

Medical Bacteriology- Lecture: 12

Other non spore forming Gram Positive Rods

Listeria

Erysipelothrix

Gardnerella

Propionibacterium

Listeria monocytogenes

- Small gram positive rods, motile via **tumbling**. sometimes arranged in short chains, non-fastidious, Facultative anaerobic
- Commonly found in soil, surface water, sewage, plants and food.
- **Zoonotic pathogen**, usually restricted to animals uterine infections resulting in placental infections causing stillbirths.
It can cause the same infection in humans.
- It is the agent of **listeriosis**, a serious infection caused by eating food contaminated with the bacteria. a rare but potentially **lethal food-borne infection**
- Transmitted to humans through ingestion of poorly cooked meat and unpasteurized milk or milk products
- Listeriosis disease affects primarily **pregnant women, newborns, and adults** with weakened immune systems. (Meningitis)
- Humans working with an infected animals (Skin lesion), can go systemic and result in meningitis.
- Colonies are β -hemolytic by **Listreriolysin (hemolysin)** but many strains of *L. monocytogenes* produce narrow zones.
- Hemolytic activity on blood agar has been used as a marker to distinguish *L. monocytogenes* among other *Listeria* species, but it is not enough. Further biochemical characterization may be necessary to distinguish between the different *Listeria* species.
- *L. monocytogenes* multiplies not only **extracellularly** but also **intracellularly**, within macrophages after phagocytosis



- COMPASS *Listeria* Agar is a selective medium used for the differentiation and isolation of *L. monocytogenes*

Virulence Factors

1- Growth at low temperatures

The bacteria may grow and accumulate in contaminated food stored in the refrigerator. **listeriosis** is usually associated with milk, meat or vegetable products that have been held at refrigeration temperatures for a long period of time.

2- Motility

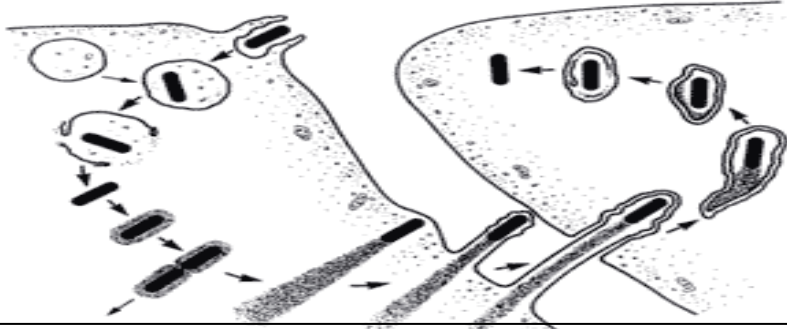
Listeria are actively motile by means of **peritrichous flagella at room temperature (20-25°C)**, produce “**umbrella**” **growth** below the motility media surface at room temperature, but the organisms do not synthesize flagella at body temperatures (37°C). Instead, virulence is associated with another style of motility: the ability of the bacteria to move themselves within and between host cells by **polymerization of host cell actin** at one end of the bacterium ("**growing actin tails**") that can propel the bacteria through cytoplasm.

3- listeriolysin O (LLO) toxin

The bacterium may escape from the phagosome after engulfment

4-Phospholipases- (phosphatidylinositol-specific phospholipase C (PI-PLC) & phosphatidylcholine-specific phospholipase C (PC-PLC)).

