Probiotics in the Management of High Cholesterol
The Gut-Heart Connection
Joanna Scott-Lutyens
BA(Hons) DipION FdSc

Nutritional Therapist
Aims

• A brief overview of good and bad cholesterol, and how both affect cardiovascular health.

• Discover how probiotics can help reduce cholesterol by harnessing the body’s natural regulation system, and be used as part of CVD protocol

• Information on the research behind this.

• A quick discussion on how probiotics compare to other products on market
What is cholesterol?

- Waxy like substance
- Essential in the body
- Majority of cholesterol is produced by liver (80%)
Why do we *need* cholesterol?

At least 6 reasons:

1. As a component of all cell membranes
2. To manufacture vitamin D
3. To manufacture steroid hormones
4. To manufacture bile salts
5. To repair blood vessels
6. For absorption & transportation of fat-soluble vitamins
How is cholesterol transported in the body?

- Body binds fats to lipoproteins – these are a mix of lipid and protein - different densities = different properties
- High density lipoprotein (HDL = good)
- Low density lipoprotein (LDL = bad)
What is a healthy cholesterol level?

- Varies depending on the doctor’s opinion and general health of the patient
- TC: < 5 mmol/L (<4 for those at risk)
- LDL: < 3 mmol/L (<2 for those at risk)
- HDL: > 1 mmol/L (lower than this can increase risk)
- TC:HDL ratio < 4 (>6 is considered at risk)

http://www.nhs.uk/conditions/Cholesterol/Pages/Introduction.aspx
http://www.Heartuk.org.uk/
What are the issues with high cholesterol?

Atherosclerosis leading to:

High blood pressure, angina, heart attack, stroke

Plaque composition: cholesterol, white blood cells, fibrotic material, calcium, platelets

Consider: LDL, inflammation and immunity
Inflammation or high cholesterol?

- LDL is more liable to be oxidised than HDL
- Oxidised cholesterol is more dangerous because it is:
  - more reactive
  - inflammatory
  - stimulates the immune system

- High cholesterol more of a concern in a patient with inflammation, is overweight, or has metabolic disease.
How cholesterol is naturally synthesised and regulated

acetyl CoA and acetoacetyl-CoA

3-hydroxy-3-methylglutaryl CoA (HMG-CoA)

HMG-CoA reductase (enzyme)

mevalonate

Another 6 molecular changes

Cholesterol

• Rate of cholesterol synthesis highly responsive to cellular levels of it
• Increased levels of Cholesterol in a hepatocyte will lead to inhibition/destruction of HMG-CoA reductase – reducing ability for cholesterol to be produced.
• Dysregulation of HMGR leads to increase in cholesterol levels

https://www.ncbi.nlm.nih.gov/books/NBK22336/
Conventional treatment

- Statins work by slowing down the production of cholesterol by the liver. They do this by interfering with the action of a key enzyme, HMG-CoA-Reductase.

- Side effects include:
  - Muscle pain
  - Muscle weakness
  - Tummy upset
  - Increase risk of diabetes II
  - Reduction in vitamin D
The gut-heart link

- Growing research into the reduction of LDL with probiotics
- A natural method harnessing the body’s own mechanisms.


The gut-heart link

Strain specificity – a brief overview.

Not all strains in the same species, or any other species, have the same function – e.g., lower cholesterol.

For example: *Lactobacillus rhamnosus* Rosell-11 reduces AAD, Foster et al. (2011)

*Lactobacillus rhamnosus* GR-1® balances the microflora in the female intimate area Reid et al. (2011)
The gut-heart link

  
  Double blind, placebo controlled
  
  114 subjects – some taking the strain *L. reuteri* NCIMB 30242
  
  Results were an improvement in cholesterol ratio and a decrease in overall cholesterol
  
  American supplement - Cardioviva

  
  This In-Vitro trial showed: BSH production, adherence to cholesterol and butyrate and propionate production.


For your cholesterol

- Three strains of probiotics have been shown in in-vitro and clinical research as unsurpassed in their ability to reduce cholesterol
  - Capsules containing 1.2 billion CFU of:
    - *L. plantarum* CECT 7527
    - *L. plantarum* CECT 7528
    - *L. plantarum* CECT 7529
- Capsules containing Alpha-linolenic acid from cold-pressed virgin flaxseed oil
Clinical trial design


Gold standard: Double-blind, randomised, placebo-controlled clinical trial
Size: 60 patients with high cholesterol
Allocation: 30 on probiotic (1.2 billion), 30 on placebo
Measurements: Taken at baseline, 6 weeks and 3 months
Results: Statistically significant results were seen after 3 months
Results

- 6 week measurements were not significant

- After 3 months the probiotic group had an average decrease in TC of 0.9mmol/L (14%)

