

A perfect portfolio for cholesterol lowering

Linda Main

Diet continues to be a cornerstone for managing raised lipids and reducing cardiovascular risk. More and more healthcare professionals and informed patients are looking for dietary interventions as a first step in correcting raised cholesterol before resorting to statins and other cholesterol-lowering medications. Linda Main, Dietetic Advisor, Heart UK – the cholesterol charity, explains the impact of the portfolio diet in practice.

The diet

The portfolio diet is based around a low saturated fat diet where four key cholesterol lowering foods are incorporated – soya protein, sterols/stanols, nuts and soluble fibre.

The original portfolio diet's high volume of plant based foods favoured only highly motivated individuals or those content with adopting an almost vegan diet, with little room for meat or fish and near exclusion of dairy. In addition, the key food components of the diet were difficult to obtain in common supermarkets. So, although the diet demonstrated impressive cholesterol lowering results, its practical application and adoption by healthcare professionals was extremely limited.

The original portfolio diet:

- **Low saturated fat** $\leq 7\%$ of energy intake
- **Dietary cholesterol** at no more than 200mg per day
- **5-10 servings of fruit and vegetables**
- **Four** key cholesterol lowering foods
 - **2g plant sterols/stanols** – at the time only sterol fortified margarines were available.
 - **45-50g soya protein** equating to a minimum daily intake of:
 - 500ml soya milk + 75g tofu + 85g cooked dried soya beans + a soya burger/sausage or a serving of soya mince.
 - Soya, especially dairy alternatives, are now mainstream foods in the UK with a much wider range of palatable foods accepted by the average patient.
 - **15-20g of soluble fibre** – with specific attention to:
 - 3g of beta glucan – mainly consumed as oat bran fortified products and barley
 - Okra/Ladies fingers and egg plants / aubergines
 - Psyllium (a soluble fibre supplement/additive – often used as a laxative).
 - Other vegetable proteins – 100g beans or pulses
 - **28-46g almonds**
- **Meat, fish or poultry** – no more than 3 x a week. Meat/poultry portion at 85g and fish at 95g.

The research

Dr. David Jenkins, a Canadian scientist, noted the cholesterol-lowering abilities of the four specific food components and hypothesised that combining

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these could provide greater cholesterol reductions. Initial results showing that a reduction of LDL cholesterol of 28-35% could be achieved, an effect similar to a starting dose of a first-generation statin, were promising¹.

To clarify if this would be practical on a long-term basis, Jenkins and colleagues studied the effects of the portfolio regime in 66 people with raised cholesterol over one year².

Overall, a 13% reduction of LDL cholesterol was achieved and sustained over one year, with as much as 30% reductions in those who were most compliant with the regimen - approaching levels seen with a first-generation statins. Compliance was linearly related to LDL cholesterol reductions achieved so even the worst compliant saw an improvement in cholesterol levels. The diet also raised HDL cholesterol levels and achieved reductions in total to HDL cholesterol ratio of 12.7% and a small but significant reduction in triglycerides and C-reactive protein.

The portfolio diet in the 21st Century

Both the scientific evidence and acceptance of many of the portfolio foods have advanced beyond recognition. More current scientific evidence is demonstrating less volume of the cholesterol lowering foods may be needed to achieve drops in serum lipids. This is especially true for soya protein where the current evidence clearly demonstrates that cholesterol-lowering effects can be achieved from as little as 15g of soya protein per day compared to the original 46-50g. More importantly, the availability, palatability and acceptance of low saturated fat foods and the four key components – soluble fibre (incl. beta-glucan), soya protein, almonds and stanols/sterols – are now readily available in a variety of palatable every day foods e.g. beta-glucan breads and breakfast cereals, soya milk, yoghurt, custard alternatives as well as impressive meat replacements.

The portfolio diet in the 21st Century is simply an updated version where the diet has been modified to reflect UK national dietary guidelines and current scientific evidence and uses a step by step approach to accommodate all patients rather than just the most highly motivated or those happy to follow a mainly plant based diet. As Jenkins' group demonstrated, cholesterol lowering levels can be achieved at any level of the diet's adoption.

