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Designer Eggs: A Future Prospective

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ABSTRACT

With the advancement of science, there is a rising interest in poultry biotechnology for changing the composition of egg by nutritional as well as genetic manipulations for the human well beings. These alterations are in change in cholesterol level, fatty acids and adding therapeutic pharmaceutical compounds etc. For acceptance of this designer egg we have to address some of the legal, ethical and social aspects along with its economic production.

Key words: Designer egg, human health, cholesterol, fatty acids

INTRODUCTION

Egg is natural life supporting chemical storehouse which provides highly nutritious food including essential vital nutrients for humans. Due to this nutrient profile, low cost and variety in its utilization as food, it is one of the most popular foods in almost all the world. The animal products contribute most of total lipids, saturated fats and cholesterol in human diets. However, recently the awareness and phobia of high cholesterol decreases the consumption (Djousse and Gaziano, 2008). With this changing social and eating behaviour, the egg should be of special value so that it can compete with other food products. For this egg have to be designed in such a way which increase its properties according to the need of the changing scenario. Designer eggs are those in which the content has been modified from the standard egg in terms of high vitamin and minerals, lower cholesterol, high omega fatty acids and added pharmaceutical compounds.

High vitamin content: Designer eggs can be produced with higher concentrations of several vitamins particularly vitamin A and E. Although, the vitamin content of eggs varies with the diet of hen but the hen may also differ in transferring the different vitamins with different efficacy. It is highest for vitamin A (60-80%), vitamin B12, riboflavin, biotin and pantothenic acid (40-50%), vitamin D3 and vitamin E (15-25%). So the attention should be there for the economic production of high vitamin eggs.

High mineral content: As we know that most of minerals particularly calcium and phosphorus are present in egg shell. So altering the calcium and phosphorus level of edible portion of egg

(albumin and yolk) is very difficult. However, scientists have achieved the success in increasing the micro mineral contents of these portion especially selenium, iodine, zinc, copper and chromium by dietary supplementation. Iodine deficiency exists in many developing countries including India, so eggs could be a good source for its supplementation (Kaufmann *et al*., 1998). Selenium level in eggs can be increased by incorporating the selenium yeast in diet of hens.

Alteration in pigment content: The yolk colour is the indicator of pigment content of egg and varied with dietary supplementation such as plants viz., marigold, chilli or corn; blue green algae viz., spirulina. Recently in a study, it was found that high intake of carotenoids reduced the macular degeneration, a major cause of blindness in the elderly.

Low cholesterol: An average sized egg contains approximately 200-220 mg of cholesterol. Many researchers have tried to reduce cholesterol level of chicken eggs by the use of genetics, nutrition or pharmacology intervention (Hargis, 1988; Elkin *et al*., 2003; Kim *et al*., 2004; Elkin, 2007). Supplementation of chromium to laying hen diets at concentrations of less than 1 ppm have been shown to lower egg cholesterol and also improve the interior egg. The low cholesterol eggs can be produced by feeding a all-vegetarian diet rich in protein and fiber fortified with vitamin E.

Fat and fatty acid profile: Although, change in the total fat contents in the diet of poultry does not significantly affect the total fat in the eggs but we can change the fatty acid profile of egg by the alteration in the fat in the diet of poultry. Various studies suggests that high amount of Polyunsaturated Fatty Acids (PUFA) in the diet of human beings promote the infant health and reduces the chances of atherosclerosis, heart attack and stroke (Dyerberg and Bang, 1979). The inclusion of safflower oil (Jia *et al*., 2008), marine algae (Herber and van Elswyk, 1996), fish oil (Gonzalez-Esquerra and Leeson, 2000; Shimizu *et al*., 2001), fish meal (Nash *et al*., 1995, 1996) and vegetable oil in feeds of the poultry increases the omega-3 fatty acid content in the egg yolk which is vital nutrient for adult and children (Holman *et al*., 1982; Bjerve, 1991). The beneficial effects of omega-3 fatty acids are faster development and enhanced functioning of brain, less chance of heart attack, better oxygen deliver to tissues and some support in rheumatoid arthritis, inflammatory disorders and other diseases (Yashodhara *et al*., 2009). High content of this fatty acid also increases the keeping quality and shelf life of the eggs. Studies have also been conducted on the egg having the lower saturated and unsaturated fatty acid ratio by feeding the hen with canola oil.

Pharmaceutical alterations: With the advancement of biotechnology, we can produce genetically modified chickens which then produce the eggs containing the desired compound e.g., insulin for the treatment of diabetic patients.

