2nd Professional
(Veterinary Microbiology)

Topic: Listeria & Erysipelothrix

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Theory

Listeria

Genus *Listeria*

Lis.te'ri.a. N.L. fem. n. Listeria named after Lord Lister

Taxonomy hierarchy: *Listeria*

Class:	*Bacilli*
Order:	*Bacillales*
Family:	*Listeriaceae*
Genus:	***Listeria***

History

- First isolated by Murray and co-workers in 1926.
- Named Listeria was coined in 1940 -

Taxonomy and General Characteristics

The genus Listeria currently contains 17 species:

1. *L. aquatica*
2. *L. booriae*
3. *L. cornellensis*
4. *L. fleischmannii*
5. *L. floridensis*
6. *L. grandensis*
7. *L. grayi*
8. *L. innocua*
9. *L. ivanovii*
10. *L. marthii*
11. *L. monocytogenes*
12. *L. newyorkensis*
13. *L. riparia*
14. *L. rocourtiae*
15. *L. seeligeri*
16. *L. weihenstephanensis*
17. *L. welshimeri.*

What is Listeria?

- The genus Listeria
  - belongs to the class Bacilli and the order *Bacillales*
  - consists of at least 17 recognized species that includes *Listeria monocytogenes*
  - *Listeria monocytogenes* is pathogenic bacteria that causes the infection listeriosis
  - grow and reproduce inside the host's cells
  - one of the most virulent foodborne pathogens
  - *Listeria monocytogenes* organisms are short, gram-positive, rod-shaped, non-spore-forming, facultative anaerobic bacteria.
  - Listeria species can grow in a temperature range of 0-45°C and within a pH range of 5.9-9.6.
  - These growth conditions contribute to its versatility to propagate in many food products.

Virulence

- *L. monocytogenes* is a facultative intracellular pathogen.
- *L. ivanovii* predominantly infects sheep

Genus Listeria

Listeria Monocytogenes

(A Psychrophilic Bacterium)

- *L. monocytogenes* and *L. ivanovii*, are considered pathogens.
  - Key phenotypic characteristics of *Listeria monocytogenes* species include :
    - Motile (multi-flagellar) (at least at 30 °C)
    - Non-spore forming
    - Facultative anaerobes
    - Optimum growth temperature 30-37 °C
    - ability to grow at temperatures at 0-45 °C
    - motility Tolerates high salt concentration 10-12% NaCl
    - It can survive at a pH range of 5.5 - 9.6

Biochemical features

- positive catalase Reaction
- inability to reduce nitrate to nitrite
- positive reaction in the Voges-Proskauer test.