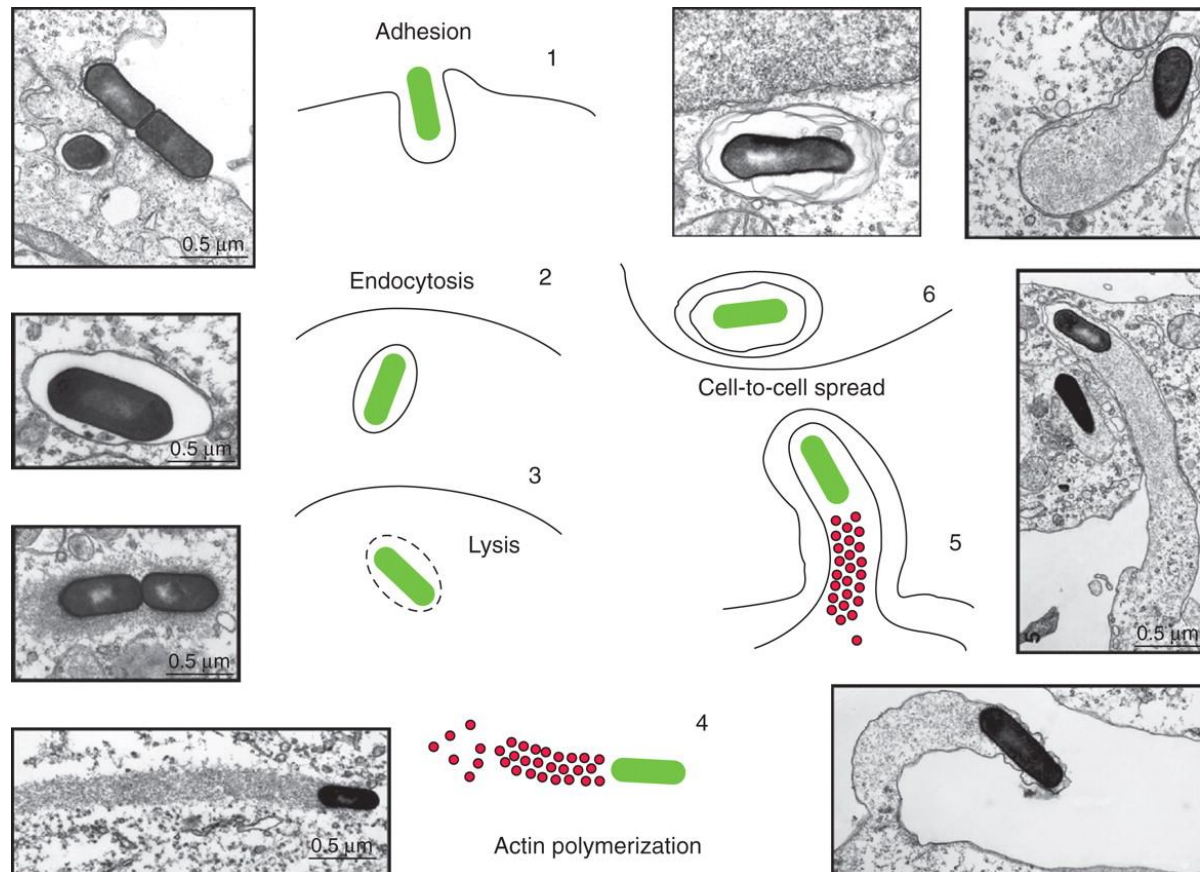
lyses host cells by forming a pore in the cell membrane, these phospholipases disrupt membrane lipids (lecithin).



The bacteria multiplies rapidly in the cytoplasm & moves through the cytoplasm to invade cells by polymerizing actin to form long tails