Biological compounds: Like many other animals, chicken can also produce antibodies that can neutralize the antigens of bacteria, viruses etc. These antibodies circulate in the blood and transferred to eggs for the protection of chicks. Researchers are trying to take the advantage of this fact and in future become successful to develop antibodies against battery of antigen and concentrate in egg. We can expect the designer eggs containing the antibodies (anti-venom) against snake venom.

CONCLUSION

Designer egg enriched with vitamins, minerals and other nutrients like fatty acids can be not only a good nutritional product but also a good vector for the delivery of pharmaceuticals and biological products like antibodies for human health. Despite all these promising prospects, there is a tendency among humans to resist change, particularly those of transgenic. Thus, the future of biotechnologically modified foods is at crossroads even after three decades of promising results. The future of the poultry industry is not just about producing more and more eggs but about producing more eggs of the right kind. Thus, we can expect that in future poultry farmers may be the producers of "designer eggs".

REFERENCES

Bjerve, K.S., 1991. Omega-3 fatty acid deficiency in man: Implications for requirement of α-linolenic acid and long chain omega-3 fatty acids. World Rev. Nutr. Diet, 65: 133-142.

Djousse, L. and J.M. Gaziano, 2008. Egg consumption in relation to cardiovascular disease and mortality: the Physicians? Health Study. Am. J. Clin. Nutr., 87: 964-969.

Dyerberg, J. and H.O. Bang, 1979. Homostatic function and platelet polyunsaturated fatty acids in Eskimos. Lancet, 2: 433-435.

Elkin, R.G., 2007. Reducing shell egg cholesterol content. II. Review of approaches utilizing non-nutritive dietary factors or pharmacological agents and an examination of emerging strategies. World's Poult. Sci. J., 63: 5-31.

Elkin, R.G., E.J. Furumoto and C.R. Thomas, 2003. Assessment of egg nutrient compositional changes and residue in eggs, tissues and excreta following oral administration of atorvastatin to laying hens. J. Agric. Food. Chem., 51: 3473-3481.

Gonzalez-Esquerra, R. and S. Leeson, 2000. Effect of feeding hens regular or deodorized menhaden oil on production parameters, yolk fatty acid profile and sensory quality of eggs. Poult. Sci., 79: 1597-1602.

Hargis, P.S., 1988. Modifying egg cholesterol in the domestic fowl: A review. World's Poult. Sci. J., 44: 17-29.

Herber, S.M. and M.E. van Elswyk, 1996. Dietary marine algae promotes efficient deposition of n-3 fatty acids for the production of enriched shell eggs. Poult. Sci., 75: 1501-1507.

Holman, R.T., S.B. Johnson and T.F. Hatch, 1982. A case of human linolenic acid deficiency involving neurological abnormalities. Am. J. Clin. Nutr., 35: 617-623.

Jia, W., B.A. Slominski, W. Guenter, A. Humphreys and O. Jones, 2008. The effect of enzyme supplementation on egg production parameters and omega-3 fatty acid deposition in laying hens fed flaxseed and canola seed. Poult. Sci., 87: 2005-2014.

Kaufmann, S., G. Wolfram, F. Delange and W.A. Rambeck, 1998. Iodine supplementation of laying hen feed: a supplementary measure to eliminate iodine deficiency in humans? Z Ernahrungswiss, 37: 288-293.

Kim, J.H., S.T. Hong, H.S. Lee and H.J. Kimt, 2004. Oral administration of pravastatin reduces egg cholesterol but not plasma cholesterol in laying hens. Poult. Sci., 83: 1539-1543.

Nash, D.M., R.M.G. Hamilton and H.W. Hulan, 1995. The effect of dietary herring meal on the ω-3 fatty acid content of plasma and egg yolk lipids of laying hens. Can. J. Anim. Sci., 75: 247-253.

Nash, D.M., R.M.G. Hamilton, K.A. Sanford and H.W. Hulan, 1996. The effect of dietary menhaden meal and storage on the omega-3 fatty acids and sensory attributes of egg yolk in laying hens. Can. J. Anim. Sci., 76: 377-384.

Shimizu, Y., K. Arai, S. Ise and H. Shimasaki, 2001. Dietary fish oil for hens affects the fatty acid composition of egg yolk phospholipids and gives a valuable food with an ideal balance of n-6 and n-3 essential fatty acids for human nutrition. J. Oleo Sci., 50: 797-803.

Yashodhara, B.M., S. Umakanth, J.M. Pappachan, S.K. Bhat, R. Kamath and B.H. Choo, 2009. Omega-3 fatty acids: a comprehensive review of their role in health and disease. Postgrad. Med. J., 85: 84-90.