

EGGS: CLEARING THE CHARGES, EXPLORING THE POTENTIAL!

Maryam Amour, Judith Boshe

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ABSTRACT

Of all the various kinds of foods, an egg is special for its combination of all essential food nutrients in one item. However for much of the past 40 years, the public has been warned away from eggs because of concerns that they increase the risk of coronary heart disease and stroke and a claim that they raise the blood pressure by causing vasoconstriction. In Tanzania, up to date there are some cultures that forbid women in general or pregnant women in particular from eating eggs due to a belief that they will get bald babies or have problems during delivery.

Several studies over the years have examined egg intake and its relationship with coronary outcome. When dietary confounders were considered, no association was seen between egg consumption and the risk of coronary heart disease in non-diabetic men and women.

Recent researches have not only linked eggs with biological functions beyond basic nutrition but to a huge potential in the medical field. Eggs are now linked to fetal brain development and boosting of the immune system thus consequently lowering the risk of getting breast cancer, colon and lung cancer. For already developed cancer, eggs show potential for the development of *promising* anticancer drugs through the production of Monoclonal antibodies. They are also proven to prevent cataract and macular degeneration and protect against heart attacks and strokes by preventing arteriosclerosis and facilitating fat metabolism.

Moreover researchers now not only prove eggs do not increase your blood cholesterol, but also link eggs to lowering high blood pressure by acting like an antihypertensive through an ACEI like inhibiting mechanism.

Components in eggs were also found to be active as anti-adhesives, microbicides and as chelators in metal poisoning.

Good news to egg lovers again!

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Of all the different kinds of foods, an egg is special for its combination of all essential food nutrients in one item. Chicken eggs have an average weight of (~50g) with two distinct parts that have distinct nutritional values: the yolk (17g); and white (33g).

The egg white is also known as albumen with 90% of its weight coming from water and the remainder coming from protein, trace minerals, fatty material, carbohydrates, vitamins, and glucose. The predominant proteins and their approximate respective percentages of composition of the albumen include the following: Ovalbumin (54%), Ovotransferrin (12%), Ovomuroid (11%), Globulins (8%), Lysozyme (3.5%), Ovomucin (1.5%), Avidin (0.06%), and others (10%). The egg yolk comprises the majority of the calories contained in the egg, most of the minerals (iron, phosphorus, calcium, potassium, thiamine, and riboflavin) and virtually all of the fat soluble vitamins (A, D, E and K). The approximate composition (by weight) of the most prevalent fatty acids in egg yolk include: unsaturated fatty acids (Oleic acid (47%), Linoleic acid (16%), Palmitoleic acid (5%), Linolenic acid (2%); and saturated fatty acids (Palmitic acid (23%), Stearic acid (4%), Myristic acid (1%). It is also a source of lecithin, a common emulsifier. Other biological active components of an egg are: Methionine, Manganese, Carotenoids, and Lutein. Leaving aside the nutritional value found in a single egg, they are now understood to contain substances with biological functions beyond basic nutrition, and extensive research has been undertaken to identify and characterize these biologically active components. Continued research to identify biological functions of chicken egg components will help to define new methods to further improve the value of eggs as a source of numerous biologically active compounds. (18-21)

THE CHARGES

For much of the past 40 years, the public has been warned away from eggs because of a number of concerns:

Increase in the risk of coronary heart disease and stroke being one of the major concerns. This was based on three observations: 1. Eggs are a rich source of dietary cholesterol, 2. When fed experimentally, dietary cholesterol increases serum cholesterol and 3. High serum cholesterol predicts the onset of coronary heart disease.

However, data from free-living populations show that egg consumption is not associated with higher cholesterol levels (9). Furthermore, as a whole, epidemiologic literature does not support the idea that egg consumption is a risk factor for coronary disease. The most recent American Heart Association guidelines no longer include a recommendation to limit egg consumption, but recommend the adoption of eating practices associated with good health. (15)

A study was done to find the relationship between the risk of getting cardiovascular disease in men and women and egg consumption. The study involved 37,851 men aged 40 to 75 and 80,082 women aged 34 to 59. During 8 years of follow up for men and 14 years of follow up for women, the researchers documented 2626 total cases of coronary heart disease (CHD) and stroke in both men and women. No evidence was found on the overall association between egg consumption and risk of CHD in either women or men, and in subgroup analyses, higher egg consumption appeared to be associated with an increased risk of CHD only among diabetic subjects. (16)

Several other studies over the years have examined egg intake and its relationship with coronary outcomes (1-8). Most failed to consider the role of other potentially confounding dietary factors. When dietary confounders were considered, no association was seen between egg consumption at levels of up to 1 egg per day and the risk of coronary heart disease in non-diabetic men and women.(9) In fact, studies have proven that dietary cholesterol intake has very little influence over our cholesterol blood levels (15).