- ‘Administering the *L. plantarum* mixture greatly reduced the atherogenic index and the cardiac risk factor. The hepatic lipid content, the triglyceride content, and total cholesterol content in the liver tissue was remarkably reduced by the administration of the *L. plantarum* mixture.’
Stratification

• The results from the group of 30 patients in the probiotic group can be divided into:
  
  - Those with highest initial cholesterol (6.5 to 7.8 mmol/L)
  
  - Those with medium-high initial cholesterol (5.2 to 6.4 mmol/L)
Stratification

Those who had higher initial cholesterol had a larger decrease in TC (1.2 mmol/L – 17%) than those in the medium-high group (0.5 mmol/L – 9%)
Safety

- No adverse effects were reported
- Slow mechanism of action = gradual effects = reduced risk of side effects
- Negative feedback mechanism – harnessing a natural process
How do probiotics reduce cholesterol?

- Improve blood lipidic profile
- Intervention in the enterohepatic cycle: increase de novo synthesis of bile salt from plasmatic cholesterol
- Reduces of cholesterol absorption from the diet
- Propionic acid to with anti-inflammatory properties / hepatic cholesterol synthesis inhibition
- Butyric acid production as energy source for the colonicocytes
Breakdown of bile salts –
Enterohepatic cycle

- Probiotics produce **bile salt hydrolase** (BSH). This breaks down bile salts to bile acid & amino acid = precipitation

- High BSH activity means **less bile is reabsorbed**.

- Therefore **cholesterol is taken from blood** for new bile synthesis in the liver

Bosch et al, (2014)
Binding to dietary cholesterol

• Cholesterol binds to the bacterial cellular surface of CECT 7528.
• The bacteria incorporates the cholesterol into its cellular wall.
• Cholesterol bound to the bacteria inhibits intestinal cholesterol micelles from forming so cannot reach the intestinal surface – leading to lower cholesterol being absorbed into blood stream.

Producing propionic acid

- These strains produce a particularly large amount of propionic acid – especially CECT 7529
  
  Short chain fatty acid

  Absorbed into blood stream

  Perceived as a signal by the liver

  Less cholesterol produced

- Propionic acid is also anti-inflammatory
  
Producing Butyric acid

• Butyrate is a key nutrient for metabolic activity and growth of colonocytes

• Now thought to be a regulator of intestinal fat absorption and circulating lipoprotein concentrations

Anti-inflammatory

1. Probiotics increase anti-inflammatory cytokines e.g. IL-10

2. Probiotics decrease pro-inflammatory cytokines e.g. IL-6

3. Short chain fatty acids are known to be anti-inflammatory (Vieira EL et al, 2012)

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3257741/
What other options are there for reducing Cholesterol on the market

- Statins
- Artichoke
- CoQ10
- Fish oil
- Insoluble fibre
- Lecithin
- Niacin
- Plant sterols
- Red yeast rice
- Soluble fibre
How do these compare to AB-Life strains

| How does ‘For your cholesterol’ compare? | For your cholesterol | Statins | Artichoke | CoQ10 | Fish oil | Insoluble fibre | Lecithin | Niacin | Plant sterols & stanols | Red yeast rice | Soluble fibre |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Daily effective dose used in clinical trials | 1.2 billion probiotics | 5-80mg | 1-1.5g | >2g | EPA, DHA | >3g | 1-54g | 1.5-2.4g | >3g | 13-24g | >3g |
| Dosage commonly provided | 1.2 billion probiotics to 300mg N-A | 5-80mg | 250-600mg | 30-200mg | >100mg | >3g | 1.4-15g | 130-300mg | >3g |

- **Decompensate bile salts**
- **Binds to bile salts**
- **Increases bile production**
- **Reduces absorption of dietary cholesterol**
- **Reduces cholesterol production in liver**
- **Down regulation of genes for cholesterol production**
- **Improves ratio of ‘good’ to ‘bad’ fats consumed**
- **Reduces inflammation**
- **Reduces triglycerides**
- **Reduces statin side effects**
Vascular health protocol

• Specific probiotic strains to lower cholesterol and reduce inflammation

• Include as an important part of your protocol to:
  ✓ Reduce excess LDL cholesterol
  ✓ Reduce inflammation
  ✓ Increase antioxidants
  ✓ Support healthy immune function
Conclusion

• There is more to probiotics than gut health

• Heart and vascular health is complex, involving many factors, of which cholesterol is an important one

• Specific strains are *clinically trialled* and *shown to reduce* cholesterol

• *New and exciting* concept in natural medicine
Thank you for listening
joanna@wrenlabs.com

For a full trade guide please email Christina
christina.georgallou@wrenlabs.com
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