

Detection of *Salmonella* Spp. in Eggs and on Eggshells

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Structured Abstract

Background: *Salmonella* contamination in eggs poses a persistent threat to food safety and public health. Contamination can occur internally during egg formation and externally through fecal contact and environmental exposure. This study aims to determine the total bacterial count and presence of *Salmonella* in both egg contents and eggshells from two different sources which are commercial and farm-sourced eggs in Selangor. It also assess the antibiotic resistance profiles of the isolated strains, an area of growing concern in clinical and food microbiology.

Methods: Thirty eggs (15 commercial, 15 farm) were analysed. Total bacterial counts were performed using nutrient agar (NA), while *Salmonella* was selectively cultured on *Salmonella Shigella* Agar (SSA). Presumptive *Salmonella* colonies underwent Gram staining, indole, Triple Sugar Iron (TSI), and catalase tests for further confirmation. For sample preparation, eggshells were blended with Buffered Peptone Water (BPW), and egg contents were homogenized before serial dilution. After inoculation and incubation at 37°C, colonies were counted and identified. Antibiotic susceptibility was assessed using the Kirby-Bauer disk diffusion method on Mueller-Hinton Agar (MHA) with selected antibiotic discs which are vancomycin, cefoxitin, aztreonam, amikacin, and chloramphenicol. Zone diameters were measured and interpreted according to CLSI guidelines.

Results: Eggshells showed higher bacterial counts than egg contents, with farm-sourced eggs exhibiting greater contamination than commercial ones. *Salmonella* was most prevalent on farm eggshells (90% of positive samples), with minimal detection in commercial eggs. Biochemical tests confirmed isolates as *Salmonella* spp., characterized as Gram negative, indole negative, H₂S producing rods. Antibiotic susceptibility results showed all isolates were resistant to vancomycin, and cefoxitin but susceptible to amikacin, aztreonam and chloramphenicol.

Conclusion: In conclusion, the findings of this study indicated that eggshells particularly from farm environments, are critical points of microbial contamination. The findings highlight the urgent need for improved biosecurity measures at the farm level, proper egg-handling, and public education. The presence of multi-drug resistant *Salmonella* underscores the need for continuous surveillance and antibiotic stewardship. Overall, these results support integrated strategies to mitigate risk of *Salmonella* across the egg supply chain.

Keywords: *Salmonella*, Eggshell, Bacterial Contamination, Antibiotic Resistance, Food Safety

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