



EGG

Nutrition

Health
Benefits

Health
Risks

B Sesikeran

Declaration of Conflict of Interest

- I enjoy eating eggs



The egg is the symbol of perfection.

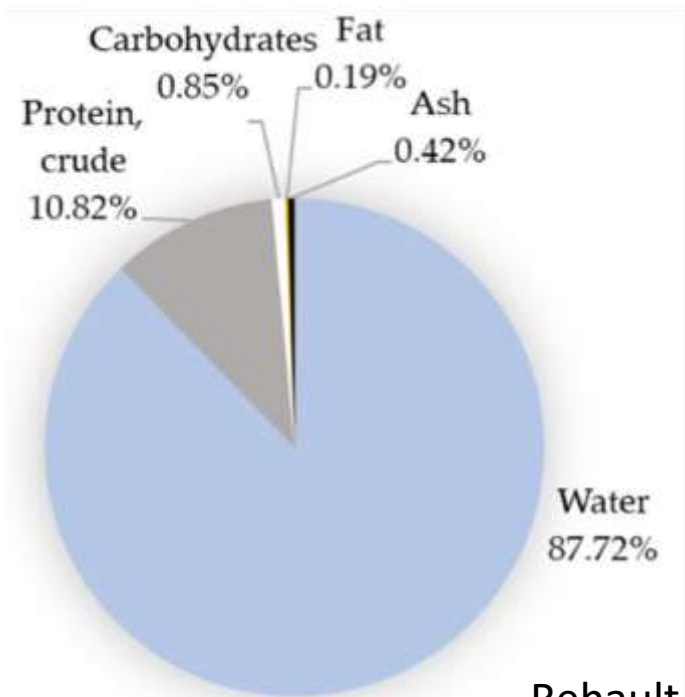
Mason Cooley

EGGS

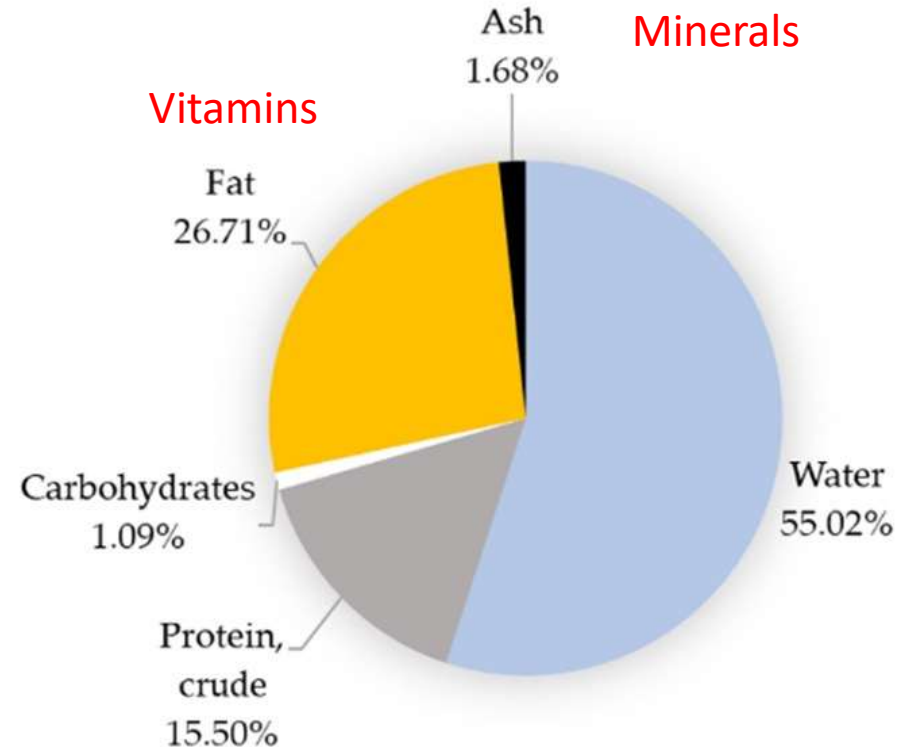
- An affordable source of high quality protein, iron, unsaturated fatty acids, phospholipids, and carotenoids.

Nutrition- Protein

- About 13.0 g / 100g Raw whole egg (IFCT ICMR NIN 2017)
- Present both in White and Yolk



Rehault-Godbert et al
Nutrients;2019.11 684



Egg White Protein Components

- One egg about 6 gms of protein
- Structural Proteins- Ovomucin(OVM)
- Glycoproteins- Ovalbumin (50%)- Excellent quality Protein (OVA)
- Ovotransferrin (OVT)
- Avidin
- Protease Inhibitors
- Anti Bacterial Lysozyme
- Bioactive peptides
- 150 distinct proteins have been identified (Gautron, J et al 2011)

Digestibility of egg proteins (Evenepoel et al J Nutrition 1998)



- Cooked egg approx. 91%



- Raw Egg Approx – 51%

Lipid composition of Egg Yolk

- Total Fat – Whole egg 5- 6 gms (9 gms/ 100 gms)
- Total Fat – Egg Yolk 13 to 15 gms/ egg (26 gms/100 gms)
- Cholesterol – About 200mg / egg (400mg / 100 Gms)
- LDL cholesterol - 68%
- HDL. ,, - 16%
- Major fatty acids – Palmitic and Stearic Acid

