# Mechanisms of cholesterol reduction by *Lactobacillus plantarum* $LP_{LDL}$®

**Kolida S |** Hernandez O | OHara SP| Rastall RA|

## Background

*Lactobacillus plantarum* $LP_{LDL}$® is a probiotic with established cholesterol reducing activity in normal to mildly hypercholesterolemic adults. Probiotics can reduce cholesterol by various mechanisms:

- Adsorption to cell surface.
- Integration to cell membrane.
- Bile Salt Hydrolase (BSH) activity- prevents bile salt reabsorption.
- Cholesterol esterase activity-conversion to coprostanol.

## Aims

Investigate the relevance of the above described mechanisms to the cholesterol lowering activity of $LP_{LDL}$®.

## Methods

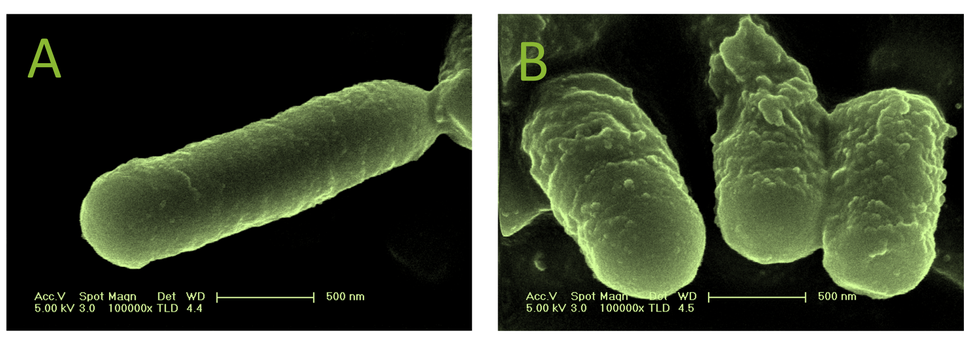
To investigate the ability of $LP_{LDL}$® of passively removing cholesterol through adsorption on its cell membrane, pure cultures were carried out in the presence and absence of cholesterol. Samples were analysed using scanning electron microscopy (SEM).

Faecal, micro-scale, pH-controlled batch cultures (10ml) containing cholesterol-enriched growth media, were carried out in the presence of $LP_{LDL}$® . Culture supernatants were obtained at 0, 10 and 24h for:

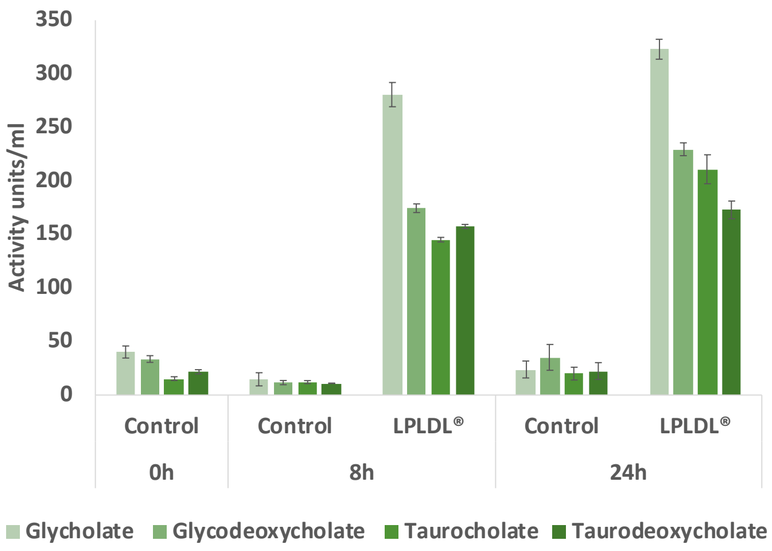
- Bile Salt Hydrolase (BSH) activity determination.
- Cholesterol and coprostanol concentrations were determined using GC-FID.

A double blind, placebo controlled, randomized study was carried out in normal to mildly hypercholesterolemic adults to confirm cholesterol reducing efficacy *in vivo*.

