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Table Egg Production and Consumers Safety: A Review

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ABSTRACT

The high demand for poultry products (meat and eggs) has necessitated research into ways of increasing the productivity per bird. Commercial egg producers all over the World have been exploring ways of increasing the number of eggs produced by a hen and enriching eggs with valuable nutrients that could be very vital to normal growth of the body in addition to those already present in the egg. Such intensive systems of production have often used chemicals (pesticides, antibiotics, feed supplements etc.) which may accumulate in the egg and cause public health hazards. Microbial contamination of eggs in the process of production, handling and marketing has also been of a major public health concern. This paper reviews some of the ways table eggs can get contaminated and become unsafe for human consumption, suggesting some measures for improving consumer's safety.

Key words: Table eggs, contamination, public health

INTRODUCTION

The increase in the world population and the increasing awareness of the importance of animal proteins in the diet has resulted in an increase in the demand for these products. Commercial egg producers all over the world have been exploring ways of increasing the number of eggs produced by a hen and enriching eggs with valuable nutrients that could be vital to normal growth of the body in addition to those already present in the egg (Kukwi, 2000).

Adequate nutrition, proper management and disease control are necessary for maintenance of normal growth, egg production, hatching and long productive life in poultry (Akinyemi *et al.,* 1987). A number of feed supplements and chemicals are being used with the ultimate aim of increasing productivity in poultry and preventing or controlling diseases. While these feed supplements and drugs help increase egg number, they may also pose a serious problem to consumers through toxic residues from eggs laid by hens under such management system. This is more so in developing countries where little or no attention is paid to the recommended withdrawal period of veterinary drugs (Kukwi, 2000). When drug withdrawal periods are not well adhered to their residues may occur in animal products and constitute health risks to the consumer (Crosby, 1991). In addition microbial contamination of badly stored eggs is common and the organisms involved could be of public health significance. This paper reviews some possible ways of poultry egg contamination and their public health significance.

Chemical residues in eggs

Drug and pesticide residues in edible tissues and eggs are a human safety concern. Possible sources of these contaminants in the poultry production chain are feed, water, air, soil and environment (Kan, 2002). The causes can be deliberate use of pesticides, fumigants, fungicides and related agricultural products on the feed, birds or the buildings or food colouring pigments in the feed which will give rise to residue levels in the abdominal fat and yolk (Kan, 2002).According to Kan (2002) some chemicals have carry-over effect from yolk to egg and long term intake of such chemicals (residues) can have some untoward or sensitizing effect on consumers of the residue containing eggs.

As litter eating is common in poultry (Hetland *et al.,* 2004) birds that are provided with chemically treated wood

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to increase their welfare may pick up traces of the used chemical. Pentachlorophenol, previously widely used as a wood preservative may cause residues in animals both via the oral route (Butler and Frank, 1991) or by absorption through the skin (Qiao *et al.,* 1997). Malathion, a well known ectoparasiticide used in poultry could not be recovered from the egg after dosing laying hens (Schenck and Donoghue, 2000). Recently, Grob *et al.* (2001) drew attention to contamination of eggs with olefins and n-alkanes due to the incorporation of mineral oil or paraffin oil into the feed. Studies carried out in the United States of America (Stephens *et al.,* 1990; Petreas *et al.,* 1991; Stephens *et al.,* 1995) and Switzerland (Schuler *et al.*, 1997) have shown that when chemically contaminated soils are incorporated into poultry diets the levels of the contaminant increases in eggs or body fat.

Penicillin antibiotic is the most incriminated drug in hypersensitivity related to consumption of residues in animal products and this can be fatal in the exposed individuals (Guest, 1976). Consumption of penicillin residues (even in minute quantities) have been reported to have health hazards (Dipeolu and Ojekunle, 2005). Donoghue *et al.* (1994) reported that developing yolks incorporate both ampicillin and oxytetracyclin residues.

