

## Eggs

Eggs have been part of the human diet since before recorded history. As a symbol of life, eggs have played various roles not only in the diet but also in many ceremonial aspects of culture. Eggs provide high-quality protein, virtually every essential nutrient but vitamin C, and a number of functional nutrients. Eggs also contain cholesterol, which for the later part of the twentieth century was viewed as a health risk and eggs were singled out as a food to be restricted in the diet. Today eggs are recognized not for their cholesterol content--which has been shown not to be an independent predictor of high blood cholesterol levels or of heart disease risk--but rather for the totality of their numerous contributions to nutrition and health as a nutrient-rich source of high-quality protein and essential nutrients.

### Eggs and Heart Disease Risk

Egg intake--both across and within populations--has not been associated with plasma cholesterol levels. Evidence from epidemiological surveys has shown that across cultures, per capita egg consumption is not related to heart disease incidence and that there is no difference in relative heart disease risk between individuals consuming one egg a week and those consuming one egg a day. Clinical intervention trials have demonstrated that adding eggs to the diet can have a modest effect on plasma cholesterol levels in some individuals, resulting in an increase in both the atherogenic low density lipoprotein (LDL) and the anti-atherogenic high density lipoprotein (HDL); however, there is no measurable change in the LDL:HDL ratio, which is a major determinant of heart disease risk. These findings are independent of age, gender and plasma lipid status. The evidence to date indicates that egg intake is not independently related to heart disease risk, which has resulted in most countries not including a dietary cholesterol restriction in their dietary guidelines. In Canada and Australia, eggs carry the Heart Check® and the Tick® symbols of the Heart and Stroke Foundation of Canada and the National Heart Foundation of Australia, respectively.

### Eggs and Health

Eggs are classified as a nutrient dense food based on their relative contribution of essential nutrients versus their contribution of calories. Two large eggs provide 150 kcal which is 7.5% of a 2,000 kcal diet yet provide a variety of essential nutrients in percentages of the requirements greater than the caloric contribution (Table 1). Eggs are an especially valuable source of choline, riboflavin, selenium, and high quality complete protein with a high content of essential amino acids.

High-quality animal proteins--which provide all nine essential amino acids--have a number of important metabolic effects. These proteins enhance satiety for weight control, reduce the rate of lean tissue loss (sarcopenia) in the elderly, and help maintain muscle tissue during weight loss. Egg protein is the standard by which other protein sources are compared. The protein in an egg is found in the white and yolk in roughly a 60% to 40% ratio, respectively.

Eggs have a high satiety index. Recent research has shown that when eggs are consumed at breakfast there is a decrease in caloric intake at lunch, and similarly, that consuming eggs at breakfast as part of a hypocaloric diet results in better adherence to the diet and greater weight loss over time.

Eggs are an excellent source of choline, which was established as an essential nutrient in 1998. Choline contributes to the structural integrity of cell membranes, is a major source of methyl groups, and is vital for cell signaling, nerve impulse transmission, and lipid (fat) transport and metabolism. Studies indicate that choline plays an essential role in fetal and neonatal brain development and helps regulate inflammatory markers in the blood. Studies show that less than ten percent of the population consumes the recommended daily Adequate Intake (AI) for choline. Egg choline is found in the yolk, primarily as phosphotidylcholine (lecithin).

Lutein and zeaxanthin are two important xanthophylls found in egg yolk. When consumed, they become concentrated in the macular region of the eye, where they protect the macula from the damaging effects of ultraviolet light, reducing the risk of age-related macular degeneration. The xanthophylls in an egg have high bioavailability due to their association with the lipid soluble phospholipid matrix present in the yolk. Studies have shown that feeding one egg a day can

significantly increase macular xanthophyll levels. Egg xanthophyll levels are highly dependent upon the composition of the hen's feed.

White eggs and brown eggs have comparable nutrient compositions. While the egg white contains most of the minerals in an egg (except for potassium), the egg yolk contains the majority of nutrients--lutein, zeaxanthin, choline, 100% of the fat soluble vitamins, and 70-80% of the water soluble vitamins. The fatty acid profile of an egg is one-third saturated fat and two-thirds unsaturated fat. Nutrient-enhanced eggs are produced by the addition of various nutrients to the hens' feed resulting in eggs with increased levels of omega-3 fatty acids, vitamins D and E, folic acid, xanthophylls, iodine, and selenium. When egg allergies do occur, they are usually for egg white proteins.

Eggs are an affordable source of high-quality animal protein as well as a nutrient-rich source of essential vitamins, minerals and functional components which contribute to human health. While eggs do have a high cholesterol content, research has shown that dietary cholesterol has little effect on blood cholesterol levels and heart disease risk. Inclusion of eggs in a healthy diet can benefit eye health, promote healthy aging, and help address the inadequate intake of choline in the population. Restricting eggs in the diet has no known health benefit but could contribute to a number of negative health consequences.

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### **Further Readings**

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## **Websites**

Egg Nutrition Center <http://www.enc-online.org>

Egg Nutrition Advisory Group of Australian Egg Corporation Limited  
<http://www.enag.org.au/index.asp>

International Egg Commission Think! Eggs <http://www.thinkegg.com/>