

Designer and Specialty Eggs¹

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Usually only chicken eggs are sold in general grocery stores. Some specialty stores, such as health food stores, may sell duck and/or quail eggs as well. Turkey and goose eggs are rarely sold for human consumption.

Brown and white shelled eggs are available on the market. They are nutritionally the same. Since brown egg layers are slightly larger birds and require more feed, the price of brown eggs is generally higher than that of white eggs.

Meeting consumer demands is a constant challenge for the animal food industry. Many consumers desire somewhat distinct products with respect to safety, healthfulness, freshness, taste, color, etc. To tap into this market, companies have developed several designer and speciality eggs which have appeared on store shelves. The nomenclature of such eggs may be confusing, and often misleading. The purpose of this factsheet is to discuss the types of "new" eggs currently on the market, their pros and cons, and some of the misconceptions held by consumers.

DESIGNER EGGS

One of the ways to market a new product is to change the old product. The contents of the chicken egg can be changed in such ways as to be more healthful and appealing to a segment of our consumers who are willing to pay for those changes in the egg. "Designer eggs" are those in which the content has been modified from the standard egg.

Vitamin content

Designer eggs have been produced that contain higher concentrations of several vitamins. Two vitamins, A and E, are receiving the most interest as components of designer eggs. The vitamin content of the egg is variable and is somewhat dependent on the dietary concentration of any specific vitamin. In addition, the hen does not transfer different vitamins into the egg with equal efficiency. Because of this, the vitamin transfer efficiency and cost of the vitamin must be taken into consideration when determining the economic feasibility of marketing such eggs. Eggs higher in Vitamin E are currently available in stores.

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Lowered cholesterol

In order for a company to claim a reduce amount of a nutrient the product must have 25 percent less than the normal product standards for that nutrient. A large egg contains approximately 200 - 220 mg of cholesterol.

Genetic selection of hens for lowered cholesterol has not been successful in lowering the egg cholesterol content. There have been claims that eggs from the Araucana chicken contain less cholesterol when compared to eggs of other breeds. Dozens of Araucana eggs have been sold in health food stores for exorbitant prices promoting them as "health eggs." There is no scientific evidence to support this claim. There have been numerous well-designed scientific studies that have compared the cholesterol content of Araucana eggs to eggs from other breeds, especially the White Leghorn, a breed that dominates the American commercial egg market. In these comparisons the egg content was corrected for egg size. The Araucana eggs consistently contain higher concentrations of yolk cholesterol than White Leghorns. Egg cholesterol is found only in the yolk. Araucana chickens simply lay a smaller egg so that cholesterol content, on a per egg basis, is lower.

Research into lowering egg cholesterol has centered mostly around diet and pharmacological intervention (drugs). Drugs have been successful in lowering egg cholesterol by as much as 50%. Drugs lower cholesterol in the egg by either inhibiting the synthesis of cholesterol in the hen or by inhibiting the transfer of cholesterol from the blood to the developing yolk on the ovary. Today, the drugs which have shown promise in lowering cholesterol are not yet approved by the FDA for commercial use.

Chromium supplementation to laying hen diets at concentrations of less than 1 ppm have been shown to lower egg cholesterol and also improve egg interior quality.

Research has also shown that the most effective way to lower egg cholesterol content is to lower the energy consumption of the hen. Tampa Farm Services (Florida) markets an egg with reduced cholesterol content (185 mg). The eggs are produced

by feeding a special all-vegetarian diet that is higher in protein and fiber, and enriched in vitamin E.

Fat and fatty acid content

Altering the total fat content in the diet of the hen has little effect on the total fat content of the egg yolk. However, the fatty acid profile (or the ratios of the different types of fatty acids) of egg yolk lipid can easily be changed, simply by changing the type of fat used in the diet.

Consumption of polyunsaturated fatty acids has been reported to reduce the risk of atherosclerosis and stroke. Consumption of these fatty acids has also been shown to promote infant growth.

