

Eggs revisited: Nutritious and safe to eat

01 May 2011

Eggs are a rich source of protein and several essential nutrients. Emerging evidence suggests that eating eggs is associated with improved diet quality and greater sense of fullness after meals, and may be associated with better weight management. In addition, substances found in egg yolk may help to prevent age-related loss of sight. Recent farm improvements have raised standards in the safety of eggs, with reductions in Salmonella contamination seen in many parts of Europe.

Little impact on blood cholesterol

In the past, there were concerns that consuming eggs and other cholesterol-rich foods could raise blood cholesterol levels, thereby increasing the risk of heart disease. However, dietary cholesterol in most cases does not influence blood cholesterol levels as much as the amount and type of fat eaten, except in some people who are sensitive to high cholesterol intakes. Current evidence suggests that egg consumption as part of a healthy balanced diet will not significantly increase blood cholesterol levels in the majority of people. Studies looking at dietary causes of heart disease have found no link with regular egg consumption (up to six eggs per week), even in people with pre-existing high cholesterol levels.^{1,2}

Other health aspects

High protein foods are known to boost satiety (the feeling of fullness experienced after eating) and this had led scientists to investigate whether eggs have a role in satiety and weight management. Two controlled trials reported that eating eggs for breakfast can promote feelings of satiety and lower daily calorie intake.^{3,4} One study found that eating eggs for breakfast at least 5 days/week for eight weeks enhanced weight loss in subjects that had overweight on a reduced-calorie diet compared to an energy-matched bagel breakfast.⁵

The carotenoids lutein and zeaxanthin, found in large amounts in egg yolk, are believed to help cut the risk of age-related macular degeneration, a major cause of blindness in older people. One study revealed that eating six eggs weekly for 12 weeks raised blood zeaxanthin levels and increased the optical density of the macular pigment.⁶ A higher optical density of the macular pigment may help reduce the stress of sunlight to the eye (photostress).

An average chicken egg weighs around 60 grams and is composed of 11% shell, 58% white and 31% yolk.⁷ Egg whites are mainly water (88%) and protein (9%), whereas egg yolks are mainly water (51%), fat (31%) and protein (16%).⁷ Key nutrients found in eggs (Table 1), such as vitamin D, vitamin B₁₂, folate, and selenium have been associated with the prevention of chronic conditions, such as heart disease, raised blood pressure, cognitive decline and birth defects. A UK survey found that adults who consumed three or more eggs per week had significantly higher intakes of vitamins B₁₂, A and D, niacin (vitamin B₃), iodine, zinc and magnesium, compared with non-consumers.⁸ The relatively high vitamin D content of eggs is

noteworthy since few foods are recognised vitamin D sources. Overall, the nutrient composition of eggs can be modified through the feed provided to the chickens. This is the case, for example, with eggs with an enhanced content of docosahexaenoic acid (DHA), an omega-3 polyunsaturated fatty acid important for brain development, normal vision, heart health and certain other bodily functions.^{9,10}

Table 1 Major nutrients in raw chicken eggs⁷

	Whole egg per 100 g	Egg white (per 100 g)	Egg yolk (per 100 g)
Water (g)	75.1	88.3	51.0
Protein (g)	12.5	9.0	16.1
Fat (g)	11.2	Traces	30.5
Vitamin A (µg)	190	0	535
Vitamin D (µg)	1.8	0	4.9
Niacin equivalents (mg) ^a	3.8	2.7	4.8
Vitamin B ₁₂ (µg)	2.5	0.1	6.9
Folate (µg)	50	13	130
Selenium (µg)	11	6	20
Zinc (mg)	1.3	0.1	3.1
Iodine (µg)	53	3	140
Magnesium (mg)	12	11	15

^asum of niacin (mg) plus tryptophan (mg) divided by 60

Food safety issues

Eggs can contain Salmonella, a bacterium linked with food poisoning outbreaks. In 2008, the European Union saw 131,468 confirmed human cases of infection with Salmonella (salmonellosis) - from all sources -, which corresponds to less than 1 in 3000 individuals.¹¹ A 2007 report by the European Food Safety Authority (EFSA) collated information about Salmonella found in egg-laying farms from 23 European countries.¹² While the average figure for the detection of Salmonella species relevant to public health was 20%, figures ranged from 8% to more than 60% in major egg-producing countries. Since then, industry action, including the introduction of standards, flock vaccination, and improved poultry welfare across Europe have been instrumental in helping to bring about large reductions in Salmonella contamination.

The way that eggs are stored and used in the home also influences food safety. Traces of Salmonella can be found on egg shells, thus hand washing is essential after handling eggs to prevent any microorganisms being transferred to cooked food. However, egg shells should not be washed as they are covered by a protective layer, the cuticle or bloom, which prevents bacteria from entering through pores in the shell.¹³ If the eggs are soiled and therefore need to be washed, immediate use is recommended.¹⁴ Broken eggs and eggshells should be disposed of immediately and not retained in the same tray as unbroken eggs.

Keeping eggs refrigerated throughout the food chain reduces growth of Salmonella, but whether it further lowers the risk of human salmonellosis remains to be evaluated.¹⁵ It seems important that repeated changes in storage temperature be avoided as they might lead to water condensation on the shell, which in turn could promote bacterial growth and penetration into the egg.

