NEWSLETTER

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EURL *Salmonella*

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Editorial Note

Bilthoven, 2 October 2026

Dear colleagues,

I hope you had a nice and relaxing summer break. This year's summer was extremely warm and dry in the Netherlands, probably like in many other European countries. It is not easy to concentrate on work during these extreme situations, but we all tried to make the best of it.

Unfortunately, the organisation of this year's **Proficiency Tests (PTs)** is not as smoothly as we are used to. For the **PT on detection of *Salmonella* in canned tomatoes**, organised in April/May 2026, we had to cancel the mailing of the samples at the very last moment. On the day of the planned shipment of the samples, we observed that the content of several sample bags was leaking into the outer bag. As several sample bags were packed in one outer bag, there was a risk of cross contamination of all samples in this bag. Hence, we could not sent these samples to the participants and informed the NRLs-*Salmonella* that we would prepare new sets of samples and had to postpone the mailing with three weeks. To prevent leakage of the newly prepared samples, we additionally closed each bag with a sample bag clip. Luckily, this worked well and all, except two, participants were able to perform this PT at the later date. Thirty-three of the 35 participants fulfilled the criteria for good performance. The unsatisfactory performance of one laboratory was likely due to the long transport time of their samples. No technical explanation was found for the unsatisfactory performance of the other laboratory. For this laboratory a follow-up study is organised.

On Monday 21 September 2026, we sent the parcels for the **PT on Primary Production Stage 2026** to the participants. The matrix of this PT is chicken faeces adhering to boot socks. Unfortunately, Murphy's law hit this PT as well. Our courier service lost track of a pallet with 32 parcels in total and twelve of these lost parcels concerned the ones for this PT PPS 2026. The involved NRLs-*Salmonella* were informed immediately. During the rest of the week, we checked several times a day at the courier service if they already located the pallet but hardly any information was provided. By the end of the week we lost hope that the parcels would be traced on time and we already considered the samples for these twelve NRLs as lost. However, we were highly surprised by a message of the courier on Monday 28 September that the pallet was found and all parcels were shipped to the laboratories. Again, the relevant NRLs were informed and requested to still analyse the samples as soon as possible after receipt. For sure we will take this long transport time into account when analysing the PT results of these twelve NRLs.

For this year, we still have one more Proficiency Test planned: the **PT on Typing of *Salmonella* 2026**. This PT is planned to start in November and will contain the obligatory part on serotyping of *Salmonella*, and again a voluntary part on NGS cluster analysis. The timetable of this PT is once more included in this Newsletter. We keep our fingers crossed that the organisation of this PT will not face any hurdles!

Best wishes,
Kirsten Mooijman
Coordinator EURL-*Salmonella*

Contribution of the EURL-*Salmonella*

EURL- *Salmonella* activities in 2026

Date(s)	Activity
7 April – 6 May 2026	EURL-*Salmonella* Proficiency Test Food 2026; Detection of *Salmonella* in a food matrix.
12 & 13 May 2026	Hybrid EURL-*Salmonella* workshop, Zaandam, the Netherlands
June 2026	Joint Training Course of the inter EURLs Working Group on NGS in Denmark.
September – October 2026	EURL-*Salmonella* Proficiency Test Primary Production Stage (PPS).
November 2026 – January 2027	EURL-*Salmonella* Proficiency Test Typing; Serotyping and (optional) NGS Cluster analysis.

Timetable EURL-*Salmonella* Proficiency Test Typing 2026

Week	Date	Subject
38	Week of 14 September	Emailing of the link to the registration form for the PT Typing. Please **register by 16 October 2026** at the latest.
43	Week of 19 October	Emailing of the protocol 2026.
45	Monday 2 November 2026	Shipment of the parcels to the participants as Biological Substance Category B (UN 3373).
45	Week of 2 November	*Upon receipt*: Starting the identification of the strains, according to the usual practice of the laboratory. Sending the link for the result form on Serotyping to the participants. Sending the link for the result form on NGS Cluster Analysis to the participants in a separate email.
50	Friday 11 December 2026 at the latest	Deadline for completing the electronic submission of **Serotyping** results: **11 December 2026.** After this deadline, the result form for serotyping will be closed.
4	Friday 29 January 2027 at the latest	Deadline for completing the electronic submission of **NGS Cluster Analysis** results: **29 January 2027.**
	February 2027	Serotyping: Evaluation of individual laboratory results and Interim summary report.
	April/May 2027	NGS Cluster Analysis: Evaluation of results and Interim summary report.

If you have questions or remarks about this Proficiency Test, please contact:

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From the Literature

Salmonella-related Literature selection from Scopus: July - September 2026

Zhou T., Chen J., Kang Z., Wang J., Kang J., Tang C., Xu J.
Microplastic biofilms enhance environmental stress, disinfectant, and antibiotic tolerance of Salmonella enterica serovar typhimurium in simulated fresh vegetable processing systems (2026) Food Research International, 236, art. no. 119183
ABSTRACT: Microplastics (MPs) are widely found in food supply chains. They act as a stable surface for microorganisms to stick to, which makes it more likely that pathogens will be present. This study aims to investigate the biofilm formation on MPs and evaluate the tolerance of foodborne pathogen Salmonella enterica serovar Typhimurium (ST) to environmental stresses, disinfectants, and antibiotics. The microplastics biofilms (MBs) were constructed on polyethylene MPs by the microbial samples from a vegetable washing sink. Microorganisms can form biofilms on MPs in the lettuce juice-based cultures. The biofilm structure and bacterial community exhibited a succession with the incubation periods. The presence of opportunistic pathogenic genera was identified. ST can successfully colonize preformed MBs, and its environmental stress tolerance to UV radiation, desiccation, and nutrient deprivation was significantly enhanced. Concurrently, mixed-species MBs enhanced the ST tolerance to BAC (Benzalkonium chloride), NaClO and PCMX (Chloroxylenol) disinfectants, and tolerance to ampicillin. These were linked to the upregulation of efflux pumps (acrAB, tolC) and tolerance regulators (phoPQ, oxyR). Genetic analysis revealed a significant upregulation of the ST virulence-associated genes (sipC, csrA, prgJ, sptP, barA, rstA). These findings emphasized the emerging threat of microplastic-biofilm synergistic contamination to food safety, and there is an urgent need to explore the transmission mechanisms and control strategies in the actual food supply chain. ISSN: 09639969

