly by pipetting up and down.

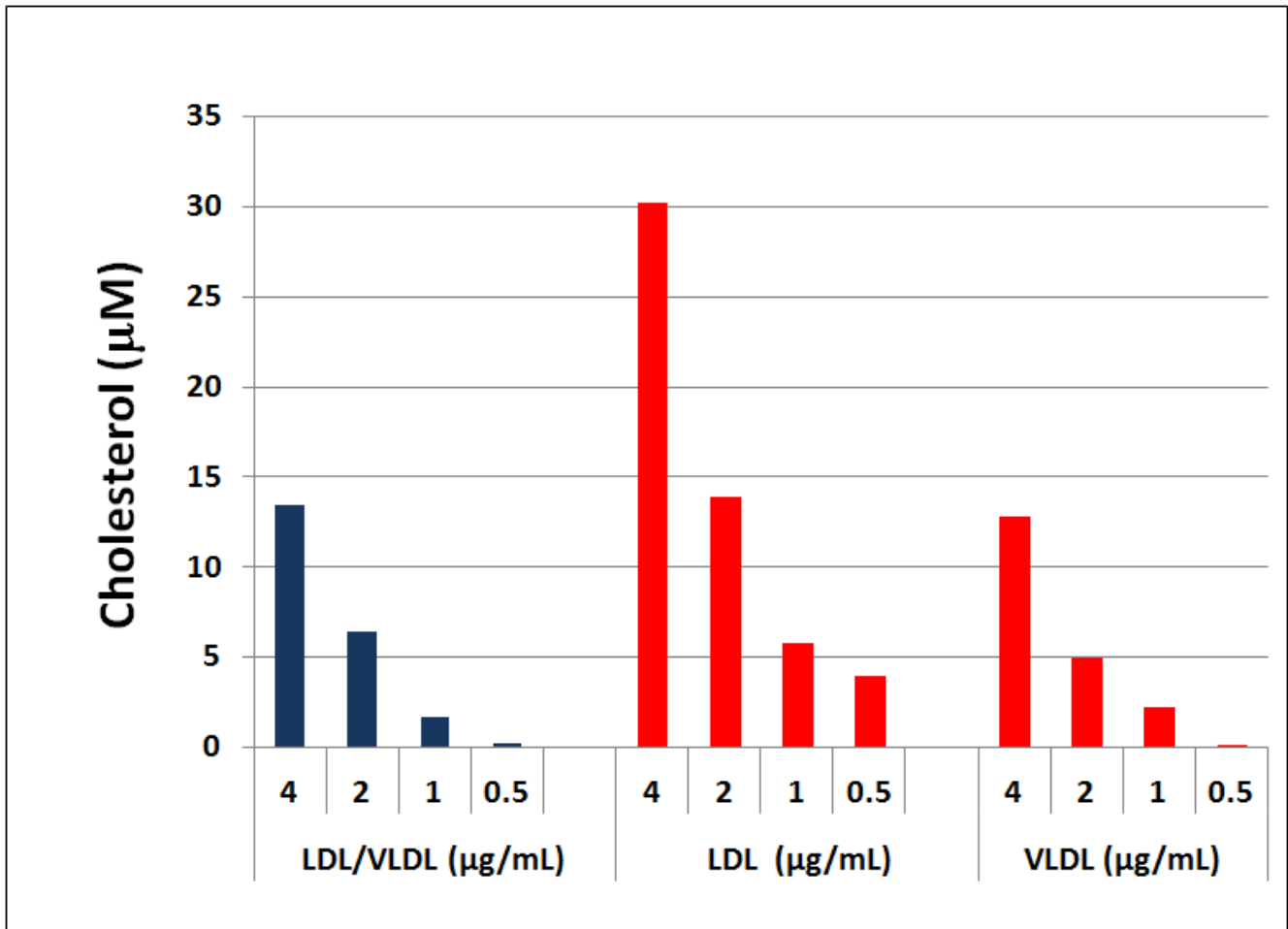
9. Incubate for 1 hour at 4°C.
10. Spin 6000 x g for 10 minutes at 4°C.
11. Transfer the supernatant (containing purified HDL) to a new tube.
12. Dialyze the purified HDL in PBS and determine the protein concentration.

