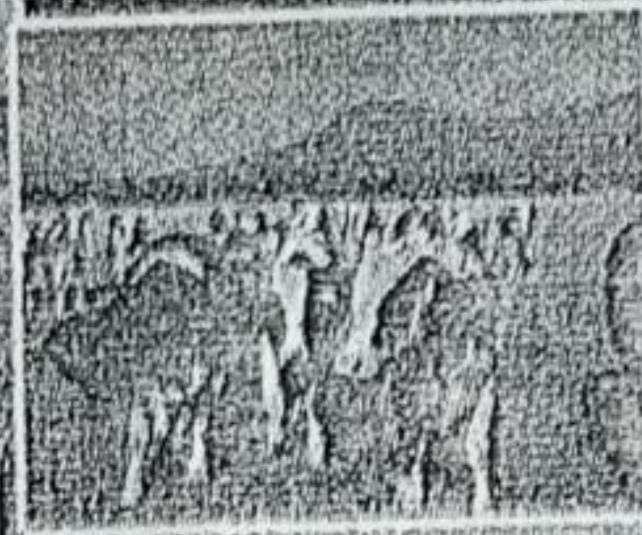
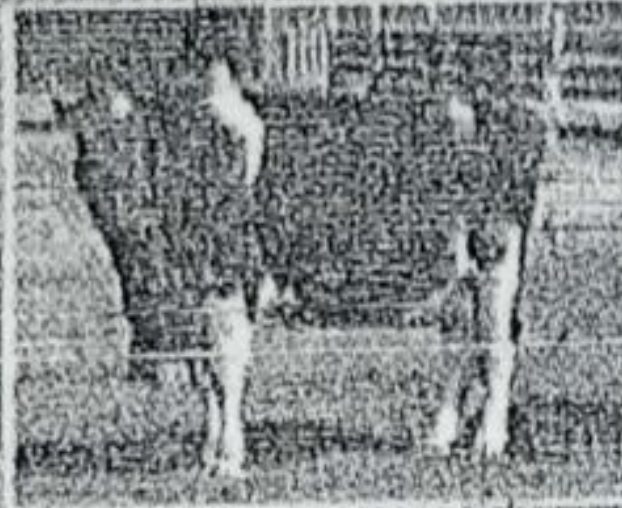


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SUSTAINABLE ANIMAL PRODUCTION FOR NATIONAL FOOD SECURITY AND POVERTY ALLEVIATION

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CHOLESTEROL – A CONTROVERSIAL COMPONENT OF POULTRY EGG: A REVIEW

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Abstract

Egg is a very cheap source of animal protein. The presence of cholesterol in it is making some people to be abstaining from its consumption for the fear of atherosclerosis. This fear is so much despite the fact that the level of animal protein consumption per day in developing countries is still below the expected. Most of the people concerned are ignorant of the fact that endogenous production of cholesterol is much and can be elevated by other sources and habits other than egg consumption. Consumption of fibrous food, low fatty meats and avoidance of cigarette smoking and coffee drinks with regular exercise are ways of avoiding atherosclerosis. Egg can therefore be consumed at any age without the fear of having cardiovascular or cerebrovascular diseases among people in developing countries where there is need to increase the daily intake of animal protein.

Keywords: Eggs, cholesterol, heart disease

Introduction

Cholesterol is a waxy substance that occurs naturally in all parts of animal body. It is present in cell membranes of the brain, nerves, muscle, skin, liver, intestines and heart. It is also a precursor of large number of equally important steroids which include the bile acids, adrenocortical hormones, sex hormones, D vitamins, cardiac glycosides, sitosterols of the plant kingdom and some alkaloids. (Gurr and Harwood, 1991). Cholesterol can be stored in most tissues as cholesteryl ester and this form is a factor leading to cerebrovascular and cardiovascular diseases (Spady *et al*, 1993). Atherosclerosis is a vascular disease caused by the blockage of the arterial walls by cholesterol deposition thereby interfering with the smooth flow of blood within the body. Continuous deposition of cholesterol may lead to the narrowing of the coronary arteries which can lead to cases of angina and heart attack.

Meanwhile, cholesterol is found in egg yolk hence the fear of consuming eggs by some people even in developing countries like Nigeria. However, there is need for sincere clarification on the correlation between egg consumption and cases of cerebrovascular and cardiovascular diseases.

Background

Chemical nature of cholesterol: The chemical formula of cholesterol is $C_{27}H_{45}OH$ and the chemical name is 5-cholesten-3 β -ol. It can be synthesized from the conversion of Acetyl-coA to 3-hydroxy-3-methylglutaryl-CoA (HMG-CoA) and later to mevalonate. Mevalonate will then be converted to Isopentenyl diphosphate which will later condense to form squalene which will be converted to Lanosterol and finally to cholesterol (Russell, 1992).

Types of cholesterol: There are two types of cholesterol; Low Density Lipoproteins (LDL) and High Density Lipoproteins (HDL). The LDL is usually referred to as the bad type of cholesterol because of its significant effect on the risk of heart attack and stroke. Its value demands higher concern in differential cholesterol analysis than the total blood cholesterol (Kane and Havel, 1986).

LDL is the ready source of cholesterol into vital parts of animal body. Its accumulation in combination with

other substances can form plaque within the arteries thereby making the less flexible and causing reduction in the pathway for the blood leading to a condition medically known as arteriosclerosis. (Mendez *et al*, 1991).