Tierney R., Louis R.P., Boxrud D.J., Lamas K.H., Angelo K.M., Weller D.L.
Effect of Diagnostic Test Type on Detection of Salmonella Infections — Foodborne Diseases Active Surveillance Network, 2004–2024
(2026) MMWR Surveillance Summaries, 75 (29), pp. 377 - 383
ABSTRACT: Salmonella species bacterial infections are a leading cause of enteric illness and can be diagnosed using bacterial culture or culture-independent diagnostic tests (CIDTs). All culture-diagnosed cases are considered culture confirmed. After a positive CIDT, infection can be culture confirmed if reflex culture is attempted and yields an isolate. A culture-unconfirmed infection is a CIDT-diagnosed infection for which reflex culture was not attempted or failed to yield an isolate. Foodborne Diseases Active Surveillance Network data from 2006 through 2023 were analyzed to compare the epidemiologic and clinical characteristics of Salmonella infections after stratifying by diagnostic method (culture versus CIDT) and culture confirmation status (culture confirmed versus unconfirmed). To improve the precision and stability of temporal trend estimates, incidence trends during 2004–2024, as opposed to 2006–2023, were evaluated overall, by diagnostic method, and by confirmation status using regression. Although overall incidence remained stable from 2004 through 2024, the incidence of culture-diagnosed and -confirmed infections declined, and the incidence of CIDT-diagnosed and unconfirmed infections increased. Culture- and CIDT-diagnosed Salmonella infections were demographically similar but exhibited distinct clinical patterns, with CIDT diagnosis associated with milder and more sporadic illnesses, which suggests that these infections were historically underdiagnosed by culture-based diagnostics. The success of prevention efforts that reduce more severe, traditionally culture-detected Salmonella infections might be offset by the expanded detection of milder infections through CIDTs. The increases in detection of milder infections through CIDTs may offset the results of successes in prevention efforts in reduction in severe Salmonella infections. Understanding how diagnostic methods influence observed surveillance trends is therefore critical for evaluating and guiding future prevention efforts. ISSN: 15460738

Nkhebenyane J., Motlhaoloa T., Lekota K.E., Thekisoe O., Khasapane N.G., Ramatla T.

Global prevalence and antimicrobial resistance profiles of Salmonella species in milk and dairy products: a 25-year systematic review and meta-analysis
(2026) Frontiers in Animal Science, 7, art. no. 1886611
ABSTRACT: Infections caused by Salmonella spp. pose a significant public health challenge, as they are among the most reported foodborne illnesses. This study investigated the global prevalence of antibiotic-resistant Salmonella spp. in milk and dairy products based on available published data covering the period 2000–2025. Following the criteria of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), this study was conducted. The Cochrane Q test and I2 test statistics, which are based on the random effects model, were used to evaluate study heterogeneity. We examined the pooled prevalence of Salmonella spp. in milk and dairy products using comprehensive meta-analysis software v4.0. A total of 53 studies containing a total of 13879 samples and 1512 Salmonella spp. from 17 countries and 5 continents were included in this study. United States exhibited the highest pooled prevalence for Salmonella spp. at 17.8% (95% CI: 11.1 – 27.4), while Egypt had the lowest at 3.5% (95% CI: 0.8 – 13.2), . The overall pooled prevalence was 8.9% (95% CI: 0.070 – 0.112). South America had the highest pooled prevalence at 24% (95% CI: 13.6 – 41.1), and the lowest was observed for Africa at 7.5% (95% CI: 4.9 – 9.3). Cotrimoxazole was significantly higher with a polled prevalence of 93.6% (95% CI: 59.8 – 99.3) and while the pooled prevalence of multidrug resistance (MDR) in Salmonella spp. was estimated to be 4.3% (95% CI: 2.8 – 6.5). This systematic review and meta-analysis underscore the persistent public health risk posed by Salmonella spp. contamination in the global dairy supply chain. These results highlight the urgent need for stringent food safety protocols and harmonized antimicrobial stewardship within the dairy industry to mitigate the spread of resistant Salmonella strains from livestock to humans. Copyright ISSN: 26736225

Ožanič Bučar M., Radojkovic D., Colarić-Jakše L.-M.
Effects of storage temperature on eggshell-associated total aerobic mesophilic bacteria and Salmonella Enteritidis growth and penetration
(2026) Acta Agriculturae Slovenica, 122 (2)
ABSTRACT: Although the refrigeration of eggs within the food supply chain is recommended by multiple studies, the official guidelines on egg storage conditions within the food supply chain remain somehow unclear and highly variable among countries. In this study, various microbiological parameters of free-range chicken eggs from a small-scale farm were examined. The aim was to evaluate the influence of different storage temperatures on eggshell microbial load. In addition, the survivability and growth kinetics of Salmonella enterica serovar Enteritidis (S. Enteritidis) were determined in dependence of the storage temperature. Our results showed significantly higher counts of the total aerobic mesophilic bacteria in eggs stored at 22°C in comparison to eggs stored at 4°C. Furthermore, storage at 22°C supported the growth kinetics of S. Enteritidis on the eggshell as well as its penetration to the inner shell membranes. In contrast, storage at 4°C prevented the replication of S. Enteritidis on the eggshell and its penetration into the internal egg contents. Consistent with the findings of other studies, our results clearly demonstrate the benefits of eggs refrigeration during transport and storage.
ISSN: 15819175

