

## Original Article

# The Garden of Eden: Implications for cardiovascular disease prevention

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Creationists and evolutionists acknowledge that the human diet has passed through at least four phases. The original plant food-based diet; a second phase of increasing meat consumption; a third phase of agricultural dependence on starchy foods; and, finally, the supermarket high-saturated fat, low-fibre phase with minimal energy expenditure. Our aim is to define the value of the original or 'Garden of Eden' diet and to speculate on which components should be retained in the modern supermarket diet. The original plant-based diet would have been high in vegetable proteins, plant sterols, dietary fibre and antioxidants, and low in saturated fats with no trans fatty acids. This diet would increase fecal cholesterol losses from the body as bile acids and neutral sterols, while providing little stimulus to cholesterol synthesis. To replace the bile acid losses we would have adapted to a relatively high capacity for cholesterol synthesis. Now, in the high-saturated fat, low-fibre supermarket age, this may be a disadvantage and predisposes consumers to high serum cholesterol and increased risk of cardiovascular disease. We believe part of the solution is a return to the plant-based 'Garden of Eden' diet combined with physical activity. A lipid-lowering portfolio containing vegetable proteins, especially soy, plant sterols and high fibre intakes combined with low saturated and trans fatty acids and cholesterol, would go a long way to reducing serum lipids and coronary heart disease risk seen in the modern Western diet.

**Key words:** diet portfolio, evolution, functional food.

## Introduction

There is one exhibit at the Ontario Science Centre in Toronto, Canada that shocks and depresses many visitors. It is a monolith showing the phenomenally rapid growth of the human population at 180 humans every minute adding to the already vast number of 6 billion. At the same time, the loss of one species of a total of only 15 million is shown to occur approximately every 15 min. Thus, one species is lost for every 2700 humans added to the planet. These numbers are difficult to verify but the association between human population explosion and rapid species extinction is alarming. It implies that human pressures may be the cause of species loss (Table 1).

Of the human activities responsible, feeding behaviour is likely to be foremost.

In looking to the future, we suggest that it might be helpful to examine past diets in which we were capable of thriving and to select the most sustainable diet and associated agricultural practices that are compatible with good health, which one might term 'econutrition'.

Creationists and evolutionists will acknowledge that the human diet has passed at least four phases. The original diet was high in plant foods,<sup>1–5</sup> including leafy vegetables, shoots, roots, seeds, berries, fruits and nuts. A second phase

of hunting resulted in increased meat and fish consumption.<sup>6–10</sup> This was followed by a third phase of agricultural dependence on starchy foods, cereals and legumes.<sup>11,12</sup> Finally, we entered the standard 'supermarket' phase of excess consumption of highly processed foods that are rich in salt, sugar and saturated fat, against a background of minimal energy expenditure.

The aim of the present paper is to define those aspects of the original 'Garden of Eden' diet, which might be usefully introduced into our modern supermarket diet. This original diet would have been plant based, high in vegetable proteins, plant sterols, dietary fibre and antioxidants, and low in saturated fats with virtually no trans fatty acids.

## 'Garden of Eden' diet

What creationists might term the 'Garden of Eden' diet is likely to have been eaten up until the end of what evolutionists call the Pleistocene. Lack of knowledge of the biblical sense of 'good' and 'evil' presumably also meant a lack of incentive to make fire or fashion stone or metal implements. It is speculated that diets would have been eaten raw and, consequently, starch would be largely absent from the diet.<sup>6,8,9,12</sup>

**Table 1.** Human 'success' story

	Humans	Other Species
Current numbers	6 billion (rising)	15 million (decreasing)
Change per minute	Gain : 2700	Loss : 1

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In order to determine the effect of such diets on contemporary humans, on two occasions we fed 10 healthy men and women a diet high in leafy vegetables: cabbage, Brussels sprouts, leeks and so on, and other yellow and green low calorie vegetables and pods. They were also given nuts and avocado and a range of temperate and tropical fruits.<sup>13</sup> The diet was fed for 14 days and might require as much as 5 kg of food to be eaten daily to maintain caloric balance. The diet provided large amounts of vegetable protein, plant sterols and soluble fibre, while being very low in saturated fat with zero cholesterol. The results on serum lipids were dramatic with over 30% reduction in low-density lipoprotein (LDL) cholesterol within 2 weeks and a significant decrease in the ratio of LDL to high-density lipoprotein (HDL).<sup>13</sup> Falls were also seen in the atherogenic lipoprotein Lp(a), which is not usually observed in dietary studies.<sup>13</sup> Three-fold increases in bile acid losses were seen in a subsequent study together with increases in fecal cholesterol, signifying that the dramatic fall in cholesterol was a result of a large loss of fecal cholesterol and bile acids. This in turn was likely to be secondary to very high plant sterol and soluble fibre intakes.

