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Establishing a human stem cell-derived infection model to visualize the effects of Listeria monocytogenes on the developing brain

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Zoonotic infections during pregnancy, especially those involving the central nervous system, are associated with an increased risk for neurodevelopmental disorders in offspring. *Listeria monocytogenes* is a key example, with prenatal exposure linked to long-term neurological impairments. To investigate underlying pathogenic mechanisms, we employed a human induced pluripotent stem cell (iPSC)-derived neurosphere model that mimics key aspects of fetal brain development.
A standardized infection protocol was implemented: Bacteria were cultured to 10^8 CFU/mL (OD 0.5) and applied at multiplicities of infection (MOI) of 50, 100, and 150 for 1–4 hours. Following gentamicin treatment to eliminate extracellular bacteria, neurospheres were fixed at 1, 24, and 48 hours post-infection. Infection was validated via immunofluorescence using *Listeria*-specific antibodies and Phalloidin to label actin filaments. Variable invasion patterns were observed across conditions, reflecting clinical heterogeneity. All MOIs supported successful infection; MOI 50 was selected for subsequent analyses, as it more closely reflects physiologically relevant infection levels. Infections were more consistent following 2-hour exposures compared to 1 hour. Viability exceeded 80% and cytotoxicity remained below 5% of controls, indicating the model's suitability for studying host-pathogen interactions without compromising neurosphere integrity.
Ongoing studies will evaluate infected cell populations, proliferation, migration, and electrophysiological alterations.

Keywords

Neurospheres, Listeriosis, Brain development, in vitro infection model

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Professional Status of the Speaker

PhD Student

Junior Scientist Status

Yes, I am a Junior Scientist.

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