**Example of Results**

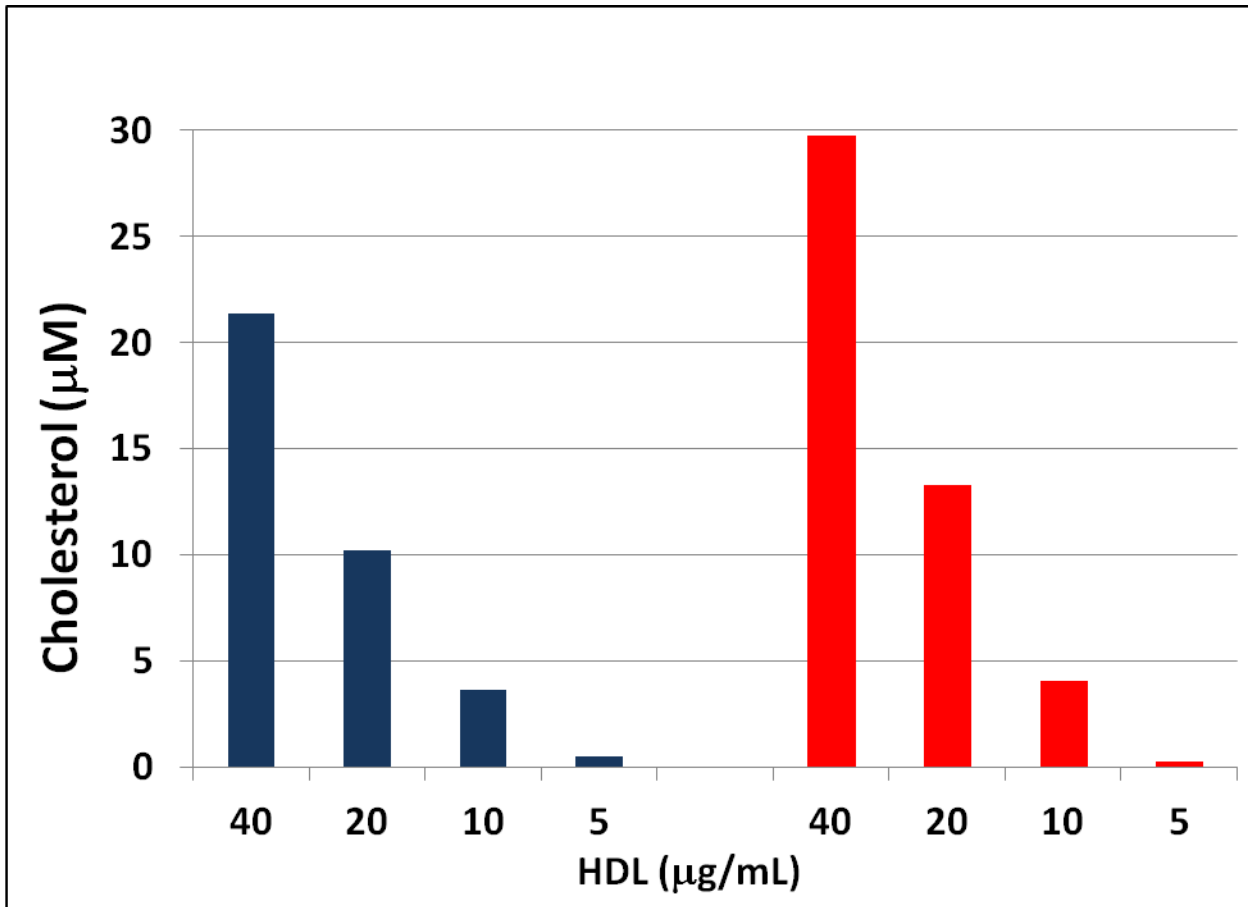
The following figures demonstrate typical results with the LDL/VLDL and HDL Purification Kit. One should use the data below for reference only. This data should not be used to interpret actual results.



**Figure 3: SDS PAGE gels of purified Lipoproteins.** 20 µg of LDL/VLDL (A) or HDL (B) purified by the STA-608 kit (lanes 1 and 3) or ultracentrifugation (lanes 2 and 4) were loaded on a 3-8% Tris Acetate Gel (A) or a 12% Bis Tris Gel (B) and stained with Coomassie Brilliant Blue Dye.