#### Palaeolithic diet

After expulsion from a tropical rain forest or 'Garden of Eden' into a more arid savanna, different dietary habits were adopted. However, even with the development of sophisticated stone implements, such as the Mousterian hand axe (possibly 150–100 000 years ago) or the Acheulian chopper (75–50 000 years ago), there is little evidence that these tools would have contributed to effective hunting.<sup>14,15</sup> Nevertheless, in the period evolutionists term Palaeolithic and especially late Palaeolithic, very effective flint knives and hunting instruments had been created and it is likely that meat intake was high.<sup>6–10,15</sup> Indeed the effectiveness of hunting and the subsequent loss of readily available ungulates for prey may have precipitated the agricultural revolution in order to provide a secure and predictable local supply of foods.

#### Neolithic diet

This more recent epoch, the Neolithic, corresponded to the large-scale introduction of starchy foods to the human diet for the first time.<sup>11,12</sup>

To test the effect of such a Neolithic diet we again fed 10 healthy subjects a diet of starchy foods as unrefined cereals and legumes, along with dairy produce, olives, dried fruit, fresh fruit and vegetables. Low-density lipoprotein cholesterol showed impressive falls of over 20% but the reduction of the LDL : HDL ratio did not reach significance. This diet was uniformly popular with the volunteers and had many of the elements of Ancel Keys' Mediterranean diet.<sup>16</sup> This diet was in turn compared with a low fibre National Education Program Step 2 Diet (NCEP Step 2 Diet),<sup>17</sup> which in this group of subjects, resulted in only small reductions of LDL cholesterol.

Therefore it appears that up to the present time humans are likely to have maintained relatively low serum cholesterol levels.

#### Contemporary supermarket diet

From the 'Garden of Eden' diet study it also appears that we were designed to be able to replace large daily fecal losses of

**Table 2.** A portfolio of dietary factors for cholesterol reduction

Dietary component	Dietary changes	Approximate LDL reduction (%)
Saturated fat*	< 7% of calories	10
Dietary cholesterol	< 200 mg/d	5
Bodyweight	Lose 10 lb (5 kg)	5
Viscous fibre	5–10 g/d	5
Soy protein	25 g/d	5
Plant sterols†	1–3 g/d	5
Total	Full portfolio‡	35

\*Reduce trans fatty acid as close to zero as possible.

†Depending on the sterol or stanol.

‡Assuming the effects are additive.

LDL, low-density lipoprotein.

cholesterol and bile acids. These losses would have been induced by soluble fibre and plant sterols in diets that provided few building blocks for cholesterol synthesis; for example, saturated or trans fatty acids.<sup>17,18</sup> In stark contrast to previous diets, the contemporary supermarket diet has changed the situation drastically. Our diets are now rich in saturated fats and dietary cholesterol and low in plant sterols and dietary fibre, especially the viscous sources of soluble fibre that are effective in reducing serum cholesterol. For these reasons we have seen a dramatic increase in the use of cholesterol-lowering agents as shown by the exponential rise in prescriptions in Britain since the introduction of the user-friendly statins as drugs of choice in the 1980s. In fact it is now said that over 25% of middle-aged men in Western nations should be taking a lipid-lowering drug<sup>19</sup> (plus aspirin, plus or minus vitamin E and selenium, folate, etc.).

#### Diet portfolio

Possibly a better way forward, nutritionally and environmentally, is to retrace our steps. Although the original diet of humans would not be considered compatible with today's lifestyles, the 'Garden of Eden' diet may still provide valuable components for today's healthy nutrition. One can envisage a dietary portfolio for the reduction of cardiovascular risk that might rival a low-dose statin.<sup>20</sup> It would be made up of a number of factors, including a diet low in saturated fat and dietary cholesterol leading to a reduction in bodyweight for the many people in middle and later life who, through inactivity, have seen their weight creep up slowly. It would also contain active plant food components such as viscous fibers, vegetable proteins and associated substances, and plant sterols in natural food or functional food supplements. Together, if these factors are additive, and the reduction of LDL cholesterol by following the 'Garden of Eden' diet suggests that they may be, then they could provide a better than 25% reduction in serum cholesterol along with other benefits for cardiovascular disease risk reduction (Table 2).<sup>20</sup> This degree of cholesterol lowering would be similar to that achieved by the cholesterol-lowering drugs of which over 25% of middle-aged men in Western nations might be advised to take.

Therefore, a possible answer to present problems may lie in examining our past and building a future that is compatible with both human and environmental health through, what can be termed as, 'econutrition'.

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