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Short communication

PREVALENCE OF MICROORGANISMS OF THE *CAMPYLOBACTER* GENUS IN QUAIL (*COTURNIX COTURNIX*) EGGS

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Summary

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A number of bird species, such as quails, partridges and pheasants, are interesting and delicious culinary items, yet their thermal processing is often short and insufficient. The presence of microorganisms of the *Campylobacter* genus in the eggs of those species has not been established. The present study has determined the existing campylobacterial contamination in different batches of quail eggs. The samples were taken from eggs in the day they were laid, as well as from eggs kept at room temperature for 5 days. Despite the established presence of *Campylobacter* in the excrements (63.3%) and the cloaca (76.7%) of the laying birds, no contamination was found in the egg samples.

Key words: *Campylobacter* spp., eggs, Japanese quail (*Coturnix coturnix*)

Toxic infections caused by microorganisms of the *Campylobacter* genus are food-borne diseases, the primary source of which are poultry and poultry products (Stern *et al.*, 1995; Corry & Atabay, 2001). In a number of countries, the reported cases of campylobacterial gastroenteritis in humans are considerably more numerous than infections caused by *Salmonella* bacteria (Rautelin & Hänninen, 2000; Wedderkopp *et al.*, 2000). In poultry farms for broiler fattening, *Campylobacter* infection in birds occurs around the 2nd to 3rd week of life, with a quick spread to 100% of the animals (Jacobs-Reitsma *et al.*, 1995). The pathogen is preserved until the end of the feeding period and can be detected during the slaughterhouse processing (Berrang *et al.*, 2000) and in the ready poultry products (Ono & Yamamoto, 1999; Musgrove *et al.*, 2003). Reference data point out the presence of *Campylobacter* spp. in the parent herds, including bacteria inside the reproductive tract of gallinaceous birds (Camarda *et al.*, 2000; Buhr *et al.*, 2002; Hiett *et al.*, 2003).

Eggs, as a food product, are examined by a number of authors to determine bacterial contamination and to assess it as a risk factor for the consumer's health. Their scientific interest has been focused on detection of *Salmonella* spp., *Listeria* spp., *Campylobacter* spp, Enterobacteriaceae, etc. on the eggshell and in egg content (Allen & Griffiths, 2001; Busani *et*

al., 2005; Adesiyun *et al*., 2006; Humphrey, 2006; Jones *et al.*, 2006). The presence of microorganisms, especially such that pose a hazard to the consumer's health, is becoming more significant in the implementation of current food safety requirements.

In this study, we aimed at establishing the contamination and species variety of *Campylobacter* spp. in quail eggs, taken on the day of laying and after 5 days in storage.

For the duration of this study on the presence of *Campylobacter* spp*.,* 90 samples from fresh (on the day of laying) quail eggs and 90 samples from eggs kept for 5 days at room temperature were obtained. The samples originated from different batches of quails, reared in batteries. Under sterile conditions, samples from the eggshell, egg white and yolk were taken from each egg. From each batch of quails, bulk samples of excrements from the cages and swab cloacal samples were obtained from a number of birds (n=30).

The cultivation of the samples was carried out in enrichment broth with antibiotic selective supplement (Merck, 1.02249) as well as on selective *Campylobacter* agar (Merck, 1.02248), containing antibiotic selective supplement (Merck, 1.02249). The samples were incubated in microaerobic atmosphere at 37–42 °C for 48 hours total. Bacterial colonies that exhibited cellular, colonial, and biochemical characteristics identical with *Campylobacter* spp. were differentiated through API Campy ® (Bio Mérieux, 20800).

The results of the research showed that thermophilic campylobacteria were detected in 76.7% of the samples taken directly from the birds' cloaca and in 63.3% of the faecal samples from the cage floor.

From the total of 180 examined quail egg samples, taken on the day of laying, as well as after a 5-day storage period, no *Campylobacter* spp. contamination was detected neither on the eggshell, nor in its contents – egg white and yolk.

The results of our research indicated a high number of egg-laying quails that carried and shed organisms of the *Campylobacter* genus. The high percentage of microorganism detection suggests its long-term presence in segments of the digestive tract and the cloaca. The presence of thermophilic microorganisms of the *Campylobacter* genus (78.3% *C. jejuni* and 21.7% *C. coli*) in the digestive tract (cloaca) of quails, however, should be noted as a risk of microbial transition onto the eggshell, during the eggs' passage through the cloaca (the final stage of laying). The excreted and piled faeces on the cage's floor are a secondary threat factor for the contamination of laid eggs. In previous research trials, we found out *Campylobacter* spp. only in the caeca (80%) and liver (16.7%) of broiler quails (Vashin & Stoyanchev, 2005).

Despite the presence of campylobacteria in the cloaca (76.6%) and the excrements (63.3%) of quails, these microorganisms did not contaminate eggs and did not survive on their shell. An explanation for this fact can be found in the protective properties of the egg's cuticula, the fast drying of the eggshell after laying, and possibly, the low number of campylobacteria in the cloaca. Low environmental humidity and drying are factors with a negative effect on the campylobacteria capacity for survival. Some authors designate the lack of humidity, as well as oxidative stress as factors contributing to the *Campylobacter*'s transformation from highly viable and fast-moving forms into distressed and hardly culturable forms. In

the literature, the *Campylobacter* organisms in this protective form are designated as VBNC (viable but noncultivable campylobacteria). These forms, under specific conditions, may be transformed into vital forms again (Cappelier *et al.*, 1999; Chaveerach *et al.*, 2003). Higher temperatures, humidity, and lack of light are good conditions for the growth of microorganisms on the eggshell and within the egg contents. A combination of these factors is often created when eggs are kept under inappropriate conditions.

The research performed on stored eggs examined the possibility of contamination with *Campylobacter* spp., which could be under stress or in quantities below the threshold of microbiological detection methods, and their growth on the eggshell or in egg content during the storage period. The latter was limited to 5 days, which was enough time for the microorganisms to reproduce. Our results indicated that, after a 5-day period, no *Campylobacter* spp. contamination could be detected on the egg's shell or contents (egg white and yolk).

Similar studies, regarding superficial or deep bacterial contamination of eggs of gallinaceous birds have been a subject of scientific interest for a number of researchers. In their study, Jones *et al.* (2006) did not find *Campylobacter* spp. in the egg contents of 384 egg samples, and detected contamination on the shell in only 2 samples. Adesiyun *et al.* (2006) did neither find any *Campylobacter* spp. in egg samples taken directly from a farm or from marketplaces and supermarkets. Other bacterial species were found in 36.8% of the cases.

To determine the adhesive and invasive capability of *Campylobacter* microorganisms, Sahin *et al.* (2003) performed an experimental contamination of eggs. The results showed that campylobacteria have a limited ability to penetrate the eggshell, and with direct inoculation in the yolk, they survived up to the 14th day. The researchers did not detect microorganisms of that species either on the eggshell or in the egg content of eggs from the parent herds, designated for hatcheries.

In conclusion, microorganisms of the *Campylobacter* genus were found in the cloaca of 76.7% of egg-laying quails, and in 63.3% of the excrements in the bird cages, which are a potential source of secondary contamination of eggs. Quail eggs on the day of laying or after 5 days in storage are not sources of infection, concerning the studied microorganism. Campylobacteria were not found either on the eggshell or in the content of quail eggs.

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