Lipid composition of Egg Yolk- 2

- Ratio of Unsaturated to Saturated Fatty Acids is 2:1
- (<https://ciqual.anses.fr/> (French Agency for Food, Environmental and Occupational Health & Safety. ANSES-CIQUAL).
- Yolk Raw – Sat 8.5 g , MUFA 10.0, PUFA 3.2 g/ 100 gms (IFCT ICMR NIN 2017)
- DHA - 180 mg/100g

Lipid composition of Egg Yolk- 3

Linoleic acid 2.9 g/ 100 gm of
yolk

Hen's diet cannot change total lipid content but
can change fatty acid composition or ratio of
White: Yolk (Rehault-Godbert et al
Nutrients;2019.11 684)

No other Non Veg has more
Unsaturated

Phospholipids

- Rich source of phospholipids (approx. 1.3 g / egg) (Jiang et al J Nutrition 2001)
- Egg has highly bioavailable phospholipids- Phosphatidyl Choline
- They get incorporated into HDL particles
- Elevate HDL cholesterol levels
- Benefitted patients with metabolic syndrome (Blesso et al Metabolism 2013 and J Clin Lipidol 2013)

Carotenoids

- Content dependent of diet of the hen
- Lutein, Zeaxanthin, Beta Carotene, Alpha carotene, beta Cryptoxanthine
- Less than veg sources but better bioavailability
- Increases in plasma lutein, zeaxanthin, and β -carotene were observed in subjects with metabolic syndrome who consumed 3 eggs per day for 3 weeks. (Blesso et al Food Funct 2013)

Micronutrients

- All vitamins except C
- 2 eggs/ day may provide approx.10 to 30% of EAR of most vitamins
- Yolk rich in vitamin A, D, E, K, B1, B2, B5, B6, B9, and B12,
- Egg white has high amounts of vitamins B2, B3, and B5 but also significant amounts of vitamins B1, B6, B8, B9, and B12
- (Rehault-Godbert et al Nutrients;2019.11 684)
- Eggs are very rich sources of Choline

Minerals and Trace elements

- Rich is Phosphorus, Calcium and Potassium
- Trace elements- Cu, Fe, Mg, Mn, Se and Zn
- Concentrations would vary depending on the poultry diets

Properties of Bioactive molecules in egg

- Antibacterial- Lysozyme, Ovotransferrin
 - Antioxidant- Vitamins, minerals
 - Anti hypertensive- ACE inhibitory peptides
 - Immunomodulatory- egg white pleotropin
 - Anti Cancerous- Ovomucin derived peptides
-
- About 550 active substances have been identified
 - The function of only 20 of them have been worked out

Adverse effects of egg
consumption

Allergy

Hen's egg protein allergy 1

- 2nd most common form of food allergy in infants and children
- Affects 0.5 to 2.5% of children (Rona RJ, et al.. J Allergy Clin Immunol. 2007)
- IgE mediated or Cell mediated forms
- Most are in egg white eg Ovomuroid,(OVM) Ovo transferrin, Ovalbumin (OVA) Lysozyme

Hen's egg protein allergy 2

- The proteins that resist digestion and heat stable are allergenic
- Persistent allergy children have IgE that recognise specific epitopes of OVM
- Transient allergy children do not have such IgE

Hen's egg protein allergy 3

- OVM epitopes heat stable and occur even when cooked
- OVA epitopes are heat labile – seen only with raw egg
- Allergic Yolk proteins- alpha-Livetin and Vitellenin

Hen's egg protein allergy 3

- Processed foods with traces of egg Lecithin do not cause significant allergic reactions
- Egg allergy may lead to Atopic dermatitis
- Flu vaccines derived from chick embryos may have residual OVA or OVM
- (Caubet and Wang, Ped Clin North Am; Apr 2011)

Egg consumption and Cardiovascular disease

In the past, limiting dietary cholesterol intake to 300 mg per day was widely recommended to prevent cardiovascular disease.

The weak association between dietary cholesterol and blood cholesterol,

Egg
consumption
and
Cardiovascular
disease

Dietary cholesterol is no longer a nutrient of concern for overconsumption,

2015 dietary guidelines for Americans did not carry forward this recommendation.

