# Egg on Your Face

## Viva!Health fact sheet on the impact of eggs on our health

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Eggs have never been an essential part of the human diet, merely an addition. There is no recommended egg intake simply because we don't need to eat any. Whilst they do contain some nutrients, the health risks far outweigh any benefit.

To reinforce this point, in correspondence between USDA (United States Department of Agriculture) and the American Egg Board, the Board was clearly instructed that eggs cannot be advertised as healthy and nutritious because of their cholesterol and fat content; they cannot be marketed as protein-rich foods either, simply because they're not (Greger, 2014). Eggs cannot be sold as safe – because they are the main source of salmonella food poisoning (in the US) and there's a risk of bird flu infection (Greger, 2014).

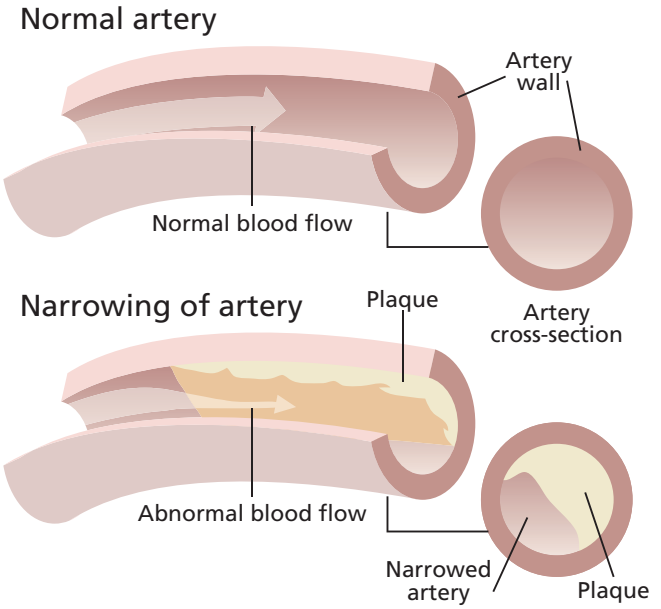
### Heart Disease

Eggs contain saturated fat and cholesterol yet the industry is very good at confusing people – even healthcare professionals – into believing that eating eggs is harmless. There are very good reasons to avoid them because they do increase your risk of heart disease.

Professor David Spence, director of Stroke Prevention & Atherosclerosis Research Centre in Ontario, Canada, warns that **eating eggs can have an effect on blood vessels similar to smoking** (Spence *et al.*, 2012). He and his team surveyed more than 1,200 patients and found that regularly eating egg yolks contributed to an increased build-up of arterial plaques (cholesterol deposits that attach themselves to artery walls and pose a serious risk factor for stroke and heart attack).

Eggs are a rich source of saturated fats which contribute to the development of heart disease. Long-term studies show that replacing saturated fats with unsaturated ones and healthy carbohydrates from wholegrains can significantly reduce the risk of heart disease (Li *et al.*, 2015; Nettleton *et al.*, 2008).

When eggs are cooked at high temperatures cholesterol oxidation takes place, a process that results in by-products increasing the risk of heart disease. These cholesterol by-products **may also be toxic to body cells and cause DNA damage** (Mili evi *et al.*, 2014).




### Choline

Eggs contain a substance called choline – an essential nutrient needed for cell membranes, nerve signal transmission and other metabolic functions. Too much, however, can be damaging to health and eggs are by far the richest source. We can get all the choline we need from plant foods.

Research into choline intake and heart disease found that one of the by-products of choline (trimethylamine-N-oxide – TMAO) is associated with the build-up of arterial plaques, promoting heart disease (Tang *et al.*, 2013). The higher the levels of TMAO, the higher risk of stroke and heart attack.

### Cholesterol

The amount of cholesterol in just one egg can exceed the maximum recommended daily amount. A single large egg yolk contains about 275 milligrams whilst people at risk of cardiovascular disease are advised not to eat more than 200 milligrams. As Professor Spence points out, cutting down on cholesterol after you develop health problems might be too late (Spence *et al.*, 2010).

### Diabetes

A large study revealed that people who ate an egg a day had **double the risk of developing diabetes type 2** compared to people who had less than one egg a week (Spence *et al.*, 2010).

Another study, of 57,000 US adults who ate eggs daily, found they were 58-77 per cent more likely to develop diabetes type 2 than those who didn't eat eggs (Djoussé *et al.*, 2009). A more recent study agrees – egg consumption affects blood sugar metabolism and increases the risk of developing type 2 diabetes, mostly due to the cholesterol in eggs (Lee *et al.*, 2014). Cholesterol both inhibits the production of insulin (hormone responsible for sugar metabolism) and can lower the body's sensitivity to it.