Many of these residues are preferentially deposited in the egg yolk rather than the albumen (Katz *et al.,* 1973; Davidson *et al.,* 1984; Roudaut *et al.*, 1987, Nagata *et al.,* 1992, Donoghue *et al.*, 1994; Ridley *et al*., 1998). This may be a consequence of the unique chemical characteristic of the yolk (i.e., higher lipid content) as chemicals that are fat soluble get access to high liquid areas readily. Normally, as the circulating concentration of a chemical increases; there is a corresponding increase in the amount in the tissue. Conversely, as the circulating concentration of the chemical declines as a result of excretion and/or metabolism the amount in the tissues also declines as it transfers back into the circulation. However, as far as eggs are concerned, residues transfer into preovulatory yolk but do not appear to transfer back and are sequestered until the developing yolks are ovulated (Donoghue, 2001). Thus, even chemicals with an extremely short half life may be stored and released in laid eggs days or even weeks after the chemical has been depleted from the rest of the bird (Donoghue, 2001) and remain a human health concern.

Microbial contamination of eggs

Another unseen quality of eggs is that of microbial content. Microorganisms can gain access to an egg either from an infected hen (transovarian infection) or through the spores or cracks. If cracked eggs pass through the system of production and marketing undetected they can easily be contaminated and constitute a risk to food safety (Bain, 2005). Microbial spoilage and low quality of table eggs and the transmission of egg born diseases is common (Kukwi, 2000). Bacteria isolated in eggs include *Salmonella, Bacillus, Proteus, Klebsiella, Staphylococcus* and *Streptococcus SPP* (Jourdain, 1980; Kukwi, 2000). Commonly incriminated moulds are *Penicillium, Sporotrichum* and *Cladosporium,* which penetrate the shell spores and can be detected on the inner aspect of the shell in the form of spots or patches (Jourdain, 1980; Kukwi, 2000; Smith, 2001). Such eggs are unfit for human consumption.

Foods of animal origin, especially poultry and poultry products, eggs and egg products, are often implicated in sporadic cases of outbreaks of human *Salmonellosis* (Bryan and Doyle, 1995). The latter is an acute gastrointestinal disease usually lasting 4 to 7 days (Messens *et al.,* 2005). Death from *Salmonellosis* may occur in high risk population groups (Lin *et al.*, 1997). Foods associated with *Salmonellosis* outbreak include eggs and egg products in 68.2% of the cases (WHO, 2001).

Some consumer safety measures

Eggs remain suitable for human consumption many days after laying (Kukwi, 2000). The gelatinous material present on the surface of freshly laid eggs tends to prevent the entry of microorganisms (Kukwi, 2000; Smith, 2001). Refrigeration can inhibit bacterial growth and preserve eggs for months (Oluyemi and Roberts, 1988; Kukwi, 2000; Smith, 2001). According to Smith (2001) immersion of eggs in lime water or mineral oil or coating the shell with wax or petroleum jelly improves their keeping quality.

Many countries have regulated the use of pesticides, drugs and food colouring pigments with the view of minimizing the risk of residues in eggs and other animal foods. Monitoring for residues of antibiotics is usually an integral part of quality control measures for animal products in most developed countries (Berends *et al.,* 1993; Kindred and Hubbert, 1993; Nicholls *et al.,* 1994). Very recently the European Commission has adopted a directive to reduce the level of a potentially harmful food colouring pigment, canthaxanthin that is allowed in animal feed following scientific assessment establishing a link between high canthaxanthin intake and eyesight problems (WHO, 2003). The Food Animal Residue Avoidance Databank (FARAD) in Nigeria is specifically targeted to prevent residue contaminated animals and animal products from entering into the human food supply (Networking and Professional bodies update, 2000).

In conclusion, while eggs are nutritionally important, they may also constitute a danger to consumer's health. In order to achieve maximum safety of egg consumption, farmers, animal nutritionists, veterinarians, all categories, of people involved in the production and marketing of eggs as well as food and drug regulatory agencies must work

hand in hand.

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