Salmonella risk profile of UK-produced hen shell eggs: Conclusions

This report reviewed recent evidence, including scientific peer-reviewed publication, and UK surveillance data, to determine whether the assumptions underpinning the ACMSF 2016 risk assessment on UK shell eggs remain appropriate and consider whether an updated risk assessment is necessary.

There is limited new evidence in the scientific literature with regards to *Salmonella* in eggs and the egg production environment since the risk assessment undertaken by the ACMSF in 2016.

Surveillance since 2016 shows there has been an increase in prevalence of *Salmonella* Enteritidis and regulated *Salmonella* serovars in general (but within the 2% NCP requirements) in laying flocks. The prevalence levels have not returned to the high levels seen in 80s and 90s, before vaccination was introduced.

Since 2016, the oldest flocks have increased from 60/70 weeks to 80/90 weeks old, which could lead to an increase in *Salmonella* prevalence in older flocks, although further research is needed to support this.

A ban on the use of formaldehyde-based products in animal feed was implemented in 2018. This has also been suggested as a possible contributor to the increased isolations of *Salmonella* in the broiler sector from 2018, although additional research is required.
A number of packing centres have made a change from single use cardboard trays to transport eggs, to re-usable plastic trays, which should be disinfected between use. This could lead to cross-contamination between eggs if the plastic trays are not washed adequately and could be linked to outbreaks that have occurred at packing centres in recent years, however more research is required to confirm this.

There is a lack of detail in data provided for outbreaks and additional data has been requested from UKHSA.

The total number of outbreaks and cases linked to consumption of eggs and egg products per year has not changed significantly since the 2016 ACMSF risk assessment. However, the ACMSF identified only one small outbreak in 2009 due to Lion Code eggs, whereas our data show at least two outbreaks with over 100 cases per outbreak associated with UK Lion Code eggs since 2016.

Overall, analysis of *Salmonella* in UK-produced hen shell eggs does not indicate a need for a risk assessment at this time.

5.1 Uncertainties and evidence gaps

5.1.1 Uncertainties

The key uncertainties of this risk profile are presented below in order of importance based on their effect on the risk levels:

- the number of outbreaks/cases associated with UK eggs and egg products, including eggs produced in assurance schemes; further information on the specific egg products involved in outbreaks (UKHSA data pending).
- the effect of the COVID-19 pandemic on the prevalence of *Salmonella* in eggs, underreporting of *Salmonella* cases, changes in the egg supply chain, including consumption behaviours, and whether site visits and audits done through assurance schemes have returned to usual pre-COVID levels or the affect this will have on the quality assurance of these schemes.
- lack of data on the transference of *Salmonella* during processing - whether *Salmonella* from contaminated eggs / eggshells could be transferred to the shells of other eggs during packing.
- investigation of *Salmonella* levels in eggs and egg products at retail
- the effects of flock types, such as free-range vs caged, and older flocks on the prevalence of *Salmonella*.
- the effect of the prolonged 2021-2022 Avian Influenza Prevention Zone on *Salmonella* levels in flocks.
- the effect of the formaldehyde ban in feed on *Salmonella* levels in flocks.
- the effectiveness of UV treatments applied in the eggs supply chain on *Salmonella* prevalence.
- how effectively *Salmonella* isolates currently circulating within the egg supply chain can proliferate within the egg albumen.
- the prevalence or presence of novel serovars of *Salmonella* and whether these are a significantly higher risk compared to current strains when found in the egg supply chain – in terms of virulence and antimicrobial resistance.
- whether internal contamination with *Salmonella* will lead to spoilage characteristics of eggs perceptible to consumers leading to a reduction in the consumption of these eggs.
- data and information on consumption of raw eggs, for example in cookie dough or as a protein source, without any cooking or mitigation processes.

5.1.2 Evidence gaps

These evidence gaps should be considered prior to undertaking a full risk assessment or commissioning research around *Salmonella* in eggs:

- UKHSA data for outbreaks 2016-2022
- change from cardboard to plastic trays at many packing centres & the effect on *Salmonella* cross-contamination
- older flocks and effects on prevalence of *Salmonella*
- impact of removing formaldehyde-based products from feed on prevalence of *Salmonella*
- literature on virulence of new serovars of *Salmonella* since 2016
- the effect of UV treatments applied in the eggs supply chain on *Salmonella* prevalence