HDL is the better type of cholesterol that clears away cholesterol and related substances from the arteries to the liver. This type of cholesterol is highly desirable within the animal body (Schonfeld, 1995).

Need for cholesterol: Cholesterol is needed within the animal body for the followings:

- synthesis of the bile acids
- synthesis of Vitamin D
- synthesis of steroids such as corticosteroids and sex hormones (Tall, 1995).
- protection of damaged tissue or cells (Christie, 1982).
- Constituent of cell membranes of many vital tissues and organs.

Sources of cholesterol to human body: Endogenously, human bodies are producing cholesterol on daily basis. The liver is the site for the production of cholesterol from where it will be transported to the sites where it is needed (Cullis *et al*, 1982). There is also dietary sources cholesterol from the food eaten. Food items such as cod liver oil, egg yolk (Michael *et al*, 1984), cold-water fish, dairy products and organ meats such as liver, kidney, viscera and brain are rich sources cholesterol into human bodies. Meanwhile, the fat content of a food is a not a good indicator of its cholesterol content. Liver and some other organ meats are low in fat but very high in cholesterol (Enig, 2000).

Issue at Hand

Poultry egg consumption and fear of cholesterol

The question of possible deleterious effect of consumption of high levels of animal products particularly relating to intake of saturated fats and cholesterol has received much attention in developed countries in recent years and remains controversial (Bradford, 1998). It is popular in some circles to attribute obesity and associated health problems to high

intakes of animal fats. While animal products are part of the problem, the primary problem is total food intake. The scientific evidence with intake of animal products only is weak (Harper, 1993). The issue of dietary cholesterol is particularly controversial. It is generally agreed that high blood cholesterol predisposes the heart to disease. This then led to widespread recommendations to the general population to reduce cholesterol intake. However, most of the cholesterol circulating in the blood of each individual is synthesized endogenously (CAST, 1997). The level in food from animal is of little concern because when compared to highly saturated fats, dietary cholesterol has minimal effects on plasma cholesterol in most people. Therefore, for many people in developing countries with low intakes of animal products currently, an increase in this component of their diets is expected to improve their health. This is especially true for young children.

There is this undue fear toward consumption of poultry eggs with the impression that egg is the sole contributor of cholesterol to human diets. The situation is so sympathetic that adults reaching age of forty years will start abstaining from eating poultry eggs despite the pro-egg campaign slogan of "one egg per person per day" especially here in Nigeria. While not disputing the fact that egg contains cholesterol, its consumption by adults at the rate of one egg of about 60g per day can not predispose the consumer to having arteriosclerosis. In fact, the level of protein consumption and that of animal sources in developing countries is still below the expected level due to poverty.

In developed countries where almost all of the food items contain egg, people are not abstaining totally from egg consumption. In developing countries, cake is the only common food item containing eggs and how many people are consuming cake on daily basis in these countries? The figure will be very few if any at all. So why are we running away from egg which is a cheaper source of animal protein?

Meanwhile, contributions to higher level of blood cholesterol from endogenous synthesis, emotional

stress, smoking, coffee drinks and uncontrolled appetite for some meat organs such as heart, liver and kidney are enormously greater than the dietary contribution from egg yolk (Tumanova *et al.*, 2004). Genetically, obese people are usually prone to higher level of blood cholesterol.

It is better therefore to focus on ways of reducing the endogenous production of LDL and to avoid lifestyles that can precipitate high blood cholesterol as earlier mentioned.

Methods of avoiding high level of LDL: Blood level of LDL can be regulated to normal through the followings:

- consumption of diet which is low in cholesterol and saturated fat.
- regular physical activities to maintain a healthy weight,
- avoid smoking and excessive coffee drinks,
- cultivate the habit of taking fibrous food such as fruits, vegetables, whole grain and cereals. Fibres help to regulate appetite by creating a feeling of satiety. It enhances intestinal health and modulates blood sugar. It also reduces LDL and increases HDL (Strauss, 1998).

Measurement of blood cholesterol level: Serum cholesterol can be determined with the enzymatic methods as described by Sigma (2001) and is usually expressed in mg/dl (milligram per decilitre). Total cholesterol in a given sample is the sum of LDL cholesterol, HDL cholesterol and 20% of the triglyceride. Cardiac risk ratio (CRR) is total cholesterol (TC) divided by the HDL (TC/HDL). A CRR value greater than 7 is considered to be a warning signal. According to the American Heart Association on National Cholesterol Education Programme in 2002, below is the normal range and desirable levels of differential cholesterol in an adult human:

Lipid	Normal range (mg/dl)	Desirable level (mg/dl)
Total cholesterol	170-210	<200
LDL cholesterol	60-140	<130
HDL cholesterol	35-85	<40
Triglycerides	40-150	<135

Conclusion

Egg is an important animal protein food that is highly nutritious (Delgado *et al.*, 1998). The amino acid profile of egg is excellent and it is useful for the young and old ones. Abstaining from eating eggs by older people is not advisable, rather, they should watch their appetite

for fatty meats, organ meats and avoid habits such as smoking, coffee drinks and learn how to manage stress. While supporting the slogan of "one egg per head per day", I wish to add that "egg is life out of life for life, let us keep on eating it to be alive".

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