Smith J.C., Palmer E.G., Shariat N.W.
Salmonella in Surface Water: Methodology, Complexity, and Challenges
(2026) Journal of Food Protection, 89 (7), art. no. 100818
ABSTRACT: Salmonella enterica is a significant global pathogen contributing to an estimated 176 million illnesses and 290,000 deaths annually. While meat and poultry products are often associated with these illnesses, produce-related outbreaks are also a significant cause of salmonellosis. Recent outbreak tracebacks have identified surface water as a reservoir for Salmonella, where contaminated water is used for produce irrigation. Global studies have regularly identified Salmonella in a variety of surface water sources, including creeks, ponds, rivers, and lakes. While the prevalence of this pathogen in water has been well characterized, studies investigating predictive factors that influence the prevalence, persistence, and potential food safety risks of Salmonella in surface water have been inconsistent. As a result, effective risk assessment and implementation of mitigation strategies are limited; therefore, surface water continues to be a significant food safety risk. This review highlights the current food safety regulations within the United States and potential routes of introduction and survival for Salmonella within surface water. Additionally, an overview of current sampling methods, prevalence studies, and what is known about factors influencing Salmonella potential in water is discussed.
ISSN: 0362028X

Anonymous
Multi-country outbreak of Salmonella Stanley ST2045 infections linked to consumption of flavoured noodle products. 1 July 2026
(2026) EFSA Journal, 24 (7), art. no. e10237
ABSTRACT: An outbreak of Salmonella Stanley ST2045 is ongoing in the European Union/European Economic Area (EU/EEA), with a total of 106 confirmed cases having been reported by 13 EU/EEA countries (77) and the United Kingdom (29) between November 2025 and June 2026. The outbreak is mainly affecting children and young adults, and has involved at least 49 hospitalisations. Flavoured noodle products from a specific brand are considered the most likely vehicle of infection in this multi-country outbreak, with cases reporting having consumed these products in Denmark, Estonia, Germany, Latvia, and Lithuania. The microbiological evidence includes the detection of the outbreak strain in chicken- and hot-chicken noodle products of the same brand in Germany and Lithuania. Traceability investigations linked the products to the same producer in Ukraine as the source. The detection of additional Salmonella serovars may suggest the possibility of multiple contamination sources. Control measures have included withdrawals and recalls in several countries, which significantly reduce the likelihood of new S. Stanley ST2045 infections related to this outbreak. However, a root cause and point(s) of (cross)contamination have not yet been established, and further investigations are needed. Moreover, given that these products have a long shelf life, they may still pose a risk, as they can be stored in household kitchens for extended periods, meaning that further cases could still occur. Public health authorities are encouraged to interview any new cases, sequence isolates and share information in EpiPulse. Food safety authorities are encouraged to continue investigating to verify the identified products as the vehicles of infection and to identify the source(s) of (cross)contamination, whether associated with single or multiple ingredients. Consumers are advised to strictly follow the preparation instructions indicated on labels (if products are not ready-to-eat), to ensure proper food hygiene during preparation, and to cook chicken products thoroughly. ISSN: 18314732

Trakatelli C.-M., Kitsios K., Agathangelidi-Trakatelli M., Sarigianni M., Pilalas D., Trakatellis A.
The plague of Athens (430–427 BC): Integration of historical, clinical, and ancient DNA data supports an invasive non-typhoidal Salmonella enterica etiology
(2026) International Journal of Infectious Diseases, 168, art. no. 108728
ABSTRACT: The Plague of Athens represents one of the earliest and most detailed descriptions of a large-scale epidemic in recorded history. Emerging in 430 BC during the second year of the Peloponnesian War, it caused extensive mortality, including the death of Pericles, the leader of Athenian democracy at the time. Thucydides, the famous historian, provides an eyewitness account with a rich clinical narrative encompassing symptomatology, complications, mortality rates, epidemic dynamics, post-infection immunity, and animal involvement. In this narrative review, we integrate Thucydides' account with modern clinical knowledge, archaeological evidence, and ancient DNA data to reassess the most plausible cause of the epidemic. DNA analysis from dental pulp of skeletons found in a mass burial of the Kerameikos cemetery demonstrated the DNA presence of Salmonella enterica among individuals who died during the outbreak. Human-restricted pathogens traditionally proposed as causes of the Plague of Athens fail to account for the zoonotic features emphasized in the historical record. By contrast, non-typhoidal Salmonellae enterica (NTS) are zoonotic and, under conditions of crowding, malnutrition, and sanitation breakdown, are capable of causing invasive, systemic disease with high mortality. We propose that the cause of the epidemic is most consistent with an unusually virulent, invasive strain of non-typhoidal Salmonella enterica . While precise serovar identification remains speculative, this interpretation provides the most coherent synthesis of the historical, clinical, archaeological, and molecular data currently available. A structured differential diagnosis against other zoonotic pathogens further supports this conclusion. ISSN: 12019712

Anonymous
Multi-country outbreak of Salmonella Bovismorbificans ST377 infections linked to the consumption of alfalfa sprouted seeds 25 June 2026
(2026) EFSA Journal, 24 (7), art. no. e10220
ABSTRACT: Between January and May 2026, 109 confirmed cases of Salmonella Bovismorbificans ST377 were reported from 10 European Union/European Economic Area (EU/EEA) countries (Austria, Belgium, Czechia, Denmark, Finland, Germany, Ireland, Luxembourg, Spain and the Netherlands) and the United Kingdom. The outbreak predominantly affected adult females. Eighteen cases required hospitalisation. Two deaths were reported in Finland (one confirmed and one probable case). Epidemiological and

microbiological evidence identified alfalfa sprouted seeds traded from Italy as the primary vehicle of infection. Microbiological evidence included the detection of the outbreak strain in water samples collected during alfalfa sprouted seed harvesting in the Netherlands and Northern Ireland (UK). A Finnish sprouted seed producer was epidemiologically linked to cases in Finland. Traceability investigations in Italy identified a common seed supplier in India, suggesting this area as a potential origin of seed contamination. The outbreak strain presumably started circulating in Europe in October 2025 via two alfalfa seed consignments, before being distributed across multiple countries. Control measures included the withdrawal of the implicated consignments, recalls of related products, cessation of production and the destruction of suspected products. Following these interventions, case notifications decreased. However, further infections may occur until the source of contamination is fully identified and controlled, particularly because sprouted seeds can be sold as ready-to-eat products, representing a concern for microbial food safety. Based on available information, the risk of infections is assessed as low-to-moderate for people in EU/EEA countries who frequently consume sprouted seeds. Public health authorities are encouraged to interview new cases, sequence isolates, and share information in EpiPulse. Food safety authorities are encouraged to investigate the role of the environment in seed contamination. Seed producers should implement appropriate measures to minimise the contamination risk. Sprouted seed producers should implement adequate food safety management systems to ensure safe products reach the market.
ISSN: 18314732

