

An 'EGG'aggerated concern? Separating the cholesterol from the egg

Dr Juliet Gray

Evidence shows dietary cholesterol from eggs and other foods such as prawns only have small, clinically insignificant effects on blood cholesterol in most people. Dr Juliet Gray, Registered Public Health Nutritionist explores the common misconception 'eggs are bad for your heart' and how to advise patients on including eggs as part of a healthy balanced diet.

Despite public health bodies such as the British Heart Foundation no longer recommending limits, restriction on egg consumption prevails. A rich source of protein, eggs also contain a wide range of essential micronutrients, are relatively low in calories and are inexpensive, versatile and easy to cook for all age groups.

How many eggs are we eating?

Average weekly egg consumption has been steady and relatively low for many years, having fallen to approximately half what it was in the 1950s by the 1980s. Data from the National Diet and Nutrition Survey indicate that average weekly consumption is about two to three for adults, with slightly lower intakes for women relative to men, and less than two a week for children^{1,2,3}. This represents only 2-3% of average daily protein intake and 1-2% of average daily energy intake³.

The myth

The association between raised blood low density lipoprotein (LDL)-cholesterol levels (so-called 'bad' cholesterol) and risk of coronary heart disease (CHD) is well-established. Confusion about the relationship between *dietary* cholesterol and CHD mainly arises from the erroneous belief that cholesterol in food is converted directly into cholesterol in the body. This is partly because early feeding studies used animal models and unphysiologically high quantities of cholesterol-rich foods such as butter; importantly these regimens were also very rich in saturated fatty acids (SFA)⁴. As cholesterol was a key component of the vascular lesions developing in these animals, the studies concluded that dietary cholesterol must be central to the aetiology of atherosclerosis in animals and man. This now appears to be simplistic.

As eggs, or specifically egg yolk, represent a rich source of dietary cholesterol (between 150-250 mg, depending on size), subsequent human studies in the 1970s and 80s used eggs in large numbers to load subjects with dietary cholesterol. It is now acknowledged that these studies were confounded by various factors and specifically by the high SFA levels in the background diet^{5,6}.

Reviewing the evidence

More rigorously controlled egg feeding studies in the 1990s used background diets low in both total fat and SFA. In reviewing these studies Lee and Griffin⁷ concluded that although dietary cholesterol can increase serum LDL-

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cholesterol, the effect is small and extremely variable between individuals; most importantly, it has no clinically significant impact on CHD risk.

In contrast, the effects of SFA on raising LDL-cholesterol and increasing CHD risk are well-established. Interestingly, Barraij and colleagues⁸, using a risk apportionment model, demonstrated that eating one egg daily accounted for less than 1% CHD risk, whereas a 40% risk could be attributed to smoking, poor diet, minimal exercise and high alcohol intake.

Common misconception	Why it is wrong
Eggs increase blood cholesterol	Although eggs contain cholesterol, it is the saturated fats in food that have the greatest effect on blood cholesterol levels
Eggs are high in saturated fat	An average medium size egg contains about 1.7g saturated fat, less than 12% of the GDA (guideline daily amount)
Eggs are high in calories	An average medium size egg contains just under 80 calories
Eggs are 'binding'	There is no evidence that eggs cause constipation, especially if they are consumed with plenty of vegetables, salads and wholegrain foods that are rich in fibre.

Public health advice

As a result of this revised thinking, limits on egg consumption are no longer stipulated in UK public health advice on healthy diets and CHD prevention, issued by bodies such as the Food Standards Agency (or Department of Health since the change in government) and the British Heart Foundation; the emphasis is on controlling SFA consumption^{9,10}. However, individuals with familial hypercholesterolaemia, who have a greatly increased risk of premature CHD, are still advised to restrict intake to three to four eggs per week¹¹.

Dietary and lifestyle modifications to lower blood cholesterol levels

Reduction in blood cholesterol levels is a key focus of strategies to prevent CHD in high risk individuals, as reflected in current NICE guidance¹² and in public health advice^{13,14}. The key dietary target for blood cholesterol lowering remains SFA reduction, but other dietary and lifestyle approaches are also important (Table 1). SFA should represent no more than 10% of total dietary energy (including alcohol); ie 11% food energy. Total fat intake should also be reduced. Main sources of SFA in the UK (Table 2) should be replaced by small quantities of products containing fats and oils rich in monounsaturates (olive and rapeseed oils) and n-6 polyunsaturates (soya, sunflower, corn oils), which reduce LDL-cholesterol and also slightly raise high density lipoprotein (HDL) – cholesterol (good cholesterol)¹⁵.

Trans fatty acids (TFA; 'trans fats'), unsaturated fatty acids with a double bond in the 'trans' rather than 'cis' position, have a similar LDL-cholesterol-raising effect to SFA. Most TFA occur as a result of partial hydrogenation of fats in

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processing; small amounts occur naturally in meat and dairy products from ruminant animals (Table 2). Average UK TFA intakes are about half the recommended maximum of 2% food energy and much lower than in the US, largely due to reformulation of products by the food industry¹⁶. However, those consuming large amounts of some types of fried and baked products may have undesirably high TFA intakes.

