SEGMENT-SPECIFIC IMMUNE MODULATION IN THE OVIDUCTS OF LAYING HENS DURING *SALMONELLA* ENTERITIDIS INFECTION ASSOCIATED WITH VERTICAL TRANSMISSION RISK

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Abstract

Salmonella Enteritidis (SE) is a critical foodborne pathogen posing a severe public health risk, transmitting predominantly via contaminated eggs. Despite this, mechanisms enabling persistent reproductive colonization and vertical transmission remain poorly defined. This study investigated tissue colonization patterns and segment-specific immune responses in the oviducts of specific-pathogen-free (SPF) laying hens following oral SE challenge. Twenty-four hens were assigned to SE-infected and control groups (n = 12 each), and samples were collected at 3–5 weeks post-inoculation. SE infection resulted in persistent cloacal shedding and significantly reduced egg production ($P < 0.05$). High bacterial loads were observed in the cecum, spleen, and oviduct segments, while ovarian colonization was limited. Immunological analysis revealed distinct tissue-specific T cell responses. $CD4^+$ T cells were reduced in the spleen and ovary, whereas $CD8^+$ T cells were increased in these tissues but significantly decreased in the magnum ($P < 0.05$). Cytokine profiling showed a pro-inflammatory Th1/Th17 response in the isthmus, with elevated IL-2, IL-18, and IL-17A, while the magnum exhibited an anti-inflammatory profile characterized by increased IL-10 expression. In conclusion, SE infection induces segment-specific immune modulation within the oviduct. The pro-inflammatory environment in the isthmus contrasts with an immunosuppressive state in the magnum, which may facilitate persistent bacterial colonization. These findings provide insight into the immunological basis of vertical transmission risk and highlight the magnum as a potential niche for SE persistence.

Keywords: *Salmonella* Enteritidis, oviduct colonization, T lymphocytes, immune modulation, laying hens