Pasutto P., Amendola A., Gori M., Fappani C., Gusmeroli M., Colzani D., Borghi E., Pontello M., Tanzi E., Bianchi S.
Salmonella enterica in Northern Italy: Insights from a Historical Collection
(2026) Pathogens, 15 (7), art. no. 771
ABSTRACT: Historical microbiological collections linked to epidemiological and clinical metadata represent a valuable resource for retrospective investigation of long-term changes in pathogen populations. In this retrospective study, we analyzed the epidemiological, clinical, and microbiological information recorded in the datasheets accompanying Salmonella enterica isolates archived in a historical collection assembled in Lombardy, Italy, between 2001 and 2016. Overall, metadata associated with 6624 salmonellosis cases with confirmed serovar identification were included to describe serovar distribution, bloodstream infections, and antimicrobial resistance (AMR) patterns within the collection. Four serovars (S. Typhimurium, S. Enteritidis, S. 1,4,[5],12:i:-, S. Napoli) accounted for approximately 80% of all cases. The relative representation of S. Napoli increased over the study period, whereas S. Choleraesuis showed the highest proportion of bloodstream isolates and predominantly affected adults. Overall, resistance to penicillins (46.9%) and tetracyclines (48.0%) was common, whereas resistance to fluoroquinolones (2.9%) and third-generation cephalosporins (<2%) remained low. Among invasive non-typhoidal Salmonella (iNTS) infections, 69.3% of isolates were resistant to at least one antimicrobial class, and 34.7% exhibited multidrug resistance (MDR), with fluoroquinolone resistance increasing to 13.9%. These findings highlight the value of historical microbiological collections and their associated metadata for documenting long-term changes in serovar distribution, invasive infections, and AMR, while emphasizing their importance as a resource for future molecular epidemiology and One Health surveillance.
ISSN: 20760817

Oh S., Patel J.
Phenotypic and Metabolic Diversity of Salmonella Isolates from Agricultural Creek Sediment
(2026) Journal of Food Protection, 89 (7), art. no. 100807
ABSTRACT: Salmonella is an important foodborne pathogen, and its outbreaks are increasingly linked to environmental contamination in preharvest systems. Sediment in agricultural watersheds can provide a critical long-term microbial reservoir. However, the phenotypic and metabolic diversity in Salmonella populations hampers effective control. We assessed growth characteristics of 16 Salmonella isolates recovered from sediment of the Conococheague Creek in the Mid-Atlantic USA. We tested hydrophobicity, tolerance to acidic (pH 3.0), alkaline (pH 10.0), and oxidative (H_2O_2) stress, metabolic activity using isothermal calorimetry, and antimicrobial susceptibility. Isolates showed variable hydrophobicity levels of 15% to 81%. Notably, serovar Newport isolates were grouped into two distinct clusters, indicating clonal variation. Isolate 5 (serovar Typhimurium) exhibited a high degree of acid resistance, whereas isolate 4 (serovar Holcomb) was highly susceptible to alkaline and oxidative stresses, indicating isolate-specific stress tolerance. Calorimetry analysis revealed variation in peak heat flow from 49.6 to 63.0 μW across isolates. In a subset of isolates, a secondary metabolic shift was observed at 24–26 h,

pointing to the fact that these strains may adapt to fluctuating environmental conditions by utilizing alternative energy sources. Most isolates were susceptible to the antimicrobials tested, while isolate 4 (serovar Holcomb) showed intermediate resistance to cefoxitin (MIC = 16 μg/mL), suggesting a potential mobile β-lactamase in this isolate, linking environmental survival to antimicrobial resistance (AMR) threats. We demonstrated distinctive characteristics of Salmonella isolates from the environment, and this research provides a basis for improving risk assessment and preharvest food safety strategies. ISSN: 0362028X

Oliveira M.M., da Pia A.K.R., Oliveira S.B.S., Sant'Ana A.S.
Quantifying variability and viability: A dual-modeling and cytometry approach to Salmonella survival in low-moisture conditions
(2026) Food Control, 185, art. no. 112070
ABSTRACT: Foodborne outbreaks in low moisture food (LMF) have been reported for decades and in most cases, Salmonella is one of the main pathogens present. This study used 5 isolates from soybean meal production chain of five processing plants in Brazil and used a predictive modeling approach to describe the survival of Salmonella serovars under four different low water activity, aw, (0.9, 0.8, 0.7 and 0.6) conditions was determined. In parallel the determination of cell viability was measured using flow cytometry. The Weibull model best described the survival of Salmonella serovars under the tested conditions. The secondary model was fitted against the experimental data and had an acceptable goodness of fit (R2 = 0.79). The result of this fitting was a second-order polynomial. When evaluating the t5D data, serovars variability was greater than biological variability. Even after Salmonella serovars reached the detection limits, viable cells were detected, indicating the presence of cells in the viable but non-culturable state. This study provides crucial data on Salmonella resistance under low water activity (aw) stresses and contributes to the understanding of the behavior of this pathogen under these conditions. Knowledge of Salmonella behavior is strategic for developing processes to prevent and mitigate the presence of this pathogen in products of animal origin or considered low-moisture foods. ISSN: 09567135