On top of that, many doctors and nutritionists claim we should avoid eating egg yolks because they contain arachidonic fatty acid (AA) that raises the blood pressure by causing vasoconstriction. This theory is false as eggs do not cause high blood pressure.

In Tanzania, up to date there are some cultures that forbid women in general or pregnant women in particular from eating eggs due to a belief that they will get bald babies. However, literature and research show that egg consumption during pregnancy helps in fetal brain development and is a protective factor against breast cancer. (10,11)

THE POTENTIAL

Researches have now linked eggs with the following protective biological processes: fetal brain development, lower risk of developing cancer and an overall boosting of the immune system,

promising anticancer drugs; production of monoclonal antibodies, preventing cataract and macular degeneration, reducing cholesterol absorption, protection against heart attacks and strokes by preventing arteriosclerosis and facilitating fat metabolism, antihypertensive effects, anti-adhesive properties of egg yolk, microbicidal action, and chelating action in metal poisoning.

Fetal brain development

The yolk contains all of the choline present in an egg. One yolk contains approximately half of the recommended daily intake. [Choline](#) is an important nutrient for development of the brain, and is said to be important for pregnant and nursing women to ensure healthy fetal brain development (11).

Lower the risk of developing cancer and act as an overall immune booster

A stunning discovery based on epigenetics (the inheritance of propensities acquired in the womb) reveals that consuming choline during pregnancy may significantly affect breast cancer outcomes for a mother's offspring.

The researchers made the discovery in rats by studying females whose mothers were fed with varying amounts of choline during pregnancy. Some groups of pregnant rats received diets containing standard amounts of choline, others received no choline at all, and others received extra choline. Then the researchers treated the female offspring with a chemical that causes cancer of the mammary gland (breast cancer). Although animals in all groups developed mammary cancer, the daughters of mothers that had received extra choline during pregnancy had slow growing tumors while daughters of mothers that had no choline during pregnancy had fast growing tumors .(11)

Lutein, yet another component in eggs, boosts the [immune system](#) and, accordingly, prevents [cancer](#). This is because development of cancer as a disease is associated with immune system impairment. In addition to boosting the immune system, lutein may also fight cancer by both protecting your cells from free radical damage and increasing cell-to-cell communication, thus preventing them from turning malignant.

In a study described in Mark Stengler's *Natural Physician's Healing Therapies*, people with high-lutein diets at any age decreased their chances of developing [colon cancer](#) by 17 percent; furthermore, young people with high-lutein diets decreased their chances by 34 percent. Studies show that a diet high in lutein will also decrease your chances of other [cancers](#), including cancers of the lung and breast (23).

Production of Monoclonal antibodies; Promising anticancer drugs

Human sequence monoclonal antibodies in chicken eggs have successfully been produced by the US genetic firm. The antibodies were expressed solely in the chicken oviduct and deposited into egg white in concentrations of 1-3 milligrams per egg. Antibodies produced in this manner demonstrated 10-100 fold greater ability to kill targeted cells, compared to therapeutic antibodies produced by conventional cell culture methods. These monoclonal antibodies have demonstrated great success as human therapeutics, with over 25 approved for human therapeutic use and an increasing number of these proteins in clinical development. This achievement may lead to cheaper and more effective therapies for already developed cancers and other diseases. (12,13)

Preventing cataracts and macular degeneration

In a Harvard University-based study, women with [diets](#) high in lutein and zeaxanthin experienced a 22 percent reduced risk of [cataracts](#), while men reduced their risk by 19 percent. In yet another study described by Laurie Deutsch Mozian in her book *Foods that Fight Disease*, a dietary intake of only six milligrams of lutein per day decreases your chances of developing [age-related macular degeneration](#) by 43 percent. (23) Lutein and Zeaxanthin are phytochemicals, a naturally occurring group of biochemicals that are classified within the carotenoid class of molecules. Eggs have been found to contain high levels of these important cataract preventing molecules. (14) Theory suggests that lutein and its companion [zeaxanthin](#) may save our sight by acting as a shield or filter that helps to absorb harmful UVB light and dangerous free-radical molecules, both of which threaten retinal tissue. Furthermore according to Life Extension Foundation's *Disease Prevention and Treatment*, lutein can literally save the sight of those who have family histories of [macular degeneration](#) and other vision loss problems. (23)

Reducing cholesterol absorption

While cholesterol is essential in our bodies, excessive absorption of it could be harmful to our bodies if it results into high serum cholesterol. Through the active component Lecithin, eggs have been found to reduce the amount of cholesterol absorption into the body (24). The inhibitory action of lecithin on cholesterol intestinal absorption was studied in an unanesthetized rat using a single pass perfusion technique. Lecithin additions at concentrations of 0.1–1.5 mM caused a progressive, dose-related inhibition of cholesterol absorption (24). Lecithin derived from eggs could lead directly to development of new compounds for lowering cholesterol (25).

