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Egg: A Review on its Microbial Content

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Abstract:- This review shows that it would be more safety to prefer market eggs from the cooler cabinets with cold chains. It is necessary to be more careful about village egg consumption because of their microorganism load which can penetrate into eggs by outdoor sale conditions like heat and moisture. In production, large variances in hatchability among chickens are frequently observed, even if the hens were from the same breed, of the same age, raised in the same environment, and if their fertile eggs have a similar quality (Wang et al., 2019). Therefore, the influence of egg internal constituents on hatchability must be considered.

Keywords:- *Egg; Microbial Content; Hatchability.*

I. INTRODUCTION

Animal origin foods such as meat and egg products of poultry are concerned as the general reason for a food-borne infection induced by micro-organisms (Sabarinath et al., 2009; Casey et al., 2012). Egg quality can be affected by the contamination of eggs and products with microbes. This can lead to pathogen transmission and consequently spoilage and this causes foodborne infection or consumer poisoning. Microbial contaminations of eggs commonly take place within few seconds after oviposition, transaction and till consumption (Indhu et al., 2014). Eggs may be infected vertically by; microorganisms from the blood of digestive tract, pass through egg yolk by blood (Gordon and Tucker, 1965) and horizontally depending on the environmental conditions after oviposition by various organisms (*Streptococcus* and coli-acrogens at artificial insemination) (Harry, 1963), cloacal contact with nest and litter material during oviposition. Other factors may also affect bacterial contamination such as dust in barns and storerooms, shell hygiene or structure (cracks, the existence of cuticle and membrane quality), season and storage conditions (Mallet et al., 2010).

The contamination of the eggshells with microorganisms is mostly through feces. Whenever eggs are laid, they can be contaminated with fecal material and microorganisms may pass through the shell and membranes by vacuum effect which occurred by heat loss of egg after lay. Microorganisms may reach the egg content by unsuitable long storage and transfer conditions (Keller et al., 1995). Contaminated eggs and products may lead to serious health risks when consumed raw or uncooked. The shelf life and food safety of eggs may be adversely affected by high levels of contamination. Nowadays good egg perception of consumers has changed from eggshell hygiene and physical properties into microbial unity by increasing awareness of food safety issues.

Many kinds of bacteria, such as *Escherichia, Micrococcus, Salmonella, Streptococcus, Staphylococcus, Aeromonas, Enterobacter, Proteus, Pseudomonas* have been determined on the shells of table eggs. Similarly, mold and yeast were also determined (Mayes and Takeballi, 1983; Ricke et al., 2001; Musgrove et al., 2004). On the other hand, the gram negative Enterobacteriaceae group isolated as a major contaminant of commercial chicken eggs (Arathy et al., 2009; Sabarinath et al., 2009). *Salmonella* is a gram-negative, selective anaerobic bacteria of the family Enterobacteriaceae. And eggs are one of the most common foods that cause *Salmonella* infections (Akbaş, 2014).

Storing eggs by cooling is a good method to prevent the growth of pathogens such as Salmonella spp. (EFSA, 2005). Some regulations regarding eggs in different regulations are stated as follows; transport and storage of eggs should be carried out at a constant temperature, providing the best hygiene conditions (EC, 2004-853), eggs must be purchased within 21 days after laying (EC, 2004-853) and the expiry date of eggs must be determined 28 days after laying (EC, 2008-589). Turkey is also a candidate country for future membership of the European Union. Turkish government prepared regulations for egg and egg products as Turkish Food Codex Microbiological Criteria (Regulation on Turkish Food Codex Microbiological Criteria, 2011) and Egg Notification (Regulation on Turkish Food Codex Egg Notification, 2014). Turkish regulations asked for storage at 5-8˚C from the 18th day onwards after the lay of eggs. *Enterobacteriaceae* load must be lower than 10^2 and free from *Salmonella spp*.

An egg is a biological system intended to ensure the health of the embryo and allow it to successfully hatch into a chicken (Wilson, 1997; Moran, 2007; Liu et al., 2018). During incubation, eggs provide nutrients and other necessities for the growth and development of the embryo. However, not every embryo will successfully develop into a chick. Factors affecting embryonic growth include maternal effects (breed, age, and maternal nutrition status) (King'Ori, 2011), rooster semen quality, incubation conditions (such as temperature, humidity, light, and ventilation), and egg quality (including egg weight, eggshell thickness, porosity, and shape index) (Heier and Jarp, 2001).

The growth and development of chicken embryos rely on the essential amino acids, lipids, carbohydrates, and minerals stored in eggs (Narushin and Romanov, 2002; Vieira, 2007; Ho et al., 2011; Yadgary and Uni, 2012; van der Wagt et al., 2020). The egg yolk is the main source of nutrients for embryo growth and it influences embryo viability (Peebles et al., 2000). The egg white mainly plays a role in resisting bacterial invasion and

provides nutrients to the embryo, which has been reported as necessary for the start of embryo development (Willems et al., 2014). Several studies have confirmed that certain functional proteins in eggs can influence hatchability (Muramatsu et al., 1990; Rehault-Godbert et al., 2014; Cheng et al., 2021). Other studies in mammals have demonstrated that microbiota from various maternal sites during pregnancy may potentially influence the health and passive immunity of offspring. The placental microbiota affects pregnancy outcomes (Pelzer et al., 2017; Nyangahu and Jaspan, 2019), and plays a yet unknown role in early embryonic development (Koren et al., 2012; Wen et al., 2021).

Initially, the egg white was considered sterile. However, a recent study discovered microorganisms inside the egg white (Lee et al., 2019). The presence of microorganisms has also been confirmed in egg yolks (Ding et al., 2022). Eggs are formed in the maternal reproductive tract, and the embryo in the egg grows and develops into a chick after 21 days of incubation. Previous research confirmed the presence of microorganisms in the maternal reproductive tract and digestive tracts of 1-day-old chicks (Pajurek et al., 2019; Zhou et al., 2021). Several studies have shown that hen gut and fecal microbes are associated with both egg formation and fertility (Elokil et al., 2020a, b). This suggests that microbes may have an effect on the reproductive traits or eggs of the hens. Although it has become clear that the egg yolk and white are not sterile, the microbial compositions of egg yolks and whites in fresh and hatching eggs, and their influence on hatchability, remain unknown.

CONCLUSION

In this review, the eggs from grocery should be taken with caution because of their microorganism content. The public should be warned and educated about the risks of consumption of raw and undercooked egg and egg products. Although the eggs were highly contaminated with total bacteria the absence of *Salmonella spp*. at the market, eggs are an encouraging factor for consumers.

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