Xavier I.B., Viana A.C.D.M., Perim M.D., Kim P., Barão C.E., Figueiredo H.C.P., Magnani M., Lacerda I.C.A., Alvarenga V.O.
Salmonella in microgreens: quantitative modeling of Salmonella Enteritidis in a controlled environment system
(2026) Food Research International, 235, art. no. 119209
ABSTRACT: Microgreens have become popular due to their nutritional content and simple production requirements. Salmonella spp. is frequently associated with microgreens recall. This study was divided into two parts: (i) detection of Salmonella spp. and Enterobacteriaceae in commercial microgreens; (ii) simulate a controlled environment to assess Salmonella Enteritidis survival during cultivation and storage of microgreens. Among 122 samples, Enterobacteriaceae counts ranged from 2.70 to 7.49 log CFU/g, and Salmonella spp. was detected in sunflower and radish. Salmonella reached 8.31 Log CFU/g and 7.73 Log CFU/g in mustard and sunflower substrate, respectively. The maximum growth rate (μmax) in the substrate was 0.94 h−1 for mustard and 0.81 h−1 for sunflower, and the lag phase was higher in sunflower (lag = 5.9 h) than in mustard (lag = 3.8 h). Regarding microgreens, initial counts were 8.17 in mustard and 5.41 Log CFU/g in sunflower, with slight reductions by harvest (maximum inactivation rate (kmax) = 0.01 and 0.03 h−1; growth/inactivation potential (δ) = −0.39 and − 0.79 log CFU/g, respectively). The mustard microgreens system showed residual irrigation water, and Salmonella increased δ = 0.58 log CFU/mL with μmax = 0.02 h−1. In storage at 5 °C, Salmonella showed a slight reduction in mustard (kmax = 0.04 h−1, δ = −0.21) and a higher reduction in sunflower (δ = −1.37, kmax = 0.10 h−1). Scanning electron microscopy revealed bacterial adhesion to surface crevices, depressions, and near stomata, suggesting potential internalization. These findings highlight contamination risks in microgreen production and underscore the importance of preventive measures during cultivation, irrigation, and postharvest storage. ISSN: 09639969

O'Dowd A.
UK salmonella outbreak: Cases rise as another death is recorded
(2026) BMJ (Clinical research ed.), 394, pp. e100696; ISSN: 17561833

Baraniuk C.
Salmonella: Vulnerable people should avoid runny eggs when dining out, officials say
(2026) BMJ (Clinical research ed.), 394, pp. e100641; ISSN: 17561833

Korniienko L., Shchur N., Pyskun A., Kuriata N., Pishchanskyi O., Aliekseieva H., Karpulenko M., Musiiets I., Nenych N., Kulykova V., Matviienko O., Romanko M.
National Program for the Control of Poultry Salmonellosis in Ukraine: Epizootiological Aspects and Monitoring of Salmonella spp. Pathogens in Poultry and Poultry Products Over 2010–2025
(2026) Advances in Animal and Veterinary Sciences, 14 (9), pp. 1907 - 1921
ABSTRACT: The safety of poultry products directly depends on controlling the spread of Salmonella spp. pathogens on poultry farms. The sustainable development of this sector in Ukraine is a critically important factor in ensuring the country's food security and also plays a significant role in exports. The poultry industry demonstrates high adaptability, developing in the direction of European integration and implementing principles of natural resource conservation. The aim of this study was to analyze reports on the results of laboratory diagnostic tests of samples subject to surveillance, in accordance with the National Program for the Control of Avian Salmonellosis, to assess the prevalence of Salmonella enterica at all stages of production (breeding, housing, production, and product distribution) on the commercial poultry operations, and to study the epizootiological aspects of avian salmonellosis monitoring in Ukraine. Authors analyzed non-confidential data. It was established that 94.6% of the planned studies were completed, with 941 Salmonella cultures isolated using standard bacteriological methods and identified by serotyping, representing a 0.03% detection rate in samples. The broiler testing plan was exceeded by 8.8%, while other categories were under-implemented by 4–12% (breeding and hatchery poultry – 93% and 91.8%, respectively). The most frequently isolated serovars were Salmonella Enteritidis (30.8%; 95% CI: 27.88–33.88%), Salmonella Pullorum and Salmonella Gallinarum (10.8%; 95% CI: 8.93–13.0%), Salmonella Eimsbuettel (11.1%; 95% CI: 9.12–13.23%), Salmonella Infantis (8.3%; 95% CI: 6.61–10.24%), and Salmonella Typhimurium (3.4%; 95% CI: 2.34–4.77%). The peak years for the isolation of various Salmonella strains were 2010 (95% CI: 10.49–14.83%), 2013 (95% CI: 12.86–17.54%), and 2018 (95% CI: 10.69–15.05%). Studies showed that isolates were most frequently detected in the samples from broilers (32.5%), commercial poultry (laying hens) (30.9%), and poultry products (egg products) (14.0%). At the same time, the highest number of isolates was detected predominantly in the southeastern regions of Ukraine. This review underscores the need for further refinement of the state control strategy throughout the entire production cycle to enhance the effectiveness of measures to combat avian salmonellosis, protect public health, and ensure food safety.
ISSN: 23093331

Baraniuk C.
UK salmonella outbreak leaves one dead and more than 200 ill
(2026) BMJ (Clinical research ed.), 394, pp. e100606
ISSN: 17561833

