**THE GENUS LISTERIA**

At first considered as a member of the family Corynebacteriaceae, primarily because of morphological characteristics, later chemotaxonomic studies demonstrated that *Listeria* spp. are quite distinct from the corynebacteria. It was not until 1984, The genus *Listeria* as originally described was monotypic, with *L. monocytogenes* the sole member. In the ensuing years a further seven species were recognised: *L*. *ivanovii* (previously *L. monocytogenes* serovar 5), *L. innocua*, *L. welshimeri*, *L. seeligeri*, *L. murrayi*, *L. grayi* and *L. denitrificans*. *Listeria* spp. are short (0.4–0.5 ×0.5–2.0 µm) Gram-positive rods. The onset time to gastrointestinal symptoms is unknown, but probably exceeds 12 hours. An early study suggested that *L. monocytogenes* is unique among Gram-positive bacteria in that it might possess [lipopolysaccharide](https://en.wikipedia.org/wiki/Lipopolysaccharide), which serves as an [endotoxin](https://en.wikipedia.org/wiki/Endotoxin). Later, it was found to not be a true endotoxin. *Listeria* cell walls consistently contain [lipoteichoic acids](https://en.wikipedia.org/wiki/Lipoteichoic_acid" \o "Lipoteichoic acid), in which a glycolipid moiety, such as a galactosyl-glucosyl-diglyceride, is covalently linked to the terminal phosphomonoester of the teichoic acid. This lipid region anchors the polymer chain to the cytoplasmic membrane. These lipoteichoic acids resemble the lipopolysaccharides of Gram-negative bacteria in both structure and function, being the only [amphipathic](https://en.wikipedia.org/wiki/Amphiphile) polymers at the cell surface. They are nonacid fast and do not produce spores. At 20 C they are motile by means of peritrichous flagella, but motility is not observed in cultures incubated at 37 C. They are facultatively anaerobic and grow over a wide temperature range of 0–45 C (optimum 30–36 C), although growth at very low temperatures is slow. Growth over a wide pH range occurs, with some strains growing at pH 9.6, but is optimal at neutral to slightly alkaline pH. The major antigenic determinants of *Listeria* spp. are the somatic (O) and flagellar (H) antigens. The current serotyping scheme, based on these antigens, distinguishes six serogroups (1/2, 3, 4, 5, 6 and 7).

**PATHOGENESIS**

Apart from the very rare exception of direct inoculation via skin or

conjunctiva, it is most likely that in the adult the bacteria gain access to the host via the gastrointestinal tract. In the case of the fetus, infection in the majority of cases arises from haematogenous

seeding of the placenta and only a few cases are thought to be acquired *intra partum* as the neonate exits the birth canal. Late onset neonatal listeriosis is acquired through direct or indirect person-toperson transmission. Although it has been suggested that co-infection with another gastrointestinal pathogen may predispose to invasion of the gut by *L. monocytogenes*, it is now known that the bacterium can specify its own uptake by mammalian cells, including those which are nonprofessional phagocytes. The expression of cell-surface-associated proteins, of which internalin (Inl) A and B are the best characterised, are of key importance in this process. Another protein (p60), the product of the *iap* gene, recently renamed cwhA (cell-wall hydrolase) was originally thought to play a significant role in this context, but its contribution to invasiveness has since been downplayed . Following internalisation by the host cell, the bacterium lyses the

membranes of the phagosomal vacuole. Lysis is mediated by listeriolysin O, a haemolysin which is related to other cholesterol-dependent pore-forming toxins (CDTX) such as streptolysin O. Two phospholipases, PlcA and B, are also deemed to be important in allowing *L. monocytogenes* to escape from phagosomal vacuoles. Once free in the host cell cytoplasm, the protein ActA promotes actin accumulation and polymerisation resulting in the formation of an actin tail at apole of the bacterium, and it is propelled in a pseudopod-like structure into an adjacent cell whereupon it is then phagocytosed. The bacterium escapes from the resulting double-membrane vacuole through production of listeriolysin and PlcA and B.

*Listeria monocytogenes* has been isolated from a very wide range of environmental sources including dust soil and sewage. Although it is often considered that *L. monocytogenes* in soil and vegetation results from faecal contamination by animals.

*Listeria monocytogenes* can survive for extended periods in the

environment. It can survive for up to 1500 days in certain types of soil and can persist and multiply in water, being isolated from surface water of canals and lakes as well as estuarine environments. The bacterium has also been isolated from raw and treated sewage. The formation of biofilm, which is strain dependent, may be important in this respect . Following the recognition that listeriosis is frequently a food-borne infection there have been few foods which have not escaped the attention of microbiologists seeking *L. monocytogenes*. Studies to determine the extent of listerial contamination of a given food product often yield different results. The reasons for this are complex and reflect, at least in part, geographic, seasonal and other differences as well as variations in isolation protocols. Carriage of *Listeria* spp. in the vagina has been investigated but does not seem to occur outside the setting of recent maternofetal listeriosis . as well as a failure to recognise that food-borne listeriosis may manifest with a clinical picture of gastroenteritis similar to that of salmonellosis or campylobacteriosis . Person-to-person transmission outside the hospital setting has never been convincingly demonstrated, but nosocomial spread of *L. monocytogenes* is well recognised, particularly on neonatal units, Zoonotic cases of listeriosis are uncommon and have presentations which differ from the more commonly recognised syndromes and include cutaneous lesions, conjunctivitis and pneumonia. the pregnant woman may be asymptomatic with the first indication of infection being the abortion or stillbirth of the foetus or neonatal listeriosis in a live-born child. Listeriosis in adults is frequently seen against a background of immune suppression, particularly where cell-mediated immunity is affected. listeriosis is 150–300 times more common in HIV-positive patients than in matched control groups from the general population. Meningitis, with or without focal neurological signs, is the most common form of CNS listeriosis.