Since Salmonella is killed by heat, proper cooking, i.e. a minimum temperature of 70°C in all parts of the food, further adds to eggs being safe to eat.¹⁴ For vulnerable groups, such as the frail elderly, the sick, infants, small children and pregnant women, eggs and egg dishes must always be cooked thoroughly. The World Health Organization (WHO) discourages the consumption of foods containing raw or undercooked eggs, examples of which are mayonnaise, hollandaise sauce, ice-cream or certain desserts such as mousses, particularly if prepared at home and from unpasteurised eggs.¹⁴ It is strongly advised to clean and disinfect surfaces after whisking raw egg mixtures and to ensure that uncovered ready-to-eat foods are not standing close by during whisking.

Food safety advice commonly includes using pasteurised egg products rather than raw shell eggs. Special hygiene requirements for manufacturing egg products are laid down in the respective regulation by the European Commission.¹⁶

Conclusions

Eggs can make a valuable contribution to a healthy, balanced diet in that they provide high quality protein and a number of vitamins and minerals. In Europe, measures are constantly being improved to ensure farming and processing practices result in eggs and egg-containing foods that are safe to eat. Combined with consumers adhering to a few food safety guidelines in the home, these make for a safe and nutritious addition to the menu. Overall, the negligible food safety risk posed by eggs is far outweighed by their contribution to healthy diets for all age groups.

References

1. Hu FB et al. (1999). A prospective study of egg consumption and risk of cardiovascular disease in men and women. *Journal of the American Medical Association* 281:1387-1394.
2. Song WO & Kerver JM. (2000). Nutritional contribution of eggs to American diets. *Journal of the American College of Nutrition* 19:556S-562S.
3. Vander Wal JS et al. (2005). Short-term effect of eggs on satiety in overweight and obese subjects. *Journal of the American College of Nutrition* 24:510-515.
4. Ratliff J et al. (2010). Consuming eggs for breakfast influences plasma glucose and ghrelin, while reducing energy intake during the next 24 hours in adult men. *Nutrition Research* 30(2):96-103.
5. Vander Wal JS et al. (2008). Egg breakfast enhances weight loss. *International Journal of Obesity* 32:1545-1551.
6. Wenzel AJ et al. (2006). A 12-wk egg intervention increases serum zeaxanthin and macular pigment optical density in women. *The Journal of Nutrition* 136:2568-2573.
7. Food Standards Agency (2002). McCance and Widdowson's *The Composition of Foods*, 6th summary edition. Cambridge: Royal Society of Chemistry.

8. Ruxton CHS et al. (2010). Nutritional and health benefits of consuming eggs. *Nutrition & Food Science* 40:263-279.
9. European Food Safety Authority (2010). Scientific Opinion on the substantiation of health claims related to docosahexaenoic acid (DHA) and maintenance of normal (fasting) blood concentrations of triglycerides (ID 533, 691, 3150), protection of blood lipids from oxidative damage (ID 630), contribution to the maintenance or achievement of a normal body weight (ID 629), brain, eye and nerve development (ID 627, 689, 704, 742, 3148, 3151), maintenance of normal brain function (ID 565, 626, 631, 689, 690, 704, 742, 3148, 3151), maintenance of normal vision (ID 627, 632, 743, 3149) and maintenance of normal spermatozoa motility (ID 628) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. *EFSA Journal* 2010;8(10):1734
10. European Food Safety Authority (2010). Scientific Opinion on the substantiation of health claims related to eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA), docosapentaenoic acid (DPA) and maintenance of normal cardiac function (ID 504, 506, 516, 527, 538, 703, 1128, 1317, 1324, 1325), maintenance of normal blood glucose concentrations (ID 566), maintenance of normal blood pressure (ID 506, 516, 703, 1317, 1324), maintenance of normal blood HDL-cholesterol concentrations (ID 506), maintenance of normal (fasting) blood concentrations of triglycerides (ID 506, 527, 538, 1317, 1324, 1325), maintenance of normal blood LDL-cholesterol concentrations (ID 527, 538, 1317, 1325, 4689), protection of the skin from photo-oxidative (UV-induced) damage (ID 530), improved absorption of EPA and DHA (ID 522, 523), contribution to the normal function of the immune system by decreasing the levels of eicosanoids, arachidonic acid-derived mediators and pro-inflammatory cytokines (ID 520, 2914), and “immunomodulating agent” (4690) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. *EFSA Journal* 2010;8(10):1796
11. European Food Safety Authority (2009). The Community Summary Report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in the European Union in 2008. Available at: <http://www.efsa.europa.eu/en/scdocs/scdoc/1496.htm>
12. [European Food Safety Authority \(2007\). Report of the Task Force on Zoonoses Data Collection on the Analysis of the Baseline Study on the Prevalence of Salmonella in Holdings of Laying Hen Flocks of Gallus gallus.](#)
13. Food Science. 5th revised edition. Ed. NN Potter, JH Hotchkiss. Chapman & Hall, New York, 1995.
14. WHO website, Food Safety Section. Food safety measures for eggs and foods containing eggs. Available at: <http://www.who.int/entity/foodsafety/publications/consumer/en/eggs.pdf>
15. European Food Safety Authority (2009). Special measures to reduce the risk for consumers through Salmonella in table eggs – e.g. cooling of table eggs. Scientific Opinion of the Panel on Biological Hazards. *The EFSA Journal* 957:1-29.
16. Corrigendum to Regulation (EC) No 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin. Official Journal of the European Union L 226 of 25 June 2004. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:226:0022:0082:EN:PDF>