The portfolio diet in UK practice

1) Low in saturated fat – no more than 10% of energy should come from saturated fat – this means a ceiling intake of 20g saturated fat per day:

- Majority of fat consumption should be from plant, nut and seed oils.
- **Avoidance of high saturated fat foods** – i.e. foods containing *more than 5g saturated fat per 100g or per portion*
- **Less frequent consumption of foods modestly high in saturated fat** - containing *between 1.5g and 5g per 100g food*.

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- For individuals with a healthy BMI or those not wanting to lose weight (but where weight is stable) it is not necessary to cut down on total fat intake.
- UK practice does not require the restriction of dietary cholesterol from eggs and shellfish in the majority of the patients.

2) Fruit & Vegetables – at least 5-a-Day

3) The four key portfolio foods:

- Soya protein
- Plant sterols/stanols
- Soluble fibre – including 3g beta-glucan
- Nuts

Table 1: Key foods of the portfolio diet

Food type	Mechanism	Daily Target	Provided by	Dietary ideas
Soya products	<p>Soya protein down-regulates LDL cholesterol synthesis in the liver.</p> <p>Soya products are also low in saturated fat and a source of soluble fibre which may also contribute to the cholesterol lowering effect.</p>	<p>15g per day and increase to patient's tolerance and acceptability.</p> <p>A plateau effect occurs around 50g of soya protein per day for the highly motivated!</p>	<p>15g soya protein can be achieved with:</p> <ul style="list-style-type: none"> • 500ml soya milk (preferably calcium fortified) • 28g/handful soya nuts • 50-60g marinated tofu pieces • 90g cooked soya beans • ~30g soya mince • 250ml soya milk + 150g plain soya yogurt • 125g fruit yogurt + a soya/tofu burger <p>Once the patient is ready to increase their soya protein intake, the following options provide at least 5g of soya protein:</p> <ul style="list-style-type: none"> • 200ml soya milk – 175g serve soya custard • 150ml soya yoghurt –plain or fruit • 10g dried soya mince/chunks (1½ tbsp) • 40g cooked soya beans (2tbsp/50 beans) • 35g tofu • 10g (2tsps) soya nuts • 20g marinated soya pieces • 50g fresh or frozen soya beans (Edamame) • 1 soya mince/tofu sausage or ½ burger 	<p>Substitute soya alternatives to dairy (e.g. milk, yoghurt) where you would usually have animal products. Use soya beans as an extra vegetable in salads and casseroles</p> <p>Soya yoghurt and desserts are delicious as snacks.</p> <p>Substitute soya mince for ordinary mince and try recipes and stir fries that include tempeh and tofu.</p>

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Food type	Mechanism	Daily Target	Provided by	Dietary ideas
Plant sterols/ stanols	Interfere with biliary and dietary cholesterol absorption from the gut.	2g per day	<ul style="list-style-type: none"> • 1 mini yogurt drink OR • 3 daily servings of products fortified with sterols/stanols. One serving is: <ul style="list-style-type: none"> ○ 2 tsp spreads ○ 1 (125g) pot yoghurt ○ 1 (250ml) glass dairy sterol fortified milk or sterol fortified soya milk alternative 	Ideally include one of your three portions at each meal or take a fortified mini yoghurt drink with your main meal of the day.
Soluble Fibre	The high viscosity of soluble fibre interferes with biliary and dietary cholesterol gut absorption	15-20g per day made up of: <ul style="list-style-type: none"> • 3g beta-glucan • 1-3 servings of whole grains • 1 serving of beans / pulses • Fruit & Veg 	1) 1-3 servings of beta-glucan rich foods: <ul style="list-style-type: none"> • 30-45g oat based cereals • 20g rolled oats • 15g oat bran • 2 oatcakes • 2 slices of a 50% oat flour bread 2) 1-3 whole grain servings – one serving = <ul style="list-style-type: none"> • Small bowl whole grain breakfast cereal • 2 rye crispbreads/oatcakes • 1 slice wholemeal bread/roll • 2 tablespoons brown rice • 3 tablespoons cooked whole wheat pasta • 2-3 handfuls popped corn 3) 100g portion of beans/lentils 4) At least 5 servings of fruit and vegetables – preferably more than 7	Fruit & Vegetables high in soluble fibre include: Okra Aubergines Carrots Avocados Peaches Cabbage Sweet potato Dried figs Oranges
Nuts	Nuts, in particular almonds with their positive nutrient profile of mono-unsaturated fat, fibre and flavonoids, have been shown to lower cholesterol levels	~30g / a handful	Either: <ul style="list-style-type: none"> • A handful (approx 23 or 28-30g) of almonds or other tree nuts such as pecans, walnuts OR • 2 tablespoons of almond 	Use as a snack, in cooking (desserts, stir fries, rice dishes) or try almond butter in recipes, on toast and in sandwiches.

