WAGENINGEN
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Review of environmental sampling methods to detect *Salmonella* Enteritidis in laying hens

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Background

Eggs, contaminated with *Salmonella* Enteritidis are important sources of infections in humans. In the EU, programmes are set up to control *Salmonella* in commercial laying flocks by identification of infected flocks through sampling at farm level. In order to have an effective and efficient surveillance for *Salmonella*, it is important to know the sensitivity of the sampling methods.

The purpose of this study was a systematic literature review on sampling protocols for *Salmonella* detection in laying hens.
First, the review aimed at comparison of the within-flock prevalence in laying hens with the detection rate in environmental samples (including faecal samples). Secondly, the sensitivity of environmental sampling procedures to detect *Salmonella* in laying hens were compared.

Conclusions

- The review revealed lack of standardized way of sampling to detect *S.* Enteritidis in laying hens.
- Sensitivity of faecal and dust matrixes differed between caged and non-cages systems.
- Optimizing the sampling protocols may lead to improved *Salmonella* control programs and further reduction of salmonellosis cases in humans.

Results

The qualitative assessment revealed that eligible sources originated from a limited number of research groups, mainly from US (26%), UK (16%) and Australia (10%). Most frequent matrixes included faeces (Figure 1) and dust (Figure 2). Sample sizes and sampling locations of these matrixes were highly variable, impeding further analysis.

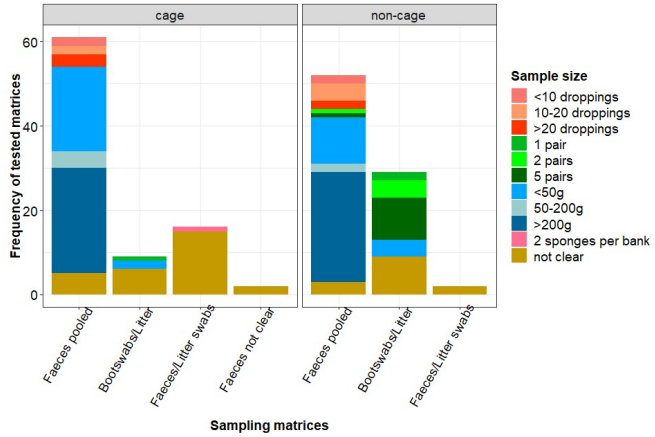

Figure 1. Variability of faecal samples within and between caged and non-caged layers.

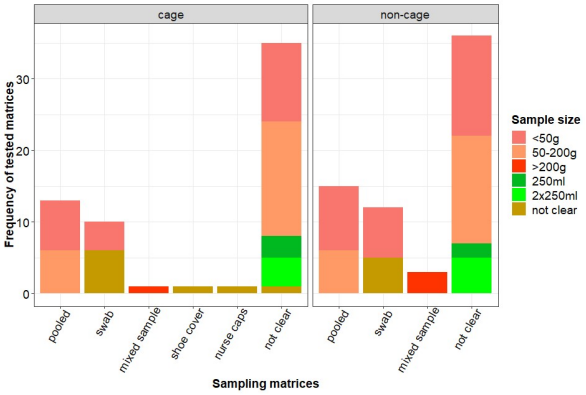

Figure 2. Variability of dust samples within and between caged and non-caged layers.

The meta-analysis of quantitative data was based on a limited number of publications, and confirmed the findings published earlier (Arnold, et al. 2014). Dust was a more sensitive method than faeces (OR=1.25, p=0.007) in caged flocks, however in non-cage system the dust had lower sensitivity than faeces (OR=0.62, p=0.001).

Detection of positive samples using any of the matrixes increased with an increase in prevalence in hens (OR=1.01, p<0.001). The prevalence in hens ranged between 0-63%, with 1.4% median.

Methods

- The review was conducted according to the PRISMA guidelines.
- Number of publications identified during the review is summarised on Figure 3.
- The publications used for data extraction were published between 1991 and 2021.
- The last search was performed on 12th January 2022.
- Uni and multivariate analyses were conducted on the quantitative data to compare the sensitivity of the different sampling matrixes and the effect of prevalence in hens.

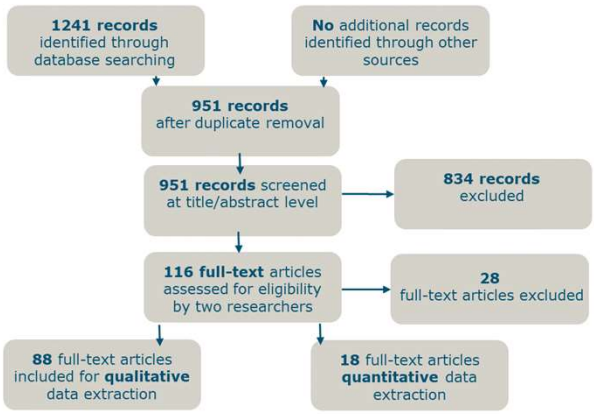

Figure 3. Methodology flow chart.

References

Arnold, et al. (2014) Epidemiol. Infect. (2014), 142, 1061–1069.

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