Structure and Metabolism of Plasma Lipoproteins – An overview

W.		Brown
----	--	-------

Department of Medicine, Mount Sinai Medical Center, New York, N.Y.

W. Brown, MD, Mount Sinai Medical Center, Department of Medicine, 1, Gustave L. Levy Place, New York, NY 10029 (USA)

Chylomicrons and very-low-density lipoproteins (VLDL) are the circulating particles responsible for transport of triglycerides from intestine and liver, respectively. Cholesterol ester exists with the triglyceride as a droplet surrounded by a monolayer of phospholipid-free cholesterol and specific proteins.

These apolipoprotein now number nine.

Apolipoprotein B (apo-B) is an essential component of both chylomicrons and VLDL. Other apolipoproteins are removed during triglyceride hydrolysis by lipoprotein lipase in the peripheral tissues (e.g. muscle and adipose tissue) but apo-B remains with the residual lipoprotein particles in the bloodstream. This 'remnant lipoprotein' may be taken up by the liver or converted by poorly understood processes to low-density lipoprotein (LDL). The latter is triglyceride-poor but cholesterol-rich. Its long half life in plasma (3 days) results in a large plasma pool of cholesterol in humans and is strongly associated with cardiovascular mortality.

Studies in our laboratory have examined the relation between dietary changes and the turnover of apo-B in VLDL and LDL. The first series of studies contrasted the effects of a diet containing 80% carbohydrate and 20% protein to a control diet of 40% carbohydrate, 40% fat and 20% protein. In 6 subjects with mild hypertriglyceridemia (type IV), triglycerides from 150 to 350 mg/dl the VLDL was isolated and labeled with ^{125}I (50–75 μCi) and triglycerides were labeled by intravenous injection of H-glycerol (300 μCi). The high-carbohydrate diet increased the production rate of triglyceride by 10% in VLDL but did not change the VLDL apo-B production. Thus the output of the major lipid of this lipoprotein is not directly tied to the synthesis and secretion of its major structural protein. A second finding

Brown

2

was an increase in the removal rate of apo-B as a component of VLDL before its final conversion to LDL apo-B. Thus the apparent synthesis of LDL apo-B was reduced during a period of increased triglyceride synthesis.