Different feeds, such as flaxseed (linseed), safflower oil, perilla oils³, chia⁴, marine algae, fish, fish oil, and vegetable oil have been added to chicken feeds to increase the omega-3 fatty acid content in the egg yolk. Omega-3 fatty acid-rich eggs may provide an alternative food source for enhancing consumer intake of these 'healthy' fatty acids. Evaluation of the eggs during storage indicates that the shelf life of the enriched eggs was comparable to that of typical eggs.

Many omega-3 fatty acid-enhanced eggs are available in the U.S. market under various brand names such as Gold Circle Farms, EggPlus, and the Country Hen Better Eggs. Omega-3 fatty acid-enriched eggs taste and cook like any other chicken eggs available in the grocery store. However, they typically have a darker yellow yolk.

There are also designer eggs on the market that contain a lowered saturated to unsaturated fatty acid ratio. Canola oil is commonly used to alter the ratio of saturated to unsaturated fatty acids. Tampa Farm Services produces an egg said to contain 25% less saturated fat than regular eggs.

Mineral content

The shell contains the majority of the minerals in an egg. There are approximately 2,200 mg of calcium and 20 mg of phosphorus in the shell. There has been very little success in changing the calcium and phosphorus content of the albumen and yolk. It is possible, however, to increase the content of selenium, iodine and chromium. This has been done

through dietary supplementation of the hen. These three minerals are important in human health. There has been some interest, therefore, in promoting these eggs as designer eggs. Such products, however, have not yet appeared on the U.S. market.

Pigment content

The color of the yolk is a reflection of its pigment content. In addition, the type of pigment in the egg and its concentration are directly influenced by the dietary concentration of any particular pigment.

Consumer preferences vary greatly on yolk color, even in the same country. Color is described on the basis of the Roche Color Fan (RCF). Yolk colors from 6 to 15 can be achieved by using only natural pigmenters obtained from natural raw materials. Natural sources can be from plants such as marigold, chili, or corn. The high protein blue-green algae known as Spirulina has also been shown to be a very efficient pigment source for poultry skin and egg yolk.

Recent research has shown that eggs may be beneficial in preventing macular degeneration, a major cause of blindness in the elderly. A recent study indicated that higher intake of carotenoids reduced the risk of age-related macular degeneration. The most effective carotenoids were lutein and zeaxanthin, which are commonly found in dark-green leafy vegetables, such as spinach and collard greens.

Most of the carotenoids in egg yolk are hydroxy compounds called xanthophylls. Lutein and zeaxanthin are two of the most common xanthophylls found in egg yolk. Lutein and zeaxanthin are high in pigmented feed ingredients such as yellow corn, alfalfa meal, corn gluten meal, dried algae meal, and marigold-petal meal. Fortunately, both lutein and zeaxanthin are efficiently transferred to the yolk when these various feed ingredients are fed to laying hens.

The egg processing industry has routinely produced highly pigmented yolks for use in bakery products, pasta and mayonnaise. Perhaps there would be a market for eggs having a higher level of lutein and zeaxanthin. Unfortunately, American consumers

prefer a lighter colored yolk and eggs from hens fed these xanthophylls will have more highly pigmented yolks. Perhaps the consumer can be educated to accept a darker yolk color. With a growing problem of macular degeneration in the elderly, the egg industry may want to seize this opportunity.

Pharmaceuticals

New biotechnology is being used to develop genetically modified chickens that produce compounds that can be harvested from the eggs. These compounds include insulin for the treatment of diabetes.

The hen, like all animals, produces antibodies to neutralize the antigens (viruses, bacteria, etc.) to which she is exposed to each day. These antibodies circulate throughout her body and are transferred to her egg as protection to the developing chick. Immunologists are taking advantage of the fact that the hen can develop antibodies against a large array of antigens and concentrate them in the egg. Specific antigens are now being selected and injected into the hen who develops antibodies against them. As new biotechnology knowledge is gained in this area, designer eggs in the future may be produced that result in a range of antibodies for treatment against snake venoms to the countering of microorganisms which cause tooth decay.