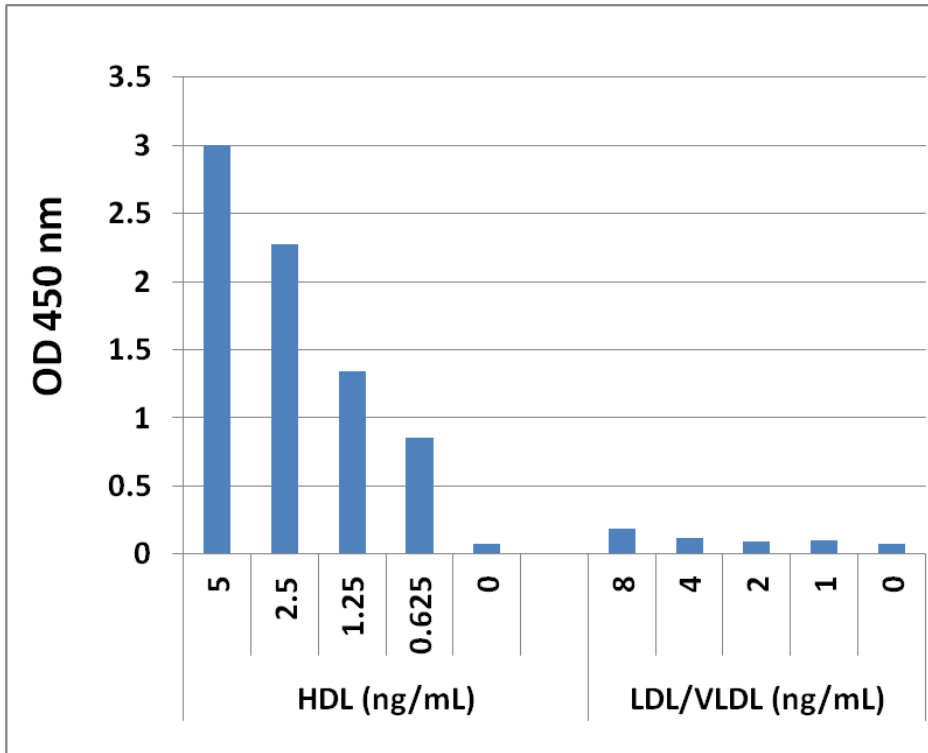


**Figure 4: Detection of Cholesterol in purified LDL/VLDL Samples.** Purified LDL/VLDL isolated using the LDL/VLDL and HDL Purification Kit (blue bars) or ultracentrifugation (red bars) was tested for the presence of Cholesterol using the Total Cholesterol Assay Kit (Cat. # STA-390).

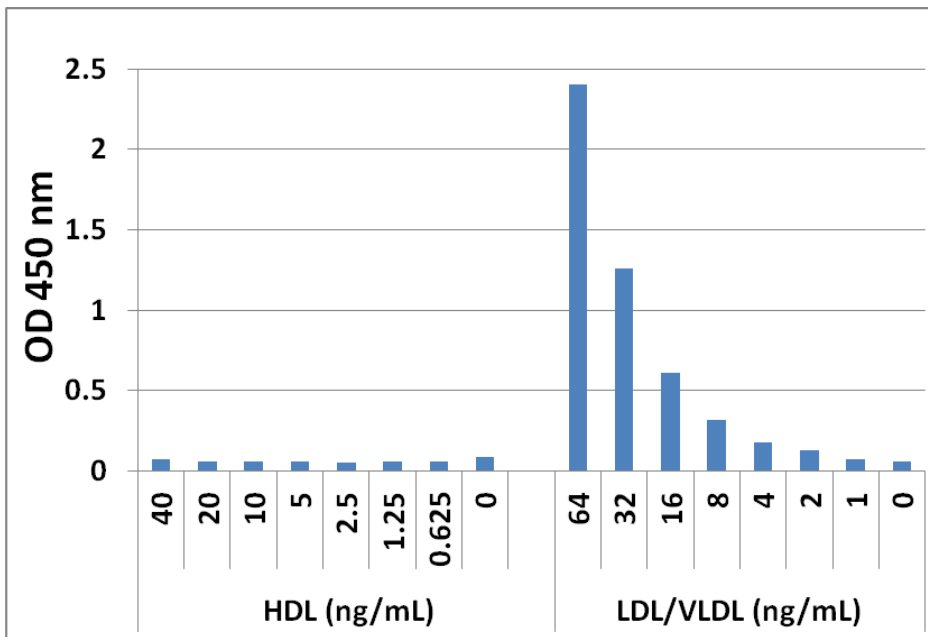


**Figure 5: Detection of Cholesterol in purified HDL Samples.** Purified HDL from the LDL/VLDL and HDL Purification Kit (blue bars) or ultracentrifugation (red bars) was tested for the presence of Cholesterol using the Total Cholesterol Assay Kit (Cat. # STA-390).





**Figure 6: Detection of ApoA1 in purified Lipoprotein Samples.** Purified HDL or LDL/VLDL from the LDL/VLDL and HDL Purification Kit was tested for the presence of ApoA1 using the Human Apo AI ELISA Kit (Cat. # STA-362).



