Listeria species

Definition:-

Listeria species are:

- Small, Gram-positive coccobacillary rods, up to 2 *µm* in length (Fig. 1).
- They are catalase-positive, oxidase-negative
- Motile
- Facultative anaerobes.
- The genus is composed of six species, three of which are pathogenic.
- *Listeria monocytogenes*, the most important of these pathogens, has been implicated worldwide in diseases of many animal species and humans. It was first isolated from laboratory rabbits with septicaemia and monocytosis.
- The organism can grow over a wide temperature range from 4°C to 45°C and can tolerate pH values between 5.5 and 9.6.
- The other two pathogens, *L. ivanovii* and *L. innocua***,** are less frequently implicated in diseases of animals. The clinical manifestations of infections with *Listeria* species are summarized in Table 1

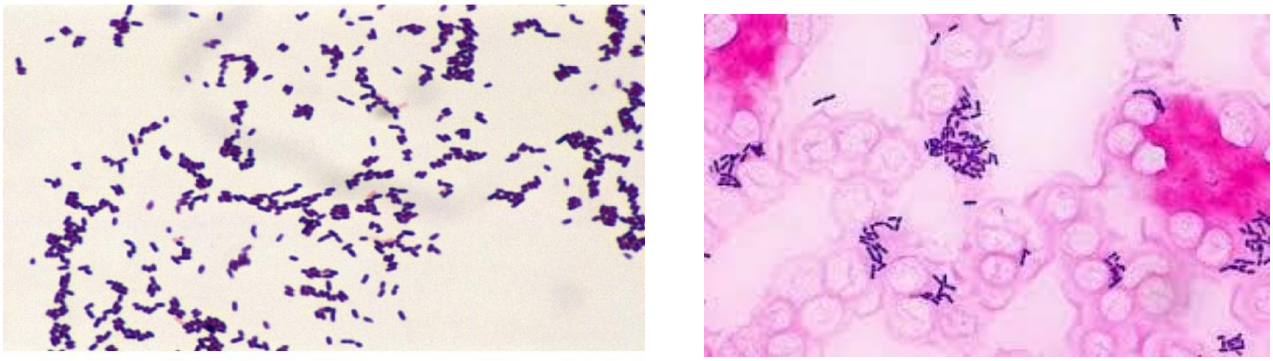

Fig. 1: Listeria monocytogenes Gram positive short rods, deeply stained – size 1.2 X 2.5µm

Table 1: Clinical manifestations of infections with *Listeria* species in domestic animals.

Species	Hosts	Forms of disease
Listeria monocytogenes	Sheep, cattle, goats	Encephalitis (neural form), abortion, Septicaemia
	Cattle	Endophthalmitis (ocular form).
	Dogs, cats, horses	Mastitis (rare)
	Pig	Abortion, encephalitis (rare)
	Birds	Abortion, septicaemia encephalitis
L. ivanovii	Sheep, cattle	Abortion
L. *innocua*	Sheep	Meningoencephalitis (rare)

Usual habitat

Listeria species can replicate in the environment. They are widely distributed and can be recovered from herbage, feces of healthy animals, sewage effluent and bodies of fresh water.

Differentiation of *Listeria* species:-

- The pattern of haemolysis on sheep blood agar
- CAMP tests and acid production from a short range of sugars are useful differentiating laboratory methods for *Listeria* species (Table 2**).**
- The colonies are small, smooth and transparent after incubation for 24 hours (fig. 2).

1-Commercially-available biochemical test kits can be used to distinguish *Listeria* species.
2-Sixteen serotypes, based on cell wall and flagellar antigens, are recognized.
3-Phage typing is reproducible and discriminating but its diagnostic applications are limited.