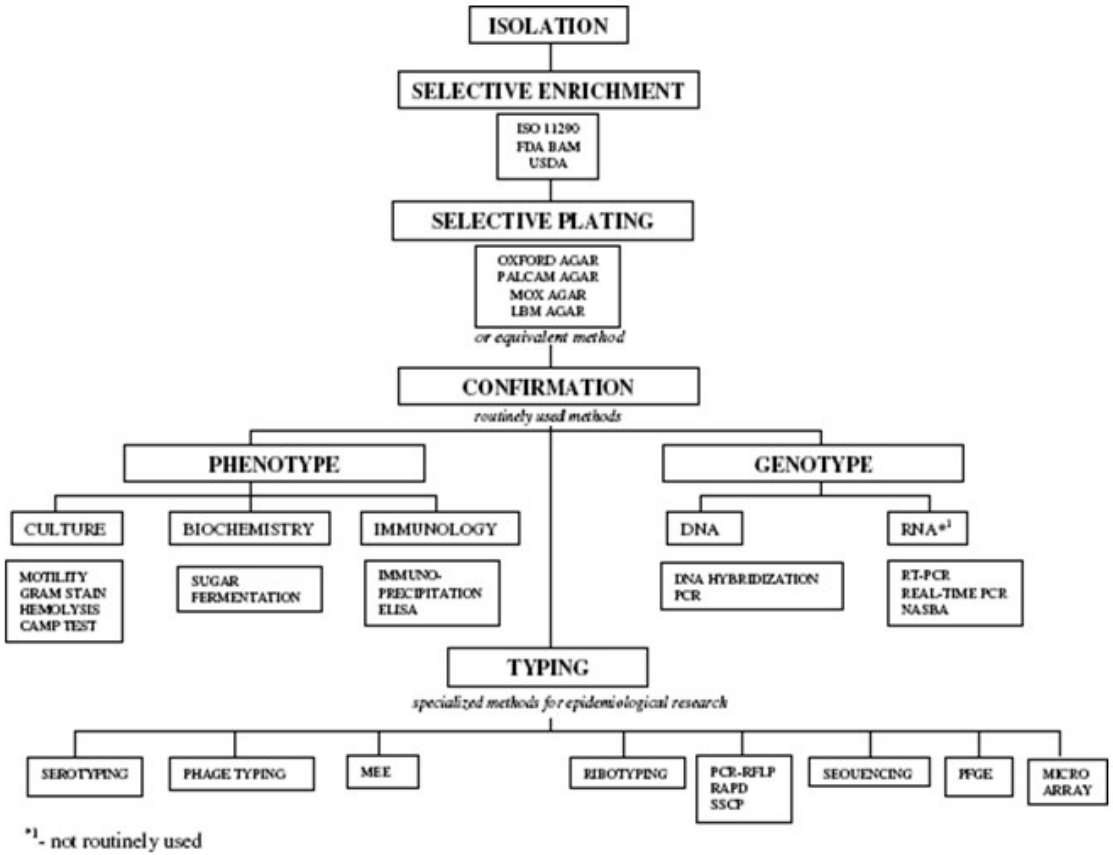
Antigenic structure

- Two types of antigen - somatic (O) and Fagellar (H) antigens

- Based on somatic (O) and Fagellar (H) antigens,13 serotypes were identified in Listeria monocytogenes including 1/2a,1/2b,1/2c,3a,3b,3c,4a,4ab,4b, 4c, 4d, 4e, and 7

- 5 serogroups determined by multiplex PCR:
  - IIa (serovars 1/2a and 3a)
  - IIb (serovars 1/2b and 3b)
  - IIc (serovars 1/2c and 3c)
  - IVb (serovars 4b, 4d and 4e)
  - L (other serovars).

Isolation and Characterization of *Listeria* and *L. monocytogenes*...



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Listeria Pathogenesis

- Ingested raw contaminated food
- Penetrates cell of intestine
- Facultative intracellular pathogen
- Immunocompromised host
- Transmitted congenitally

Intracellular invasion

- Invade mononuclear phagocytic cells
- Grow intracellularly
- Move from host cell to host cells by propelling host actin filament
- Escape from host phagosome into cytosol by secreting a cytolysin called listeriolysin O
- Multiplies in cytoplasm of host cell

Listeriosis Diagnosis

- Monocytosis
  - Peripheral blood & cerebrospinal fluid
- Gram stain
  - Gram positive rods in CFS
- Culture
  - Blood, CSF, skin lesions

Listeriosis in Animals

- L. monocytogenes can infect many animal species including cattle, goats, and sheep.
- Sheep are particularly sensitive to the bacteria.
- Listeria causes encephalitis (inflammation of the brain) in adult ruminants.
- Infected animals most commonly show severe neurologic signs
  - loss of balance (ataxia), *circling* (Circling disease) and unusual body spasms.
  - Other symptoms include fever, loss of appetite, and decreased activity.
  - Abortion.
  - New-born ruminants typically develop a blood infection.
- Listeriosis in ruminants may be caused by due to spoiled silage.

Listeriosis in birds

- birds manifest as septicaemia, resulting in focal necrosis of the liver, spleen, heart, kidneys, lungs, air sacks, intestine, oviduct or cornea
- Listerial meningoencephalitis in birds - Affected fowl exhibit typical central nervous system symptoms including torticollis, tremor, and paralysis of the legs or wings.

Listeria: Food poisoning

MILK and dairy products. This species grows at refrigerator temp. 5-12° C

Isolated by cold enrichment.

Test for Listeria in Milk

- Add fluorescent-labelled antibodies specific for *Listeria monocytogenes* to milk
- Pass through a flow cytometer. fluid is passed through a small opening
- Listeria detected by a laser beam
- NO CULTURE NEEDED!!!