

# What's Good To Eat?

## Cholesterol-Lowering Foods



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Faced with the success of clinical trials, in 2004 an update was issued by the Adult Treatment Panel III of the National Cholesterol Education Program in the US recommending that a further reduction in LDL-cholesterol (C) should be the goal for those at high risk for coronary heart disease (CHD).<sup>1</sup> The target LDL-C was lowered from < 100 mg/dl or 2.5 mmol/L to < 70 mg/dl or < 1.8 mmol/L. It is likely that the targets for intermediate and low CHD risk will also move downwards. LDL-C levels of < 70 mg/dl or < 1.8 mmol/L are the levels seen in rodents in which it is very difficult to induce arteriosclerosis. This irony poses the question as to whether the human diet has departed so far from its origins that the majority of middle-aged men and post-menopausal women will have to take medications to deal with the results of their over consumption of cholesterol-raising foods combined with a sedentary lifestyle.<sup>2</sup>

With this dilemma in mind, we created a series of diets:

- A very low saturated fat diet
- A neolithic type of diet high in starchy foods and representative of early agriculture 10,000 years ago
- A primitive ancestral diet very high in fruit, vegetables and nuts which might have been consumed in the late myocene epoch, 5.5 million-years-ago<sup>3</sup>

Our reasoning was that if we put healthy modern humans on such a diet, we could determine the rise in serum cholesterol over human dietary evolution. Therefore, we carried out a three phase study with subjects taking the National Cholesterol Education Program Adult

Treatment Panel III step 2 diet, a Neolithic or high cereal and legume-based diet with low fat dairy or a myocene diet composed entirely of fruit, vegetables and nuts.

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### Diet Results

The myocene diet resulted in 35% LDL-C reductions compared to 25% on the neolithic and 10% on the step 2 diet.<sup>3</sup> The myocene diet had high levels of components, which ironically, the US FDA now recognizes as cholesterol lowering components for which a CHD risk reduction health claim is permitted. The diet components with cholesterol-lowering ability included plant sterols, vegetable proteins, fiber and nuts.

We further reasoned that since the volume (approximately 5.5 kg q.d.) of the myocene diet made it difficult to consume in a reasonable amount of time, it would be important to determine if the same effect could be achieved using soy foods and dried legumes as the vegetable protein source; oat bran, barley, psyllium *etc.*, as the viscous fiber source; a plant sterol enrich margarine; and almonds as the nut. Using these

**Table 1**

**One day menu plan for dietary portfolio for a 2,000 kCal diet**

Breakfast	Lunch	Dinner	Snack
Hot oat bran cereal	<b>Soup:</b> Thick lentil soup	<b>Entrée: Tofu Bake with Ratatouille</b>	Orange
Brown sugar and psyllium	<b>Sandwich:</b> Soy hot dog	Firm tofu	Soy milk
Strawberries	Oat bran bread	Egg plant	Psyllium
Soy Milk	Sterol margarine	Onions	
Oat bran bread	Lettuce	Sweet peppers	
Sterol margarine	Pearled barley	Side dish:	
Double fruit jam	cucumber	Vegetables: <i>e.g.</i> , brocolli/cauliflower	
Lettuce	<b>Dessert:</b> Almonds	<b>Dessert:</b>	
	Soy milk	Almonds	
	Apple	Soy milk	
		Psyllium	
		Pear	

ingredients, a diet with a reasonable daily volume could be constructed (Table 1).

This diet combination would be predicted to lower LDL-C by 30%, assuming a 5% reduction for each of the four main components and a further 10% reduction for the low saturated fat and dietary cholesterol nature of the diet.<sup>4,5</sup> Comparison of this combination diet or dietary portfolio with a step 2 diet or a step 2 diet plus 20 mg of lovastatin demonstrated a 28% reduction in LDL-C on the dietary portfolio, a 10% LDL-C reduction on the step 2 diet and a 33% LDL-C reduction on the step 2-diet plus lovastatin.<sup>4</sup> In addition, both the dietary portfolio and step-2 statin diets reduced C-reactive protein (CRP) as an emerging risk factor for CHD.<sup>6,7</sup>

We have since followed participants in a longer term free-living study (*e.g.*, where no food was provided) and found that about one-third of motivated individuals can achieve and maintain a LDL-C reduction similar to first generation statins, one third can achieve approximately 15% LDL-C reduction and a further one-third show no improvement.<sup>8</sup> Benefits were also seen in terms of blood pressure reductions which were similar to those seen on the Dietary

Approaches to Stop Hypertension diet (DASH).<sup>9</sup>

Therefore, we believe that there is an option for those not at high risk, who for various reasons, would prefer to give diet a serious trial or have marked elevations in muscle or liver enzymes, or severe muscle pain on statins. For these individuals, the dietary portfolio approach may help to reduce blood lipids to acceptable levels. It is also possible that use of the dietary portfolio as the background diet may allow lower levels of statins to be used in combination with diet, while avoiding excessive rises in serum enzymes or muscle pain, and still achieving new target LDL-C goals. Dieting is certainly not for everyone, but with identification of more cholesterol-lowering foods and innovation from the food industry, cholesterol control through diet may be achieved by an increasing number of individuals.

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