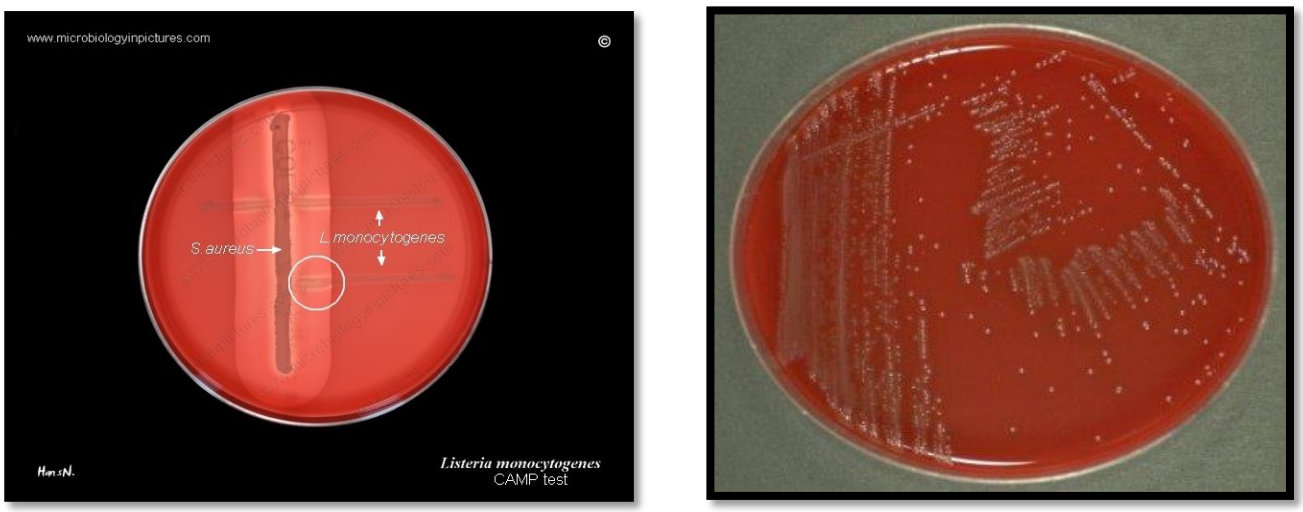

Fig. 2: *Listeria* monocy*togenes* CAMP positive test and heamolysis on blood agar

Table 2: Laboratory methods for differentiating Listeria species.

Listeria species	Haemolysis on sheep blood agar	CAMP test		Acid production from sugars		
		S. aureus	*R. equi*	D-mannitol	L-rhamnose	D-xylose
L. monocytogenes	+	+	-	-	+	-
L. ivanovii	++	-	+	-	-	+
L. innocua	-	-	-	-	v	-
L.Seeligeri	+	+	-	-	-	+
L.welshimer	-	-	-	-	v	+
L. grayi	-	-	-	+	v	-

Pathogenesis and pathogenicity:-

1-Infection with *L. monocytogenes* usually follows ingestion of contaminated feed and may result in septicaemia, encephalitis or abortion.
2-Organisms probably penetrate the M cells in Payer's patches in the intestine. Spread occurs via lymph and blood to various tissues.

3-In pregnant animals, infection results in trans placental transmission.

4-There is evidence that the organism can invade through breaks in the oral or nasal mucosa. From this site, migration in cranial nerves is thought to be the main route of infection in neural listeriosis.

5-*Listeria monocytogenes* has the ability to invade both phagocytic and non-phagocytic cells, to survive and replicate intracellularly and to transfer from cell-to-cell without exposure to humoral defense mechanisms.

6- Specific surface proteins, internalins, facilitate both the adherence of organisms to host membranes and their subsequent uptake.

7-Virulent strains also possess a cytolytic toxin, listeriolysin, which destroys the membranes of phagocytic vacuoles allowing listeria to escape into the cytoplasm. In the cytoplasm, the organisms utilize cellular microfilaments to generate tail-like structures which confer motility.

Listeriosis in ruminants:-Take three forms including: (Fig. 3)

1-Nervous form: the organism enters body through abrasions in mouth and travels to brain, where its cause encephalomyelitis:

a- Incubation period: 10days, mortality rate 50%.

b- Depression, fever and incoordination

c- The animals segregate themselves in corners

d- Start circling in one direction

e- If facial nerve infected: unilateral drooping ear, drooping eyelid, and dilated nostril.

2- Abortion form or stillbirths in all animals and mastitis in ruminant.

3- Septicemic form in monogastric animals.

Fig. 3: Listeriosis forms in ruminants.

Diagnosis

1- Clinical singes: characteristic neurological signs or abortion in association with silage feeding may suggest listeriosis.
2- Specimens for laboratory examination depend on the form of the disease:
   a- Cerebrospinal fluid (CSF) and tissue from the medulla of animals with neurological signs
   b- cotyledons, foetal abomasal contents and uterine discharges in case of abortion
   c- Suitable samples from septicemic cases include fresh liver or spleen and blood.
3- Smears reveal Gram-positive coccobacillary bacteria.
4- Immunofluorescence using monoclonal antibodies.
5- Histological examination of brain tissue reveals microabscesses and heavy perivascular mononuclear cuffing in the medulla and elsewhere in the brain stem.
6- Isolation methods:
   a- Specimens from cases of abortion and septicaemia can be inoculated directly onto blood, selective blood and MacConkey agars.
   b- The plates are incubated aerobically at 37^0C for 24 to 48 hours.
   c- Cold-enrichment procedure is necessary for isolating the organism from brain tissue. Small pieces of medulla are homogenized and a 10% suspension is made in nutrient broth. The suspension is held at 4°C in a refrigerator and subcultured weekly onto blood agar for up to 12 weeks.
   d- Identification criteria for *L. monocytogenes* isolates:
      1- Colonies are small, smooth and flat with a blue green color when illuminated obliquely. Rough variants occur infrequently. Individual colonies are usually surrounded by a narrow zone of complete haemolysis.
      2- Catalase test is positive,
      3- CAMP test is positive with Staphylococcus *aureus*
      4- Aesculin is hydrolyzed.
      5- Isolates incubated in broth at 25^0C for 2 to 4 hours exhibit a characteristic tumbling motility.