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Contamination Routes of *S. Infantis* in food chain of broiler meat production and it's significance for public health

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Abstract

From each of three slaughterhouses, 50 samples of broiler neck skin were taken at slaughter line. A farm, from which the largest number of positive samples originated, was identified. In slaughterhouse 2, *Salmonella* was determined in 17 samples of which 11 samples originated from the same farm. At the beginning of broiler breeding, *Salmonella* presence wasn`t detected. However, after the second week *Salmonella* was found. All positive samples were identified as *Salmonella Infantis*. Comparing genetic similarity with the same strain originating from infected humans showed that ≥ 92 % of mutual genetics similarity was confirmed.

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1. Introduction

Salmonella has been recognized as a major and important foodborne pathogen for humans and animals over more than a century, causing human foodborne illness as well as high medical and economical costs[1]. However according to EFSA and ECDC report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2013[2] the decreasing EU trend in confirmed human salmonellosis cases observed in recent years was continued. Most

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Member States met their *Salmonella* reduction targets for poultry. In foodstuffs, the reported EU-level *Salmonella* non-compliance in fresh poultry meat also decreased. In 2013, a total of 82,694 confirmed salmonellosis cases were reported by 27 EU MS, resulting in an EU notification rate of 20.4 cases per 100,000 population. This represented a 7.9 % decrease in the EU notification rate compared with 2012, confirming a declining trend of salmonellosis. However, *Salmonella* remained the most frequently detected causative agent in the food-borne outbreaks reported (22.5 % of total outbreaks). From 2008 to 2013, the annual total number of *Salmonella* outbreaks within the EU decreased markedly by 38.1 %, from 1,888 to 1,168 outbreaks. As in previous years, eggs and egg products were the most common identified food vehicles, associated with 44.9 % of these outbreaks. In United States approximately, 1.4 million human *Salmonella* infections occur annually with assumption of only 2% cases reported to Centers for Disease Control and Prevention (CDC), resulting in about 160,000 hospitalizations with nearly 600 deaths[3,4,5]. Due to increasing population mobility and the wide distribution of feed/food products, *Salmonella* outbreaks and salmonellosis cases are occurring across state and national boundaries[6]. Therefore, monitoring of *Salmonella* occurrence in the meat-food supply (in particular, raw meat at slaughterhouses), is necessary due to public health implications[7].

1.1. S. Infantis prevalence in humans

Salmonella enterica subspecies *enterica serovar Infantis* (further in text *S. Infantis*) was confirmed as the cause of human salmonellosis in several countries and is the third most frequently isolated serovar of *Salmonella* (1.1%) after *S. Enteritidis* and *S. Typhimurium*[8,9]. For instance, in fowl (*Gallus gallus*) *S. Infantis* was the most commonly reported isolated serovar in 2013; in broiler meat, the most common serovars were *S. Infantis* and *S. Enteritidis*, while the *S. Senftenberg* was most commonly reported in feed intended for *Gallus gallus*, followed by *S.* Typhimurium[2]. In Hungary *S. Infantis* is responsible for about 5% cases of salmonellosis[10]. The results of research indicate that the most common serovars in humans, food and in poultry in Serbia are *S. Enteritidis, S. Typhimurium* and *S. Infantis*[11].

1.2. S. Infantis prevalence in broilers

In broiler flocks, 26 EU Member States met the reduction target set at ≤ 1 % for the two serovars (*S. Enteritidis* and *S. Typhimurium*). Hungary had the highest rate of *S. Infantis* in broilers (64% flock prevalence), followed by Poland with 8%, and Czech Republic with 2.5%, respectively[12,13]. *S. Infantis*, was the 3rd most frequent serovar in human cases, and the most frequently detected serovar (29,2%) amongst contaminated broiler carcasses in the EU[14].

1.3. Sources of contamination of humans and broilers

One of the current public health priorities in Europe is to improve the epidemiological surveillance of foodborne illness[15]. The Salm-gene project, a European collaboration for DNA fingerprinting for food-related salmonellosis, was launched in 2003[16]. Prevalence of *Salmonella* in fresh meat is directly related to the findings in animals and also depends on food processing in slaughterhouses[17].

Broiler production (farm breeding) is considered the most critical place for *Salmonella* contamination. The most of contaminated samples related with poultry production were: delivery-box liners (32.0%), faeces samples (31.2%), dust samples (25.0%), farming boots (19.7%) and feed from feeders (16.0%). However, the most important risk factors for *Salmonella* contamination of the flocks, at the end of the rearing period, were *Salmonella* status of farm house after cleaning and disinfection, as well as *Salmonella* status of day-old chick flocks and feed from feeders[18].

2. Biosecurity measures to control *S. Infantis*

Biosecurity measures encompass well-defined barriers aimed at preventing the entry of *Salmonella* on the farm[19], and to avoid the spread of salmonellosis if it is already presented[20]. Such enhancement of biosecurity is the most effective way to minimize the risk of disease introduction[21,22].