**Figure 7: Detection of ApoB in purified Lipoprotein Samples.** Purified HDL or LDL/VLDL from the LDL/VLDL and HDL Purification Kit was tested for the presence of ApoB using Human Apo B ELISA Kit (Cat. # STA-368).

## **References**

1. Atmeh R. F. (1990) *J Lipid Res*, **31**: 1771-1780.
2. Havel R.J. , Eder H.A., and Bragdon J.H. (1955) *J. Clin. Invest*, **34**: 1345-1353.
3. Gaubatz J.W., Chari M.V., Nava M.L, Guyton J.R., and Morrisett J.D. (1987) *J Lipid Res*, **28**: 69-79.
4. Kostner G.M., Ibovnik A., Holzer H., and Gillhofer H. (1999) *J Lipid Res*. **40**: 2255-2263.
5. Hirowatari Y., Yoshida H., Kurosawa H., Shimura Y., Yanai H., and Tada N. (2010) *J Lipid Res*. **51**: 1237–1243.
6. Lasser N.L., Roheim P.S., Edelstein D., and Eder H.A. (1973) *J Lipid Res*. **14**: 1-8.
7. Camus M-C., Chapman M.J., Forgez P., and Laplaud P.M. (1983) *J Lipid Res*. **24**: 1210-1228.

## **Recent Product Citations**

1. Huang, J. et al. (2020). Reactive Dicarbonyl Scavenging Effectively Reduces MPO-Mediated Oxidation of HDL and Restores PON1 Activity. *Nutrients*. **12**(7):E1937. doi: 10.3390/nu12071937.
2. Sun, Y. et al. (2019). Lipid Profile Characterization and Lipoprotein Comparison of Extracellular Vesicles from Human Plasma and Serum. *Metabolites*. **9**(11). pii: E259. doi: 10.3390/metabo9110259.
3. Khattib, A. et al. (2019). Lyso-diacylglyceryltrimethylhomoserine (lyso-DGTS) isolated from *Nannochloropsis* microalgae improves high-density lipoprotein (HDL) functions. *Biofactors*. doi: 10.1002/biof.1580.
4. Ghazaryan, A. et al. (2019). Protein deglycosylation can drastically effect the cellular uptake. *Nanoscale*. doi: 10.1039/C8NR08305C.
5. Frank, A.C. et al. (2019). Apoptotic tumor cell-derived microRNA-375 uses CD36 to alter the tumor-associated macrophage phenotype. *Nat Commun*. **10**(1):1135. doi: 10.1038/s41467-019-08989-2.
6. Atrahimovich, D. et al. (2018). Punicalagin Decreases Serum Glucose Levels and Increases PON1 Activity and HDL Anti-Inflammatory Values in Balb/c Mice Fed a High-Fat Diet. *Oxid Med Cell Longev*. **2018**:2673076. doi: 10.1155/2018/2673076.
7. Müller, J. et al. (2018). Beyond the protein corona - lipids matter for biological response of nanocarriers. *Acta Biomater*. **71**:420-431. doi: 10.1016/j.actbio.2018.02.036.
8. Yamamoto, H., et al. (2017). VLDL/LDL acts as a drug carrier and regulates the transport and metabolism of drugs in the body. *Sci Rep*. **7**(1):633. doi: 10.1038/s41598-017-00685-9.
9. Palczewski, G. et al. (2016). Genetic dissection in a mouse model reveals interactions between carotenoids and lipid metabolism. *J Lipid Res*. doi:10.1194/jlr.M069021.

## **Warranty**

These products are warranted to perform as described in their labeling and in Cell Biolabs literature when used in accordance with their instructions. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THIS EXPRESSED WARRANTY AND CELL BIOLABS DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR PARTICULAR PURPOSE. CELL BIOLABS' sole obligation and purchaser's exclusive remedy for breach of this warranty shall be, at the option of CELL BIOLABS, to repair or replace the products. In no event shall CELL BIOLABS be liable for any proximate, incidental or consequential damages in connection with the products.

## **Contact Information**

Cell Biolabs, Inc.  
7758 Arjons Drive  
San Diego, CA 92126  
Worldwide: +1 858-271-6500  
USA Toll-Free: 1-888-CBL-0505  
E-mail: [tech@cellbiolabs.com](mailto:tech@cellbiolabs.com)  
[www.cellbiolabs.com](http://www.cellbiolabs.com)

©2014-2020: Cell Biolabs, Inc. - All rights reserved. No part of these works may be reproduced in any form without permissions in writing.