## Food poisoning – Salmonella

Salmonella food poisoning is one of the most common and widespread diseases carried by food, affecting tens of millions of people across the world every year and eggs are the main source (Miranda *et al*., 2015). Symptoms include diarrhoea, stomach cramps, nausea, vomiting and fever. Salmonella is destroyed by cooking so the main risk is from raw or undercooked eggs and egg products, such as meringues and mayonnaise. Contamination is another infection source, the bacteria passing from one product to another.

Salmonella is a hardy bacterium that can survive several weeks in a dry environment and several months in water (WHO, 2013). It comes in **thousands of different strains and some are antibiotic-resistant**. In most cases, people who become ill recover within a few days but in extreme cases, or in people whose health is compromised, death can be the result. Severity depends upon your health and the particular strain of salmonella, although all strains can cause disease to some degree or other (WHO, 2013).

Because of previous salmonella outbreaks, egg-laying hens on farms subscribing to the British Lion code of practice have to be vaccinated against it. According to the British Lion Quality website, 85 percent of eggs in the UK are now produced under their mark (British Lion Quality website, 2016). It follows that 15 per cent of UK eggs come from farms that might or might not have vaccinated their chickens or are imported.

Farms that have fewer than 350 hens don't have to comply with the Salmonella National Control Programme so are largely unregulated where salmonella is concerned (DEFRA, 2012).

Vaccination did significantly reduce the number of salmonella food poisonings but it doesn't guarantee eggs are salmonella free. Although egg yolks and whites are rarely infected, **it's the eggshells that can be a considerable problem** (O'Brien, 2013). In a UK study, eggshell contamination with salmonella was lower in vaccinated hens than non-vaccinated but the reduction was 15-60 per cent – far from the exaggerated claims of some newspapers about eggs being salmonella-free (Arnold *et al*., 2014).

Under UK regulations, class A eggs are not to be washed or cleaned, before or after grading – no exceptions (DEFRA, 2016). The reason is because the egg's natural protective layer acts as a barrier to bacteria and washing can pose the risk of salmonella penetrating into the egg. Nevertheless, **eggshells can carry salmonella and you can become infected by handling them**.

A total of 721 salmonella cases were reported from chicken flocks in 2014, lower than in previous years but still a considerable number. In the same year, 34 known strains of salmonella were isolated from flocks and 147 unknown (Animal and Plant Health Agency, 2015). The number of chicken-related salmonella food poisoning reported cases in people was 6,505 in 2014 (Animal and Plant Health Agency, 2015), however the real number of cases is likely much higher.

At the moment, there is a target of no more than two per cent of laying hen flocks to test positive for the two main strains of salmonella involved in previous outbreaks (*S. Enteritidis and S. Typhimurium*) but **this limit doesn't apply to other salmonella strains** (Animal and Plant Health Agency, 2015).

Forty laying hen flocks tested positive for Salmonella under this statutory testing programme in 2014 but only two of the 40 were regulated strains (Animal and Plant Health Agency, 2015). Commercial vaccines are based on just one or both of the two strains that were responsible for past epidemics – *S. Enteridis and S. Typhimurium* (Arnold *et al*., 2014). These two regulated strains are now at very low levels but **other strains are increasing** (Animal and Plant Health Agency, 2015).

The latest report by the Advisory Committee on the Microbiological Safety of Food (ACMSF, 2016) suggests that eggs produced under the British Lion Quality code, or equivalent schemes, may be served raw or lightly cooked as they're now considered at very low risk of carrying the two regulated salmonella strains. However, for eggs not produced under the British Lion Quality code or from outside the UK, existing advice remains – young children, the elderly, pregnant women and those who are already unwell should avoid raw or undercooked eggs (ACMSF, 2016).

There were 88,715 confirmed cases of salmonella food poisoning in the EU in 2014 (ACMSF, 2016). The number of food-borne outbreaks was down by 44 per cent between 2008 and 2014, from 1,888 to 1,048 outbreaks. However, **eggs and egg products accounted for almost a half of this number**.

In some European countries (Austria, Belgium, the Czech Republic, Germany and Hungary) vaccination of laying flocks is compulsory, in others it is recommended (Bulgaria, Belgium, Cyprus, Estonia, France, Greece, Italy, Latvia, Lithuania, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and the UK). In Denmark, Finland, Sweden and Ireland it is banned (Arnold *et al*., 2014).

Legislation and official figures showing a reduction in UK cases definitely linked to eggs are meant to offer reassurance – 548 cases in 2009, 324 in 2011 and 188 in 2014 (ACMSF, 2016). However, research by Inns *et al*. (2015) claims there were 287 cases in 2014, not 188. Another paper documenting salmonella decline in the UK (Barrow *et al*., 2012) stated that eggs were responsible for 459 human cases in 2010 whereas the official figures put the total at just 88 cases (ACMSF, 2016). **This naturally raises doubts about the credibility of official figures**.

