Unveiling Listeria monocytogenes: From Virulence Factors to Food Safety Challenges

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Abstract

Listeria monocytogenes is a notorious foodborne pathogen that exhibits extraordinary flexibility, posing threats to public health and the global food industry. Known to grow under conditions intolerable for most bacteria such as refrigeration, high salt, and acidic pH, the pathogen is a continual menace across a range of ready-to-eat foods, dairy, and meat production sites. Its powerful pathological weaponry, which includes invasion proteins (internalins), the actin-hijacking factor ActA, and the multifaceted listeriolysin O, enables Listeria to not only penetrate the gut, placental, or blood-brain barrier, but also to escape immune scrutiny and lead to such severe clinical outcomes as meningitis, septicemia, and miscarriage. Contemporary outbreaks though still infrequent — are usually the result of tiny contaminations that are especially perilous to groups at risk. As knowledge increases, complexity of Listeria's lifestyle emerges from environmental survival and stress responses, to sophisticated host cell entry modes and manipulation of cellular functions. Advances in molecular diagnostics, surveillance, and response technologies have transformed detection and control, but ongoing challenges require sustained scientific vigilance. This review colligates novel understanding of the epidemiology, survival strategies, virulence mechanisms and control options associated with L. monocytogenes with an emphasis on the diverse threat posed by the pathogen and the creative solutions needed to minimize its threat to food safety and also public health.

Keywords

Listeria monocytogenes, Virulence mechanisms, Actin-based motility, Epidemiological surveillance, Antimicrobial resistance.