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Who is it for?

Whilst this portfolio regime is much more practical and achievable than the original diet those most likely to succeed will:

- Be highly motivated
- Have reasonable culinary skills
- Enjoy a range of foods including vegetarian
- Be intolerant to or determined not to start statins
- Be motivated to keep their statin dose low
- Be dissatisfied with their cholesterol level or not achieving target cholesterol levels from medication alone

How to introduce the portfolio diet?

Although possible to introduce the diet all at once this may be too big a stretch for many so a step by step approach allowing at least one week to consolidate any change between stages is suggested (see table 2). Patients can take a food by food approach or a meal by meal approach, whichever appeals most. It is important that the first stage is to ensure compliance with a low saturated fat diet, other stages can be incorporated in any order. Ideally patients should agree targets, timelines and review dates in advance. Patients often benefit from the use of a food and reflective diary. Lapses in diet usually result in key learnings which can help sustain further change.

Table 2: Suggested steps when introducing the portfolio diet to patients

1	Ensure diet low in saturated fat	<ul style="list-style-type: none">• Avoid butter, lard, ghee, hard margarine• Avoid biscuits, cakes, pastries, rich puddings, pies• Avoid full fat dairy foods such as cheese, cream• Avoid fatty and processed meats• Check packaging and avoid foods containing more than 5g per 100g/portion and limit foods containing between 1.5g and 5g saturated fat per 100g/portion
2	Reduce animal protein and replace with soya and other vegetarian proteins	<ul style="list-style-type: none">• Replace dairy milk with soya milk (calcium fortified)• Replace dairy yoghurts and milk-based desserts with soya alternatives• Reduce meat, replace with vegetable proteins (soya, nuts, pulses)
3	Plant sterols	<ul style="list-style-type: none">• Incorporate plant sterol products of choice to provide 2g per day
4	Nuts	<ul style="list-style-type: none">• Replace snacks with almonds, pecans or walnuts.• Use on tops of cereals, desserts and savoury dishes• Use nut spreads on toast for breakfast or a snack
5	Soluble fibres	<ul style="list-style-type: none">• Ensure oat /oat-based foods are eaten daily• Include one pulse per day• Ensure vegetable, salad or fruit intake at each meal• Use dried, fresh, frozen and canned fruits and vegetables.
6	Monitor diet and experiment with new recipes	<ul style="list-style-type: none">• Maintain food diary• Reflect on changes made and problems encountered• Plan for social activities and celebrations• Establish good habits• Check cholesterol levels initially 3 monthly, then annually

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Starter Menu – include daily

- 250ml soya milk and 1 soya yoghurt and 1 soya dessert (ideally calcium fortified) OR a handful of soya nuts OR 200ml flavoured soya shake + soy meat alternative (e.g. soya/tofu burger)
- 1 plant sterol mini drink
- 30g nuts
- 5 portions fruit and vegetables and once the patient adopts this practice, aim to gradually increase to at least 7 portions and for the highly motivated – up to 10 portions.

Table 3: Sample menu plans

Breakfast	Lunch	Evening meal
<p>Fruit smoothie – made with 2 servings of fruit and soya milk.</p> <p>Oat based cereal (e.g. muesli, oat cereal biscuits) topped with flaked almonds and soya milk</p>	<p>Sandwich made from oat bread, with houmous and salad</p> <p>Orange / apple Soya fruit yogurt alternative</p>	<p>Plant sterol mini drink</p> <p>Stir fry using oily based fish and fresh/frozen soya beans (Edamame) and sprinkled with flaked almonds</p> <p>Stewed fruit with soya custard</p>
<p>Soya yoghurt with fresh fruit salad</p> <p>Oat bread with suitable spread, jam or marmalade</p>	<p>Chicken salad incorporating lentils or other pulses and served with wholemeal roll/pitta bread</p> <p>Soya fruit yoghurt with a piece of fruit</p>	<p>Plant sterol mini drink</p> <p>Chilli made from 50:50 lean minced beef and soya mince served with brown rice topped with natural soya yoghurt</p>
<p>Scrambled eggs made with soya milk, served on oat bread toast with grilled tomatoes and poached mushrooms</p> <p>Fruit juice</p>	<p>Carrot and Lentil soup</p> <p>Rye or pumpernickel bread</p> <p>Soya yogurt with fruit</p>	<p>Plant sterol mini drink</p> <p>Stuffed peppers with brown rice and dried fruit, nuts such as almonds, pecans or walnuts</p> <p>Baked stuffed apples with soya custard</p>
<p>Orange and grapefruit segments</p> <p>Porridge made with soya milk</p>	<p>Baked beans on oat bread toast</p> <p>Banana and soya dessert</p>	<p>Plant sterol mini drink</p> <p>Grilled salmon, new potatoes, peas and frozen/fresh soya beans (Edamame)</p> <p>Stewed fruit and soya yoghurt</p>