SPECIALITY EGGS

Eggs which have a special attribute which makes them attractive to a niche market are known as "speciality" eggs. A number of these eggs are available in stores. The packaging used, however, can often be misleading.

Cage-free or Free-roaming

The majority of commercial egg layers are housed in cages. Caging of hens has benefits for the birds, consumers and producers. The separation of birds from their faeces is advantageous in reducing the risk of disease and parasitic infections. Working conditions for producers are often better with cages than with other systems: automation is possible reducing the amount of physical labor, and dust and ammonia are usually less prevalent. Eggs are laid on

the sloping floor of the cage so that there is minimal contact between the egg and the hen. This decreases the possibility of bacterial contamination of the egg.

With regard to the welfare of the laying hens, cages have both advantages and disadvantages. While the issue of cages and animal welfare is still being debated, there are some consumers who prefer to purchase eggs produced from hens that are not kept in cages. In order to meet this niche market, some producers raise their birds in a "cage-free" or "free-roaming" system. It is important to note that "cage-free" does not mean that the birds are raised outdoors. Typically the birds are maintained on the floor of a poultry house. The higher production costs associated with this type of management system are reflected in the higher price for the eggs. The price of "cage-free" eggs is often twice that of regular eggs.

Often the packaging of "cage-free" eggs can mislead the consumer about the product they are purchasing. It is common to see designs on the egg cartons including chickens roaming free outdoors. This is not the case with "cage-free" eggs. The hens are still maintained indoors, just not in cages.

Free-range

"Free-range" eggs are produced from hens that are allowed to graze or roam outdoors. It is not necessary, however, for the hens to be outdoors all the time. Typically, the hens are housed in a poultry house that has access to the outdoors. The hens have the ability to go outdoors during the day, although they can also choose to stay indoors. The flock is usually locked indoors at night to protect the hens from predators. There is no set standard on how much range must be available for the hens.

Pature-raised

Pasture rearing of chickens is a modification of the free-range system. The birds remain on pasture all the time, but are confined within a portable pen. The pen is moved daily to give the birds access to fresh pasture. The portable pen usually has a portion covered to protect the hens from the elements.

Organic

Until recently there was no set standard for the production of organic poultry products. The USDA is currently working on developing legal standards. Many states, including Florida, have set standards for organic produce. To be certified organic, the eggs must be produced from hens that have been fed certified-organic feed which was produced without synthetic pesticides or herbicides, antibiotics, or genetically-modified crops. In addition, no synthetic pesticides can be used to control external and internal parasites. Typically, organic eggs are also produced from hens in cage-free systems.

Fertile Eggs

Almost all eggs produced commercially are infertile. Roosters do not have to be present for hens to lay eggs and roosters are, therefore, not kept with laying flocks.

When there is an excess of hatching eggs in the poultry meat industry, eggs from broiler breeder flocks can be sold for human consumption. A large percentage of these eggs will be fertile. Fertilized eggs are safe to eat. There is no nutritional difference between fertilized and unfertilized eggs. The embryo does not develop in fertilized eggs that are refrigerated soon after laying.

Additional Notes:

3. Perilla (*Perilla frutescens*), a member of the family Labiatae, is an annual herbaceous plant native to Asia. It is also known as the Asian Beefsteak plant. The leaves are used as spice and in pickled food in Japan, however it is cultivated as a foliage plant in foreign countries. Perilla herb oil is a natural spice with many uses. It is a pure plant extract, and contains no animal oils. Omega-3 fatty acids is the important ingredient of perilla oil.
4. Chia is a common name often used for several *Salvia* species. It is a member of the Mint (Labiatae) Family. For centuries Chia was of great economic importance to Native Americans of the Southwest and California coast. The parched seeds of the Chia were ground to make the staple flour, pinole. Indians also placed the seeds in water to make mucilaginous poultices and beverages. An infusion of the seeds was valued by Spanish Missionaries as a fever remedy and as a poultice for gunshot wounds.