Table 1: Dietary and lifestyle approaches for cholesterol lowering and CHD prevention in adults

Follow a cardioprotective diet

- Reduce total fat intake
- Reduce saturated fat intake
- Replace saturated fats with small amounts of fats and oils rich in monounsaturated and polyunsaturated fats
- Eat 2 portions of fish per week, including 1 (140g) portion of oily fish
- Eat at least 5 x 80g portions of fruit and vegetables each day
- Eat more whole grain products (e.g. wholegrain breakfast cereals, porridge, wholemeal / multigrain seeded breads, wholewheat pasta, brown rice, oatcakes)
- Eat less salt and salty foods

Become more physically active

- Take 30 minutes of at least moderate intensity exercise a day at least 5 days a week – this can be in bouts of 10 minutes or more throughout the day
- Incorporate more exercise into everyday life, such as brisk walking, using stairs rather than lifts and escalators, housework and gardening

Maintain a healthy weight

- Eat large portions of vegetables and salads to fill up
- Choose lower fat, lower sugar foods and beverages
- Watch portion size
- Be physically active

Avoid excessive alcohol consumption

- Keep within recommended safe limits (weekly: women -14 units, men- 21 units)

Don't smoke

Nutritional overview

Eggs are nutrient-dense providing a rich source of good quality protein and a variety of essential vitamins, minerals and trace elements (Table 3). Rich in vitamin B12, riboflavin and iodine and a source of vitamin A, folate and selenium, they are also one of the few dietary sources of vitamin D¹⁷. Eggs also contain choline, an important component of all cells, where it provides methyl groups for intermediary metabolism. Despite no current UK RNI for choline (with associated health benefits not fully understood), it is involved in foetal brain development so thought to be important for women of reproductive age¹⁸.

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Table 2: Sources of saturated fat and trans fat

Saturated fat

- 'Hard' or 'solid' fats, such as butter, lard, ghee and some 'hard' margarines
- Fatty cuts of meat and some mince
- Fatty processed meats such as sausages, salami, burgers
- Full fat dairy products, such as cheeses, cream, sour cream and full fat milk
- Pies, pastries, biscuits, cakes and some snack foods
- Ice cream
- Some sweets and chocolate

Trans fat (products that may contain partially hydrogenated oils; often labelled as 'hydrogenated' oils)¹

- Biscuits, cakes and pastries
- Meat pies and pasties; fatty meats²
- Hard block margarines; butter²
- Some fried potato and other snack products
- Some fried 'fast foods'

¹Not all above products are high in trans fats, due to substantial reformulation in the UK in recent years.

²Meat and dairy products from ruminants contain low levels of naturally occurring trans fats

Table 3: Nutritional composition of raw hens' eggs

	per 100g	per medium egg (~ 58g)
Energy (kJ/kcal)	627/151	324/78
Protein (g)	12.5	6.5
Carbohydrate (g)	Trace	trace
Fat (g)	11.2	5.8
Saturated fatty acids (g)	3.2	1.7
Monounsaturated fatty acids (g)	4.4	2.3
Polyunsaturated fatty acids (g)	1.7	0.9
Cholesterol (mg)	391	227
Retinol (µg)	190	98
Vitamin D (ug)	1.3	0.9
Riboflavin (mg)	0.47	0.24
Folate (µg)	50	26
Vitamin B12 (µg)	1.8	1.3
Phosphorus (mg)	200	103
Iron (mg)	1.9	1.0
Zinc (mg)	1.3	0.7
Iodine (mg)	53	27
Selenium (µg)	11	6
Choline ¹ (mg)	250	145

Source: FSA (2002)¹⁹, ¹USDA (2008)²⁰

Weight management

A medium sized egg provides about 80kcal and 6.5g protein. Neither high in fat nor SFA, about 40% of the total fat is derived from monounsaturated fatty acids (Table 3). With the rising tide of obesity worldwide and specifically in the UK, there is much scientific interest in 'satiety' – the feeling of fullness that persists after eating – in weight control. Both energy density (the amount of energy/calories per gram) and protein content of a food or meal are seen as

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key factors in contributing to greater satiety²¹. As well as being high in protein, eggs have a low energy density²² making them a useful food for weight control. Emerging evidence suggests that eggs may contribute to increased satiety and reduced energy intake^{23,24,25} and weight loss²⁶ when included as part of an energy-controlled diet.

Top tips for cutting back on fat and saturates

- Choose fish and poultry (skin removed) more often than meat
- Choose lean cuts of meat and trim off extra fat before cooking
- Buy 'extra lean' mince with the lowest (~5% fat) content
- Avoid fatty meats such as burgers and sausages
- Bake, steam, poach, grill, fry or roast in non-stick pans or just brush with a little oil
- Add bulk to sauces and stews with vegetables or pulses (beans, lentils and peas) instead of meat
- Choose lower-fat dairy products - skimmed or 1% milk and reduced fat yoghurts; reduced fat or low fat cheeses
- Use only small amounts and/or reduced fat spreads
- Avoid too many high fat foods such as fried and battered products, pies, pasties, biscuits, cakes and snack products (crisps etc)
- Avocados and nuts are rich in unsaturates but high in total fat
- Remember to check food labels for fat content

Conclusion

Confusion arising from early studies has resulted in persistent concerns about the effects of egg consumption on blood cholesterol levels, despite evidence to the contrary from later, more robust, investigations. Health care professionals can reassure concerned patients about the positive health benefits of eggs, as well as advising on managing blood cholesterol levels by reducing saturated fat intake and other lifestyle measures.

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