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Suggested snacks

- Soya yoghurt mixed with dried fruit, toasted nuts
- Nut and dried fruit mix
- Toasted oat bread with nut butter
- Hummus with vegetable sticks
- Handful of soya nuts
- Fresh fruit
- Bowl of instant oats made with soya milk
- Oat cakes or oat biscuits spread with soya cheese or other suitable spread

Case Studies

Mrs J

Background: Despite a reasonably healthy diet Mrs J had raised cholesterol probably because of multiple genetic influences. At age 47 she was reluctant to consider medication but concerned enough to want to change the way she ate.

Implementing change: She already had a diet low in saturated fat, consumed soya milk, ate an oat based cereal and 5 or more portions of fruit and vegetables on most days of the week. The main changes she felt she could make were to introduce nuts regularly as a snack and to include plant sterols and other sources of soya and vegetable protein in the diet.

Outcome: After 3 weeks Mrs J repeated her cholesterol test to find that modest further dietary change had reduced her cholesterol by a further 10%. Completing a food diary initially helped to remind her to eat differently and helped consolidate behaviour change. The most difficult change was to alter her evening meal due to the dietary preferences of other members of the family.

Mrs B

Background: Mrs B, had a BMI over 35 and was taking medication that increased her cholesterol levels putting her at high risk of cardiovascular disease, but she was unable to take statins. Happily she was already committed to a healthy eating pattern and eating nuts, fruit and vegetables was her dietary heaven and her partner was happy too.

Implementing change: Once established on the portfolio plan she started the day with a smoothie made from 200g of tofu and soya milk, 2-3 fruits and half a cup of oat bran. This often sustained her until early afternoon. Her next meal (lunch) was an open sandwich with a slice of pumpnickel, salad, Quark or mackerel and/or beans. Her evening meal was often a stir fry with tofu and vegetables in a pasta sauce, followed by fruit with or without an oat pancake or soya custard. She had almonds, soya yoghurts and chocolate desserts for quick snacks.

Outcome: After 10 weeks on the portfolio diet Mrs B's cholesterol levels were down by 16%, her LDL cholesterol down by 20% and her weight reduced by 3.5 kg. Her total:HDL cholesterol ratio improved from 5.6 to 4.7, a 16% drop, indicating a significant reduction in risk. Mrs B still had elevated LDL cholesterol levels and was hopeful of further cholesterol reductions over time with further weight reduction and increasing physical activity.

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The future

Whilst the uptake of the portfolio diet is relatively low in the UK, there is significant potential for growth. An increasing range of oat and soya foods now make it easier to increase intakes of soluble fibre and vegetable protein. Patients often ask for recipes and snack ideas to start them off. Happily once established on the portfolio diet, those motivated to cook are seldom stuck for recipe ideas. The diet is very filling and so can help facilitate weight loss as part of an overall dietary approach to managing cholesterol. Jenkins included psyllium as a source of soluble fibre in his research. An opportunity exists to increase psyllium's availability in the UK but for now it is limited to specialist health foods where it is usually marketed as a constipation remedy.

References

- 1) Jenkins DJA, Kendall CWC, Faulkner D et al
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- 2) Jenkins DJA, Kendall CWC, Faulkner D et al
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Further information

For more information about reducing cholesterol contact HEART UK – The Cholesterol Charity on 0845 450 5988, ask@heartuk.org.uk or visit www.heartuk.org.uk.