The ACMSF report warns about the underreporting of salmonella food poisoning cases as many go undetected – large numbers of people don't go to the doctor when they have food poisoning symptoms. It's estimated that in 2010 there were some **5.4 million genuine cases of human salmonellosis in the EU** (ACMSF, 2016) but only 99,020 were reported (EFSA & ECDC, 2012). That is a huge difference and although not all cases were related to eggs, it's worth bearing in mind.

## Food poisoning – Listeria, Campylobacter and Contaminants

Eggs can also carry other dangerous bacteria such as *Listeria* and *Campylobacter* that have been known to cause serious illness in people, although they are not the main source (ACMSF, 2016).

There is also the possibility of veterinary drug residues and environmental pollutants. Laying hens treated with drugs and given feed containing pesticides can produce contaminated eggs (Miranda *et al*., 2015; Pirozzo *et al*., 2002). Traces of many of these **potentially toxic pollutants are usually present even in free range and organic eggs** (Miranda *et al*., 2015).

## Cancer

Egg consumption has been linked to cancer, especially to hormone-sensitive cancers. In a study of ovarian cancer patients and healthy women, researchers discovered there was a **strong and significant relationship between cholesterol from eggs and the risk of ovarian cancer** (Pirozzo *et al*., 2002). Interestingly, the link was only with egg cholesterol and not other sources of cholesterol, which suggests the culprit might be a substance linked to eggs and egg yolks but not cholesterol itself. Women eating more than two eggs a week had an 82 per cent higher risk of developing ovarian cancer compared to women eating less than one egg per fortnight. The risk increase from eating just one or two eggs a week was 71 per cent!

A large study examining the link between the consumption of eggs, red meat and poultry and prostate cancer revealed that by consuming 2.5 eggs per week, **men increased their risk of prostate cancer by 81 per cent**, compared with men who consumed less than half an egg per week (Richman *et al*., 2011). It followed the dietary habits of 27,607 men for 14 years. Eating poultry and processed red meat also increased the risk of death for men who already had prostate cancer.

Another study looked specifically at the intake of choline and the risk of prostate cancer over a period of 22 years (Richman *et al*., 2012). Whole eggs are the richest dietary source of choline and it was discovered that choline is highly concentrated in prostate cancer cells and that higher blood concentrations of choline are associated with an increased risk of prostate cancer. **Men with the highest choline intake had a 70 per cent increased risk of lethal prostate cancer**. The study authors said the mechanism of exactly how choline is linked to prostate cancer isn't clear but choline metabolism is clearly altered in prostate cancer.

A scientific team analysed a series of studies on the relationships between egg consumption and the risk of breast, prostate and ovarian cancer (Keum *et al*., 2015). **Five and more eggs a week was linked to an increased risk of these hormone-sensitive cancers – with the risk of fatal prostate cancer being especially high**. The authors suggested several factors – cholesterol is involved in the synthesising of sex hormones such as testosterone and oestrogens that promote cell growth. Excessive amounts of sex hormones can contribute to cancerous growths in hormone-sensitive tissues such as breast, ovary or prostate. At the same time, cholesterol and choline are both essential components of cell membranes and a plentiful supply might help cancerous cells to grow.

## Hard-boiled facts

The truth is – it's best to steer clear of eggs – they're not essential for your health and can significantly harm it. Many recipes can easily be adapted to be egg-free – both a healthy and ethical choice! A wholesome vegan diet is the best possible for our health, animals and the environment.

## References


Advisory Committee on the Microbiological Safety of Food (ACMSF) – Ad Hoc Group on Eggs, 2016. An update on the microbiological risk from shell eggs and their products – draft.

Animal and Plant Health Agency, 2015. Salmonella in livestock production in GB 2014. Chapter 6: Reports of salmonella in chickens.

Arnold ME, Gosling RJ, La Ragione RM, Davies RH and Martelli F, 2014. Estimation of the impact of vaccination on faecal shedding and organ and egg contamination for Salmonella Enteritidis, Salmonella Typhiumurium and monophasic Salmonella Typhimurium. *Avian Pathology*. 43 (2) 155-163.

Barrow PA, Jones MA, Smith AL and Wigley P, 2012. The long view: Salmonella – the last forty years. *Avian Pathology*. 41 (5) 413-420.

British Lion Quality website. What does the British Lion Quality mark symbolise? [accessed online 8 February 2016] http://www.lioneggfarms.co.uk/information/british-lion-quality/

DEFRA, Animal and Plant Health Agency, 2012. Eggs: trade regulations. Salmonella control [accessed online 9 February 2016] https://www.gov.uk/guidance/eggs-trade-regulations#salmonella-control

DEFRA, Animal and Plant Health Agency, 2016. Guidance on Legislation Covering the Marketing of Eggs.