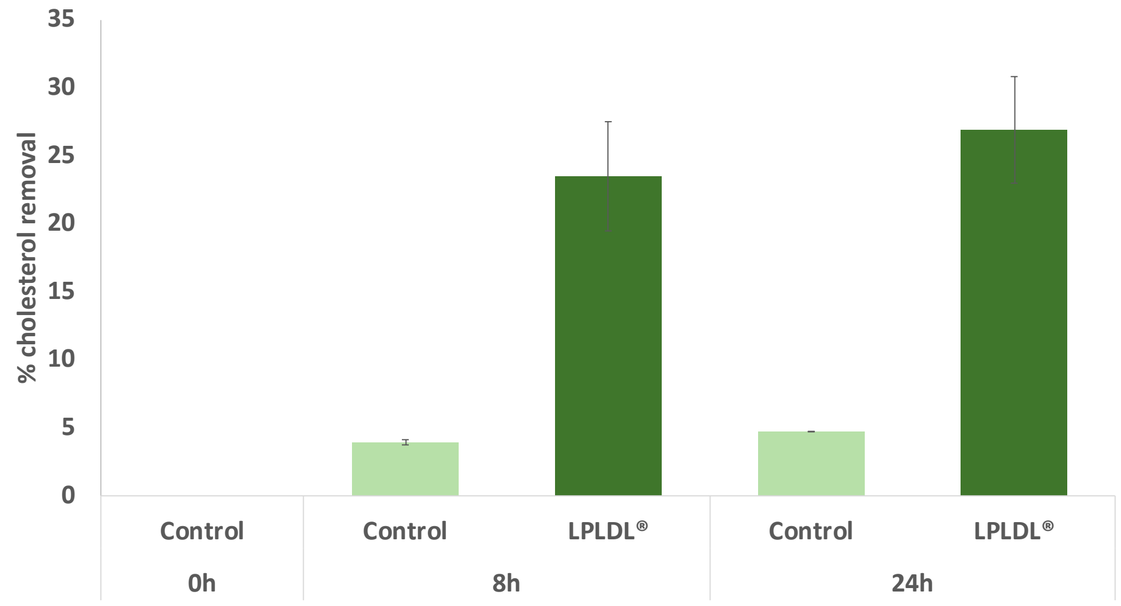
## Results



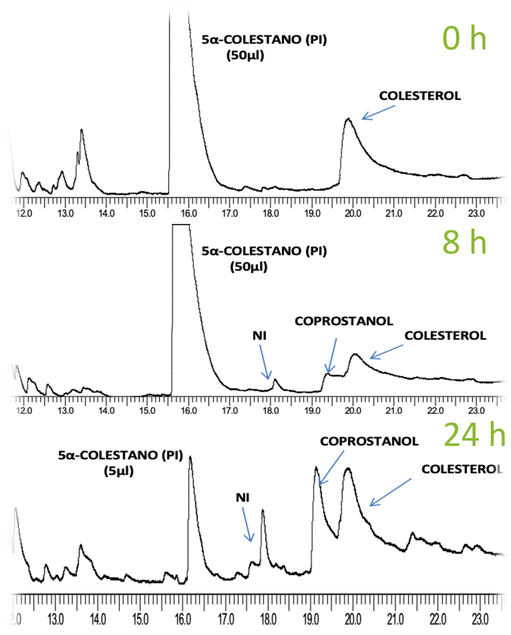

**Adsorption of cholesterol on $LP_{LDL}$® cell surface**: SEM of $LP_{LDL}$® grown in the absence (A) and presence of cholesterol (B) following washing in PBS.



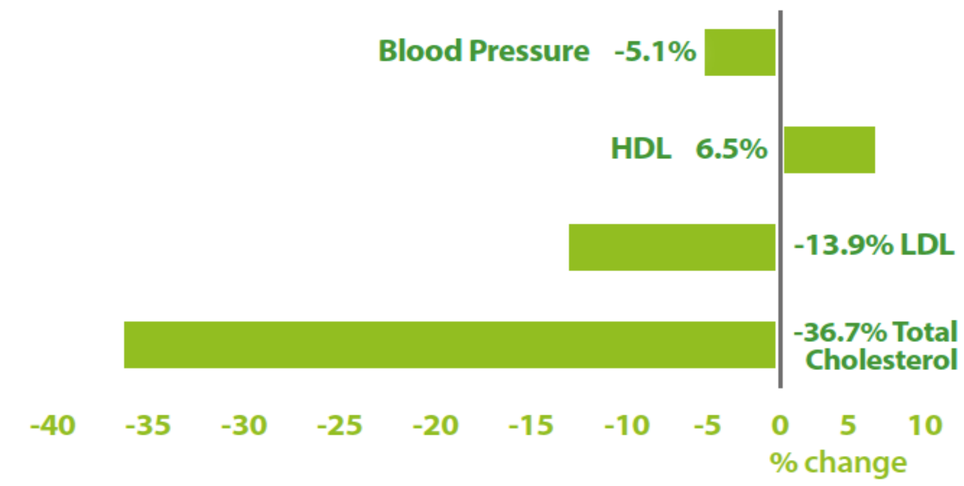

**BSH activity in pH-controlled faecal batch cultures:** significant increase in bile salt hydrolysis at 8 and 24h with significantly higher preference for glycolate.




**Cholesterol reducing activity in pH-controlled faecal batch cultures:** significant increase in cholesterol reduction at 8 and 24h in cultures where $LP_{LDL}$® was present.




**Coprosanol formation in pH-controlled faecal batch cultures:** Conversion of cholesterol to coprostanol in the presence of $LP_{LDL}$® after 8 and 24h fermentation. Once formed, coprostanol is excreted in faeces *in vivo.*




**Impact of $LP_{LDL}$® intake on serum lipid profiles *in vivo*:** statistically significant reduction in systolic blood pressure, LDL and total cholesterol and an increase in HDL cholesterol in normal to mildly hypercholesterolemic adults

## Study Highlights

Our findings suggest that $LP_{LDL}$® can mediate cholesterol reduction by three mechanisms:

I. Adsorption
II. BSH activity
III. Enzymatic conversion to coprostanol

The ability of $LP_{LDL}$® to reduce cholesterol through several mechanisms contributes to its enhanced efficacy in improving serum lipid profiles in human studies.

Contact: Dr Sofia Kolida | R&D Director | OptiBiotix Health PLC |Tel: ++ 44 7585001450|