Costa E., Garretto V., Pedonese F., Gori A., Biglia C., Mattalia M., Armani A.
Non-relevant Salmonella serotypes in fresh poultry meat: critical issues for official control officers at market level
(2026) Italian Journal of Food Safety, 15 (3), art. no. 14843
ABSTRACT: European Union (EU) and Italian legislation provide extensive control measures for non-typhoidal Salmonella (NTS) along the poultry production chain; however, a regulatory gap persists for fresh poultry meat. Current EU microbiological criteria apply only to NTS serotypes of major public health significance ("relevant"), whereas the management of other NTS serotypes ("non-relevant") is not harmonized. This study assessed the risk management strategies adopted by official veterinarians following the detection of non-relevant serotypes in fresh poultry meat at the distribution stage. Relevant EU and Italian legislation were analyzed, and operational practices in Italy were investigated through a structured questionnaire administered to local health units. In addition, EUlevel approaches were examined through the analysis of Rapid Alert System for Food and Feed (RASFF) notifications. The results revealed substantial heterogeneity in the management of comparable findings at both the national and EU levels, reflecting regulatory ambiguities and broad discretionary powers of competent authorities, thereby complicating the implementation of consistent and proportionate official controls. This variability is further challenged by the increasing epidemiological relevance of certain nonrelevant serotypes, particularly S. Infantis. The study highlights the need for a revision and harmonization of the regulatory framework to support consistent and proportionate official control practices while ensuring a high level of consumer protection.
ISSN: 22397132

Liu Y., Meng L., Wang Y., Deng Q., Duan M., Zeng Q., Bai S., Ding X., Zhang K., Wang J.
Gut microbiota signatures associated with the development of Salmonella Typhimurium super-shedders in broiler chickens
(2026) Poultry Science, 105 (8), art. no. 107034
ABSTRACT: Broiler chickens infected with Salmonella Typhimurium (S. Typhimurium) may transition from acute infection to a persistent carrier state, with a subset of individuals becoming super-shedders that disproportionately contribute to pathogen dissemination within poultry flocks. However, the microbial and host factors driving the emergence of this phenotype remain poorly understood. In this study, birds were orally challenged with S. Typhimurium and stratified into high-, moderate-, and low-shedding groups based on fecal shedding dynamics. Birds that continuously excreted high bacterial loads (> 10^5 CFU/g feces) at 14 days post-challenge (dpc) were defined as super-shedders. Persistent shedding was associated with impaired intestinal morphology, reduced production performance, and sustained intestinal inflammation. Full-length 16S rRNA sequencing revealed distinct fecal microbiota configurations among shedding phenotypes, with super-shedders characterized by a significant enrichment of Blautia and depletion of Escherichia and Streptococcus. Correlation analyses indicated that Blautia abundance was positively associated with fecal S. Typhimurium loads, whereas Escherichia showed a negative association. Furthermore, in vitro co-culture assays demonstrated that fecal supernatants from super-shedders promoted S. Typhimurium growth at later stages of incubation. Collectively, these findings suggest that a dysregulated gut microbiota and inflammation-driven intestinal microenvironment jointly facilitate the persistence and super-shedders of S. Typhimurium in broilers. Targeting gut microbial composition and intestinal inflammation may represent effective strategies to mitigate the emergence of super-shedders in poultry production. ISSN: 00325791

Aguiar N.T., da Silva E.P.R., Nascimento C.A., Alves K.F.L., da Costa L.B.S.B., Ribeiro-Júnior J.C.
Microbiological quality and Salmonella-related food safety risks in commercial and free-range eggs
(2026) Food Control, 186, art. no. 112083
ABSTRACT: Poultry is a natural reservoir for Salmonella spp. and contamination by this pathogen can occur either environmentally or internally during egg synthesis. In this study, we aimed to compare the microbiological quality and safety of eggs from commercial poultry egg farms (PEF) subject to regulatory standards and non-inspected free-range egg farms (FRE). We also sought to determine whether the occurrence of Salmonella spp. differed between the eggshells and yolks. Microbiological quality indicators in egg whites and yolks were quantified, and liquid whole eggs (LWE) were tested for the presence of Salmonella spp., Listeria monocytogenes, diarrheagenic Escherichia coli, and toxigenic Staphylococcus using microbiological and molecular methods. The shells and yolks were evaluated for the presence of Salmonella spp. The median values of total microbial counts were high in both the FRE (>5 log CFU/mL) and PEF (>3 log CFU/mL) samples. PEF had lower median values for all quantified microbiological indicators. Salmonella spp. were identified in PEF and FRE samples in similar rates (≅ 30 %). Listeria monocytogenes was identified in 9.1% of PEF samples. Salmonella spp. showed higher recovery rates in the shells and yolks than in LWE samples, with the shell showing greater contamination than the yolk in both the PEF and FRE groups. These findings suggest that egg contamination by Salmonella spp. can be more likely related to the environmental source. Overall, PEF eggs demonstrated superior microbiological quality compared to FRE eggs. Nevertheless, the presence of pathogens in both types underscores the importance of safe egg handling and cooking practices. This study emphasizes the need for strengthened inspection protocols, biosafety measures, monitoring systems, and traceability efforts to identify contamination sources and support risk-mitigation strategies within the egg production chain. ISSN: 09567135

Sarjit A., Hall A.M., Sellapperumage N., Makings C., Dykes G.A.
The faecal microbiome and carriage of Salmonella in Australian captive pythons
(2026) FEMS Microbiology Ecology, 102 (8), art. no. fiag084
ABSTRACT: There is a growing interest in keeping exotic pets such as pythons in Australia. Reptiles are known asymptomatic carriers of Salmonella in their digestive tract. This study investigated the microbiome and carriage of Salmonella in faeces from captive Australian pythons (n = 28). This study also aimed to determine the effect of temperature and nutrient availability on monospecies biofilm formation of python-associated Salmonella isolated in this study (n = 10) as a possible indicator of persistence. A total of 23 Salmonella strains were identified from 28 captive Australian pythons, representing diverse

serovars of subspecies enterica, namely S. Bergedorf, S. Havana, S. Jangwani, S. Java, S. Kottbus, S. Muenchen, and S. Umbadah, as well as subspecies S. diarizonae and S. salamae. The composition of the microbial communities differed according to sampling location, diet, and Salmonella serovars or subspecies. Bacillota, Bacteroidota, and Pseudomonadota were the most abundant taxa across the faecal microbiome. Strains belonging to subspecies enterica were generally poorer biofilm formers than strains belonging to subspecies salamae and diarizonae. This study shows that microbial communities are variable depending on the environmental factors, which could increase the risk of acquiring reptile-associated salmonellosis while handling captive pythons. ISSN: 01686496