Djoussé L, Gaziano JM, Buring JE and Lee IM. 2009. Egg consumption and risk of type 2 diabetes in men and women. *Diabetes Care*. 32 (2) 295-300.

European Food Safety Authority and European Centre for Disease Prevention and Control, 2012. The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2010. *EFSA Journal*. 10 (3) 2597.

Greger M. 2014. Who Says Eggs Aren't Healthy or Safe? [accessed online 28 Januray 2016] nutritionfacts.org/video/who-says-eggs-arent-healthy-or-safe/#

Inns T, Lane C, Peters T, Dallman T, Chatt C *et al*.; Outbreak Control Team, 2015. A multi-country Salmonella Enteritidis phage type 14b outbreak associated with eggs from a German producer: 'near real-time' application of whole genome sequencing and food chain investigations, United Kingdom, May to September 2014. *Euro Surveillance*. 20(16).

Keum N, Lee DH, Marchand N, Oh H, Liu H, Aune D, Greenwood DC and Giovannucci EL. 2015. Egg intake and cancers of the breast, ovary and prostate: a dose-response meta-analysis of prospective observational studies. *British Journal of Nutrition*. 21: 1-9.

Lee CT, Liese AD, Lorenzo C, Wagenknecht LE, Haffner SM, Rewers MJ and Hanley AJ. 2014. Egg consumption and insulin metabolism in the Insulin Resistance Atherosclerosis Study (IRAS). *Public Health Nutrition*. 17 (7) 1595-1602.

Li Y, Hruby A, Bernstein AM, Ley SH, Wang DD, Chiuve SE, Sampson L, Rexrode KM, Rimm EB, Willett WC, Hu FB. 2015. Saturated Fats Compared With Unsaturated Fats and Sources of Carbohydrates in Relation to Risk of Coronary Heart Disease. *Journal of the American College of Cardiology*. 66 (14) 1538-1548.

Mili evi D, Vrani D, Maši Z, Parunovi N, Trbovi D, Nedeljkovi -Trailovi J and Petrovi Z. 2014. The role of total fats, saturated/unsaturated fatty acids and cholesterol content in chicken meat as cardiovascular risk factors. *Lipids in Health and Disease*. 13, 42.

Miranda JM, Anton X, Redondo-Valbuena C, Roca-Saavedra P, Rodriguez JA, Lamas A, Franco CM and Cepeda A. 2015. Egg and egg-derived foods: effects on human health and use as functional foods. *Nutrients*. 7 (1) 706-729.

Nettleton JA, Steffen LM, Loehr LR, Rosamond WD and Folsom AR. 2008. Incident heart failure is associated with lower whole-grain intake and greater high-fat dairy and egg intake in the Atherosclerosis Risk in Communities (ARIC) study. *Journal of the American Dietetic Association*. 108 (11) 1881-1887.

O'Brien SJ, 2013. The "decline and fall" of nontyphoidal salmonella in the United Kingdom. *Clinical Infectious Diseases*. 56 (5) 705-710.

Pirozzo S, Purdie D, Kuiper-Linley M, Webb P, Harvey P, Green A and Bain C. 2002. Ovarian cancer, cholesterol, and eggs: a case-control analysis. *Cancer Epidemiology, Biomarkers and Prevention*. 11 (10 Pt 1) 1112-1114.

Richman EL, Kenfield SA, Stampfer MJ, Giovannucci EL and Chan JM. 2011. Egg, red meat, and poultry intake and risk of lethal prostate cancer in the prostate specific antigen-era: incidence and survival. *Cancer Prevention Research*. 4 (12) 2110-2121.

Richman EL, Kenfield SA, Stampfer MJ, Giovannucci EL, Zeisel SH, Willett WC and Chan JM. 2012. Choline intake and risk of lethal prostate cancer: incidence and survival. *American Journal of Clinical Nutrition*. 96 (4) 855-863.

Spence JD, Jenkins DJ and Davignon J. 2010. Dietary cholesterol and egg yolks: not for patients at risk of vascular disease. *Canadian Journal of Cardiology*. 26 (9) e336-339.

Spence JD, Jenkins DJ and Davignon J. 2012. Egg yolk consumption and carotid plaque. *Atherosclerosis*. 224 (2) 469-473.

Tang WH, Wang Z, Levison BS, Koeth RA, Britt EB, Fu X, Wu Y and Hazen SL. 2013. Intestinal microbial metabolism of phosphatidylcholine and cardiovascular risk. *New England Journal of Medicine*. 368 (17) 1575-1584.

World Health Organisation, 2013. Salmonella (non-typhoidal). Fact sheet N°139 [accessed online 10 February 2016] http://www.who.int/mediacentre/factsheets/fs139/en/