Salmonella risk profile of UK-produced hen shell eggs: Executive summary

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Quality assurance review log

Reviewer type	Reviewer	Risk assessment version and date distributed	Date comments addressed
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Background

A previous risk assessment from the Advisory Committee on the Microbiological Safety of Food (ACMSF) in 2016 concluded that due to the significant reduction in the risk from *Salmonella* in UK-produced hen shell eggs produced under a recognised farm assurance scheme (Lion Code or equivalent), the risk to consumers from eggs produced under these schemes was ‘very low’. This risk assessment led the FSA and FSS to update their consumer advice on the consumption of eggs in 2017, stating that vulnerable groups could consume raw or runny eggs produced within an assurance scheme.

This risk profile will examine the current situation of Salmonella in UK-produced table eggs, and the factors that may influence the current risk of *Salmonella* in UK-produced eggs and highlight any that have changed since the risk assessment provided by the ACMSF in 2016.

Hazard Identification

Non-typhoidal *Salmonella* is widespread in domestic and wild animals, and the environment, and can readily pass through the food chain. *Salmonella* is estimated to be one of the leading causes of foodborne disease in the UK. Eggs and egg products were the food type most commonly associated in *Salmonella* outbreaks in the UK between 2015-2020.

Exposure assessment

The prevalence of all *Salmonella* serovars in laying flocks in the UK in the period 2017-2021 was similar to 2009-2016 levels. The prevalence of regulated *Salmonella* serovars and *Salmonella* Enteritidis has roughly doubled in the 2017-2021 period. Levels of regulated *Salmonella* serovars still remain within the National Control Programme (NCP) requirements of 2% - in 2021, this was 0.23% in layers tested.

An EU ban on the use of formaldehyde-based products in animal feed was implemented in 2018 and was suggested as a contributing factor to an increase of *Salmonella* seen in broiler flocks but further evidence is needed to support this.

Eggs can be contaminated with *Salmonella* via direct contamination during formation, or indirectly after the egg has been laid. The major extrinsic factors of penetration of eggs by *Salmonella* are the bacterial strain, temperature differential, moisture, number of organisms present, and storage conditions. The main intrinsic factors are shell defects, cuticle and porosity of the eggshell. Cross contamination can occur at many points along the supply chain. During processing and packaging, potential areas of risk include those where the eggs are in close contact with each other, such as in the egg grader and rollers, where bacteria can be transferred from one egg to another. Additionally, an experiment involving inoculated cartons show Salmonella will transfer to eggshells from cartons.

Cross contamination can also occur during the breaking and processing of eggs before consumption - breaking eggs can transfer Salmonella to the hands or surfaces and whisking can spread Salmonella up to 40cm from the bowl.

Consumption of raw or runny eggs was investigated in the FSA Food and You 2 survey, with 61% of respondents never eating raw eggs, 22% never eating less-than-thoroughly cooked (LTTC) eggs and 8% never eat thoroughly cooked eggs.

Hazard characterisation

Symptoms of *Salmonella* infection can range from asymptomatic carriage to severe diarrhoea. This is usually self-limiting, however it can be more severe in vulnerable groups, including the elderly, pregnant women, the young, and immunocompromised, leading to systemic infection and death.

The median infective dose required to infect 50% of the population (ID50) for non-typhoidal *Salmonella* is high but varies between serovar and food vehicle, with a study by Teunis et al., 2010, suggesting the ID50 to be as low as 1.09×10^{1} colony-forming units in eggs.

Temperature can affect the viability of *Salmonella* on eggshells, with cold temperatures decreasing the growth of *Salmonella* in the egg yolk and albumen but increasing the survival of *Salmonella* on the eggshell surface.

Between 2015 and 2019, a total of 954 confirmed cases of salmonellosis were investigated as part of outbreak investigations and determined to be associated with consumption of eggs and/or egg products, in a total of 15 reported investigations. This is a similar number of cases per year as reported in the ACMSF risk assessment (2016). The majority of outbreaks (10/15) reported

fewer than 45 cases. The largest outbreaks occurred in 2016 (158 cases), 2017 (162 cases) and 2018 (259 cases). Data collected is provisional, and a full dataset has been requested from UKHSA. Two outbreaks of around 100 cases each were linked to Lion Code eggs. The ACMSF risk assessment had found only one small outbreak in 2009 linked to Lion code eggs.

Since the ACMSF report, the implementation of whole genome sequencing for *Salmonella* surveillance by the UK public health agencies has become routine. This has increased the sensitivity and specificity of case ascertainment in outbreak investigations, and confidence in source attribution.

Overall, analysis of *Salmonella* in UK-produced hen shell eggs does not indicate a need for a risk assessment at this time. Certain uncertainties and data gaps were identified that it would be beneficial to address before the commissioning of future risk assessments.