İlhan Z., Hasdoğan H., Gökmen M.
First Report on the Isolation of Salmonella enterica subsp. enterica Serovar Hofit in Wild Boars (Sus scrofa) in Türkiye
(2026) Foodborne Pathogens and Disease, 23 (9), pp. 581 - 586
ABSTRACT: The aim of this study was to isolate potential bacterial pathogens, such as Salmonella spp., from wild boars (Sus scrofa) inhabiting the Southern Marmara Region of Türkiye and to evaluate the in vitro antibiotic susceptibility of the isolates. Samples, including feces and internal organs (lymph nodes, liver, lungs, kidneys, and spleen), were collected from a total of 34 legally hunted wild boars. Salmonella enterica subsp. enterica serovar Hofit was isolated from 6 (17.6%) animals. Ciprofloxacin, streptomycin, ampicillin, tetracycline, chloramphenicol, enrofloxacin, gentamicin, ceftiofur, cefoxitin, nalidixic acid, amoxicillin/clavulanic acid, and trimethoprim/ sulfamethoxazole discs were used to determine the in vitro antimicrobial susceptibility of S. Hofit isolates. All S. Hofit isolates had 100% sensitivity to 11 of the antibiotics tested, and three isolates were resistant only to streptomycin. As a result, this study is the first to report the isolation of S. Hofit from wild boars worldwide. The high isolation rate (17.6%) suggests a potential adaptation of this serovar to swine hosts. The apparent prevalence of S. Hofit in wild boars raises concerns not only for wildlife but also for potential public health implications. ISSN: 15353141

Appiah P.O., Anita A., Owusu W.B., Muntala H., Ekua N.V., Omoniyi P., Ankrah K.R.
Salmonella Outbreaks in Low- and Middle-Income Countries over the Last Decade: A Systematic Review and Meta-Analysis of Transmission Dynamics, Clinical Outcomes, and Antimicrobial Resistance
(2026) Environmental Health Insights, 20, art. no. 11786302261487799
ABSTRACT: Background: Salmonella outbreaks persist as a public health burden in low- and middle-income countries (LMICs), yet comprehensive synthesis of their epidemiology over the past decade remains limited. Methods: Following PRISMA 2020 guidelines, we searched PubMed, Scopus, Web of Science, and Google Scholar for laboratory-confirmed Salmonella outbreaks in LMICs (1 January 2016–1 January 2026). Random-effects meta-analysis estimated pooled prevalence rates, with statistical heterogeneity quantified using I2 statistic. Given extreme heterogeneity across most outcomes (I2 > 90%), we present individual study ranges alongside pooled estimates. Results: Twenty-four studies from 14 LMICs met inclusion criteria. Salmonella Typhi was the predominant pathogen (70.8% of outbreaks). Waterborne transmission was most frequent (37.5%), predominating in Africa (83.3%), whereas foodborne and fecal-oral routes were common in Asia. Pooled laboratory confirmation rate was 28.02% (95% CI: 12.2–52.1; observed range: 1.5–100%), varying by region: Southeast Asia 54.2% (95% CI: 4.3–96.9), Western Pacific 27.6% (95% CI: 8.0–56.9), and Africa 6.1% (95% CI: 5.3–6.9). The pooled case fatality rate was 7.0% (95% CI: 3.4–13.7; range: 3.6–10.0%). Fever (93.0%), abdominal pain (53.6%), and headache (52.0%) were most common symptoms. Pooled antimicrobial resistance reached 59.3% (95% CI: 26.6–85.4%), highest for trimethoprim–sulfamethoxazole (94.2%) and ciprofloxacin (61.3%). Extreme heterogeneity and wide confidence intervals were observed across some pooled estimates and should be interpreted with caution. Conclusions: Salmonella outbreaks in LMICs are characterized by high S. Typhi prevalence and predominant waterborne transmission. Elevated mortality and widespread first-line antibiotic resistance show the need for improved WASH infrastructure, enhanced real-time outbreak surveillance, and revised empiric treatment protocols. ISSN: 11786302

Torres-Vélez J.A., Zavala-Franco A., Álvarez-Mayorga B.L., Gaytán-Martínez M., Morales-Sanchez E.
Survival of Salmonella Typhimurium in Vacuum-Sealed Maize Tortillas During Refrigerated and Ambient Storage
(2026) Foods, 15 (17), art. no. 3103

ABSTRACT: As dietary habits evolve, cereal-based foods, such as maize tortillas, are increasingly consumed as ready-to-eat products, yet their physicochemical properties may influence microbial stability during storage. This study characterized the microbiological and physicochemical properties of commercial vacuum-sealed maize tortillas and evaluated Salmonella enterica survival in vacuum-sealed laboratory-prepared maize tortillas. Nine commercial brands were characterized by proximate composition, moisture content, water activity (0.945–0.965), and pH (4.76–5.50), confirming a high-moisture and carbohydrate-rich matrix. Indicator microorganisms revealed moderate contamination levels, with total coliforms exceeding regulatory limits in several samples. Challenge studies demonstrated that S. Typhimurium survival at 4 and 25 °C followed non-linear inactivation kinetics accurately described by the Weibull model (R2 > 0.90). Storage temperature significantly affected the shape parameter (p = 0.026), whereas packaging conditions significantly influenced the estimated 5-log reduction time (t5). Vacuum-sealed tortillas exhibited prolonged pathogen survival, particularly under refrigeration (>60 days), where bacterial populations remained detectable for extended storage periods. These findings challenge the assumption that vacuum-sealing improves microbiological safety in cereal-based foods. ISSN: 23048158