Egg consumption and Cardiovascular disease

Conflicting results:

No association between egg intake and risk of cardiovascular disease,

(Diez-Espino J, et al *Clinical nutrition* 2017;. Djoussé L and Gaziano JM.. *Am J Clin Nutr* 2008; Hu et al. *JAMA* 1999)

Reported a higher risk, (Zhong et al. *JAMA* ,2019, Guo et al *Eur J Nutr* 2018)

Egg consumption and Cardiovascular disease

- An inverse association with cardiovascular disease,

(Guo Y, et al, *Heart* 2018, Key et al *Circulation* 2019)

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Egg and CVD

- Egg consumption and risk of cardiovascular disease: three large prospective US cohort studies, systematic review, and updated meta-analysis
- Jean-Philippe Drouin-Chartier,¹ Siyu Chen,¹ Yanping Li,¹ Amanda L Schwab,¹ Meir J Stampfer,^{1,2,3} Frank M Sacks,^{1,3} Bernard Rosner,^{1,3,4} Walter C Willett,^{1,2,3} Frank B Hu,^{1,2,3} Shilpa N Bhupathiraju^{1,3}
- *BMJ* 2020;368:m513 <http://dx.doi.org/10.1136/bmj.m513>
- Accepted: 13 January 2020

Study Participants

- Cohort analyses included 83,349 women from NHS, 90,214 women from NHS II, and 42,055 men from HPFS who were free of cardiovascular disease, type 2 diabetes, and cancer at baseline.

NHS- Nurses Health Study

HPFS- Health Professionals Follow up study

Main Outcome Measures

- **Incident cardiovascular disease, which included non-fatal myocardial infarction, fatal coronary heart disease, and stroke**

Results

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- Over up to 32 years of follow-up (>5.54 million person years)
- 14,806 participants with incident cardiovascular disease were identified in the three cohorts.

Results

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- Participants with a higher egg intake had a higher body mass index, were less likely to be treated with statins, and consumed more red meats.
- Most people consumed between one and less than five eggs per week.
- In the pooled multivariable analysis, consumption of at least one egg per day was **not associated with incident cardiovascular disease** risk after adjustment for updated lifestyle and dietary

In analyses stratified by geographical location

- No association was found between egg consumption and cardiovascular disease risk among US cohorts
- or
- European cohorts (1.05, 0.92 to 1.19)
- An inverse association was seen in Asian cohorts (0.92, 0.85 to 0.99)

Conclusions

- Results from the three cohorts and from the updated meta-analysis show that moderate egg consumption (up to one egg per day) is not associated with cardiovascular disease risk overall, and is associated with potentially lower cardiovascular disease risk in Asian populations.

Egg consumption and heart health: A review ; Nutrition May 2017

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- Highlights

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Consuming a cholesterol free egg substitute does not decrease an individuals risk for developing CVD risk factors, relative to whole eggs.

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Eggs are a bioavailable source of xanthophyll carotenoids, which have been shown to play a role in decreasing inflammation.

- Consuming three eggs per day for 12 weeks did not increase cardiovascular disease risk in individuals with metabolic syndrome.

(Zhong et al. *JAMA* ,2019, Guo et al *Eur J Nutr* 2018)

- Data from six different observational studies, which involved nearly 30,000 U.S. adults with an average age of 51.
- People provided information about their dietary habits, as well as other health, lifestyle and demographic information.
- Researchers then tracked their health for up to 31 years, during which time more than 6,100 people died and 5,400 experienced cardiovascular issues.

(Zhong et al.
JAMA, 2019,
contd.....

Both overall dietary cholesterol consumption (from sources including eggs, meat and dairy) and egg consumption specifically were linked to a higher risk of heart problems and premature death,

For each extra half-egg eaten per day — totalling just three to four more eggs per week — a person's cardiovascular disease risk went up by 6%, and his or her risk of early death increased by 8%, the researchers found.

(Zhong et al. *JAMA* ,2019,
contd.....

People who eat eggs every day should pay extra attention, since “greater consumption means higher risk,” Zhong says.

“Limiting foods rich in dietary cholesterol, such as eggs, may be important to consider when choosing a healthy eating pattern,”

Zhong says. “Egg whites, which are a rich source of high-quality protein without dietary cholesterol, can be used to replace whole eggs.”

(Zhong et al.
JAMA, 2019,
contd.....

But yolks are the primary source of many nutrients found in eggs, including amino acids, iron and choline,

Yolks are also one of the only natural sources of vitamin D,

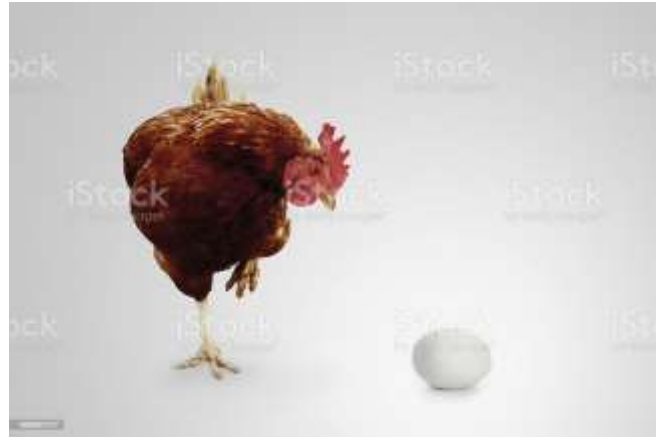
The Final Word ?

The research on eggs is contradictory — for now — so people (and their doctors) must personally decide how many eggs is too many, Zhong says.

Those who are already at risk of cardiovascular issues may want to be more cautious than those who aren't, especially if they have a family or medical history of heart disease.

Your doctor can help define the right range for you.

Stop counting eggs and move to healthier overall dietary patterns (*BMJ* 2020;368:m744)



Thank You for your attention