Protective against heart attacks and strokes by preventing arteriosclerosis and facilitating fat metabolism

A recent study by the American Cancer Society found that people who ate eggs had fewer heart attacks and strokes than those who did not. This is because eggs are one of the richest sources of choline, a component of lecithin which acts in the arteries like a fat and cholesterol emulsifier, keeping the cholesterol in other foods and the egg itself moving through the bloodstream and preventing it from sticking to artery walls (15). Eggs contain methionine, which also aids in preventing build up of fats in the arteries; and manganese which helps the body metabolize fats.

Egg as antihypertensives

Now, researches do not only prove that eggs do not increase your blood cholesterol, but also link eggs to lowering high blood pressure. Researchers Kaustav Majumber and Jianping Wu at the University of Alberta, Canada, discovered that eggs can reduce hypertension. In a research, eggs reacted like ACE-inhibiting prescription drugs, which lower blood pressure. They discovered that when eggs were consumed, stomach and small intestines reacted by producing proteins. These proteins released react in the body in a similar manner to the blood pressure medication. Moreover, fried eggs had more ACEI-like inhibiting activity than boiled eggs. The presence of several tripeptides from in vitro simulation of gastrointestinal egg digestion indicates that these peptides may be absorbed into the body and exert an in vivo antihypertensive activity, although an in vivo study is yet to be done (17).

Anti-adhesive properties of egg yolk

In another animal study, it was found that the egg yolk powder without specific antibodies is effective in controlling *Salmonella enteritidis*, *Salmonella typhimurium* and *Escherichia coli* 0157:H7. In vitro experiments were conducted and the above bacteria were investigated against the various extracted granule and plasma fraction in adhesion elimination and antimicrobial activity. (26)

Microbiocidal action of an egg

There is also extensive evidence of an antibacterial effect of ovotransferrin based on iron deprivation, iron being an essential growth factor for most micro-organisms. About 12% of ovotransferrin binds iron. In vivo, ovotransferrin demonstrates therapeutic properties against acute enteritis in infants (21). Lysozyme, yet another egg protein is used in the food industry due to its ability to selectively inhibit the uncontrolled growth of *Clostridium tyrobutyricum* during the maturation of cheese. Additionally, lysozyme can be used to protect against bacterial, viral or inflammatory diseases. It can be used as an aerosol for the treatment of bronchopulmonary diseases and for its prophylactic function against infectious pathogens of the buccal cavity, such as dental caries. It can further be used in droplet form for nasal tissue protection. Various therapeutic creams can be designed for the protection and topical reparation of certain diseases such as Herpes and shingles, as well as the treatment of recurrent aphthous stomatitis. Oral administration of lysozyme has also been shown to have immune-stimulating effects in addition to antihistamine effects (12, 21).

As a chelator in metal poisoning

Ovalbumin is useful in cases of poisoning by heavy metals (such as iron) as a chelator of heavy metals by trapping the metal ions within the sulphhydryl bonds of the protein and preventing the absorption of the metals from the gastrointestinal tract. (21) In Tanzania, among some tribes like the Haya, raw eggs are eaten as an emergency remedy in an acute case of poisoning.

Other potential uses of eggs

- It was used in medieval medicine to treat wounds and broken bones.

- They are recommended for consumption by chemotherapy and renal patients as a source of 90g of lean protein.
- They are used by athletes and body builders as a health food supplement, to aid in the building of muscles. (27)

Eggs are widely and cheaply found all over Tanzania hence the benefits could be available to all if proper information is provided.

CONCLUSION

From the review it is seen that the fear of egg consumption has been exaggerated for some time. It is also clear that a consensus has not been reached within the scientific community despite most researches having revealed that when confounders are controlled, the benefits of eggs are undisputed. Hence if included in a healthy diet, their benefits may outweigh their speculated side effects. The benefits are not only nutritional but also protectional against certain cancers and coronary diseases, and boosting to the immune system among others.

With the existing myths among our local folks, it may be a challenge for most Tanzanian health practitioners to educate the community on the benefits of eggs consumption.

RECOMMENDATIONS

Health education should be given to the community in general on the importance of egg consumption.

Cultural practices that forbid pregnant women to eat eggs should be discouraged.

More research should be done locally to see the health benefits of eggs in our setup.

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