Gast R.K., Garcia J.S.
Poultry housing and the persistence and transmission of Salmonella in egg-laying flocks
(2026) Journal of Applied Poultry Research, 35 (3), art. no. 100746
ABSTRACT: The ongoing transition of the egg industry toward increased reliance on cage-free and outdoor housing systems has raised new pathogen control and egg safety challenges for flock managers. This review summarizes current knowledge about how poultry housing systems (conventional and non-cage) influence the persistence, environmental reservoirs, and transmission of Salmonella in commercial egg-laying flocks. Consistently across different types of poultry production environments, salmonellae have been shown to persist in dust, manure, flooring substrates, soil, structural surfaces, and diverse biological vectors, Extended Salmonella survival is especially likely under conditions of high moisture and low airflow. The infection of birds via exposure to environmental reservoirs can be magnified by horizontal dissemination within flocks, which can be especially rapid and extensive when birds are stocked at high densities, can move about and intermingle widely, and share common floor or ground areas. Both cage and non-cage systems have characteristic intrinsic Salmonella risk factors: caging may increase stress-related susceptibility to infection, but cage-free systems may facilitate greater opportunities for exposure to other birds and environmental sources. Accordingly, the design and management of facilities for egg production should incorporate Salmonella risk reduction strategies which target both broadly relevant and housing-specific vulnerabilities to bacterial transmission and persistence. ISSN: 10566171

Patra A., Majumder R., Das A.
A Comprehensive Study of Conventional and Modern Salmonella Detection Methods in Street Food
(2026) Proceedings of the National Academy of Sciences India Section B - Biological Sciences, 96 (3), pp. 497 - 503
ABSTRACT: Street food is a unique and popular food source across the globe, specifically in developing countries, where it also serves as a good source of income. However, the lack of hygiene practices by the street vendors poses a high risk of foodborne illness. Being the major culprit of foodborne illness, Salmonella remains a significant health concern worldwide. Effective detection methods are crucial for identifying food sources containing Salmonella for controlling the outbreaks. This review comprehensively compares and analyses different methods employed for the identification of Salmonella, from conventional methods to the most advanced methods. ISSN: 03698211

Fatima A., Naeem M., Bourassa D.
Role of vaccines in Salmonella control — a review
(2026) Journal of Applied Poultry Research, 35 (3), art. no. 100752
ABSTRACT: Salmonella remains a persistent threat in broiler poultry production, posing significant public health and economic challenges due to its potential for foodborne transmission and clinical disease in poultry. Vaccination is a vital pre-harvest control strategy aimed at reducing colonization, shedding, and transmission of key Salmonella serovars, particularly Salmonella Enteritidis and Salmonella Typhimurium, as well as host-adapted serovars such as Salmonella Gallinarum, and Salmonella Pullorum. This review evaluates various vaccine platforms used in broiler production systems, including live attenuated, inactivated (killed), subunit, and ghost vaccines, based on their safety, immunogenicity, practicality, and application in commercial poultry production. Live

attenuated vaccines, though effective in eliciting strong mucosal and systemic immunity, carry risks of persistence and reversion to virulence. Inactivated vaccines are safer and widely accepted but generally stimulate weaker immune responses and require multiple doses. Subunit vaccines, especially when delivered via nanoparticles or in-ovo methods, offer targeted protection with improved safety profiles compared to live attenuated or inactivated vaccines, although their immunogenicity remains a limiting factor. Ghost vaccines, composed of empty bacterial envelopes, represent an innovative platform that preserves antigenicity while eliminating infectivity, demonstrating promising cross-protective potential. Various studies and field applications underscore that while each vaccine type presents distinct advantages and limitations, their strategic deployment, often in combination and integration with biosecurity and surveillance measures, can significantly lower Salmonella burden in poultry. Ultimately, tailored vaccine use based on serovar prevalence, production scale, and host-specific responses offers a practical pathway toward safer poultry products and improved public health outcomes.
ISSN: 10566171

Freshour G., Sant'Anna A.C., Coe C., Rion M.S.I., Long C., Aduloju P., Adediran A., Matak K., Jaczynski J., Boltz T., Shen C.
Efficacy of commercial marinades with and without microwave heating against Salmonella Typhimurium on chicken breasts
(2026) Journal of Applied Poultry Research, 35 (3), art. no. 100744
ABSTRACT: Salmonella contamination is primarily seen in uncooked non-ready-to-eat (NRTE) products due to post-processing contamination; therefore, this study analyzed the effect of commercial marinades with and without microwave heating on Salmonella Typhimurium survival on chicken breasts during aerobic storage. Fresh chicken breasts were trimmed to uniform 4 × 5 cm (~75 g) portions and surface inoculated with S . Typhimurium [resistant to 200 ppm of nalidixic acid (NaL)]. Marinades including A1, Italian, and Red Hot dressings were applied to chicken sample surfaces either before or after cooking in an electric double-pan broiler (218.3°C) for 2 min prior to storage at 10°C in vacuum-sealed bags for 10 days. Microbial cells were enumerated on days 0, 1, 3, 7, and 10 by spread plating onto tryptic soy agar plus 200 ppm of NaL. The experimental design followed a 2 × 5 × 2 factorial design and was analyzed by a mixed model procedure in R (α = 0.05). There was a total of 630 samples, with 3 replicates of 180 samples each. In non-marinated control samples, Salmonella increased from 4.74 to 8.47 log10 CFU/g over the 10 days of storage. Microwave reheating for 15 s only slightly (P = 0.054) reduced the pathogen counts by 0.11 to 0.33 log10 CFU/g, while reheating for 30 s increased (P = 0.004) the reductions from 1.37 to 1.99 log10 CFU/g. Applying marinades to chicken breast before cooking inhibited (P < 0.05) the growth of Salmonella up to day 7 to 10. Applying the three marinades to cooked chicken breast significantly inhibited pathogen growth during the 10-day storage period (P = 0.005), with surviving cell counts ranging from 3.91 to 4.80 log10 CFU/g. Increasing microwave heating time from 15 to 30 seconds further increased (P = 0.039) reductions of Salmonella by 0.8 to 1.7 log10 CFU/g across all tested marinated samples. Results of this study indicate that applying commercial marinades with microwave heating provides a “multiple hurdle” approach for inactivating Salmonella on NRTE chicken breasts. ISSN: 10566171