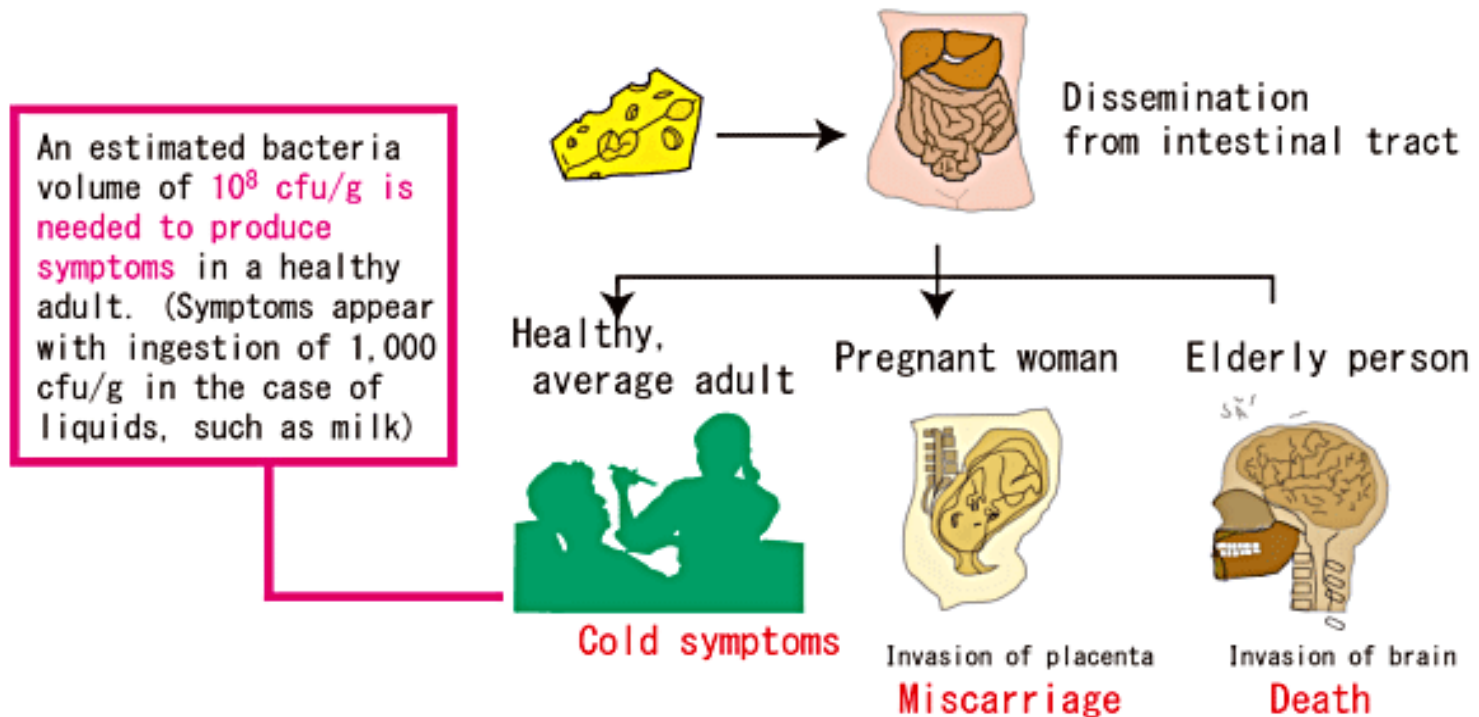


"umbrella" growth on semisolid media



The cell cycle of *L. monocytogenes*. (1) *L. monocytogenes* adheres to the surface of epithelial cells via the interactions of the surface proteins (2) *L. monocytogenes* is engulfed in a phagocytic vacuole. (3) *L. monocytogenes* lyses vacuolar membranes by means of the toxin LLO. (4) *L. monocytogenes* uses the protein ActA to harness the actin polymerization machinery and facilitate its intracellular movement via the formation of actin tails.” (5) *L. monocytogenes* exploits actin-based motility for direct cell-to-cell spread to allow the dissemination of the infection to neighboring cells via the formation of plasma membrane protrusions. (6) Once internalized by neighboring cells, *L. monocytogenes* is confined in a double-membrane vacuole from which it escapes to restart its life cycle.

If *Listeria* food poisoning occurs...

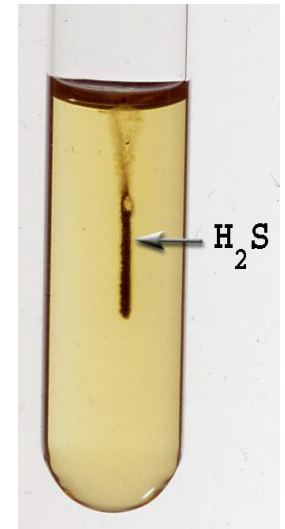
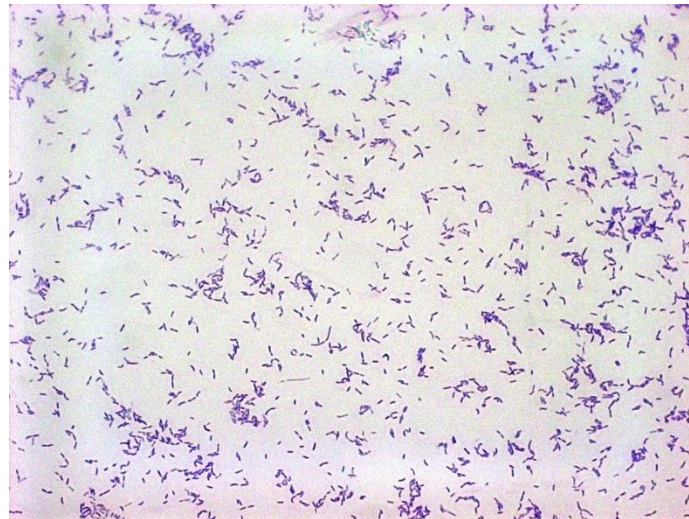


Treatment

- Antibiotic treatment of pregnant women or immunocompromised individuals can prevent serious consequences of the disease.
- Antibiotics effective against *Listeria* species include ampicillin, vancomycin, ciprofloxacin, azithromycin.

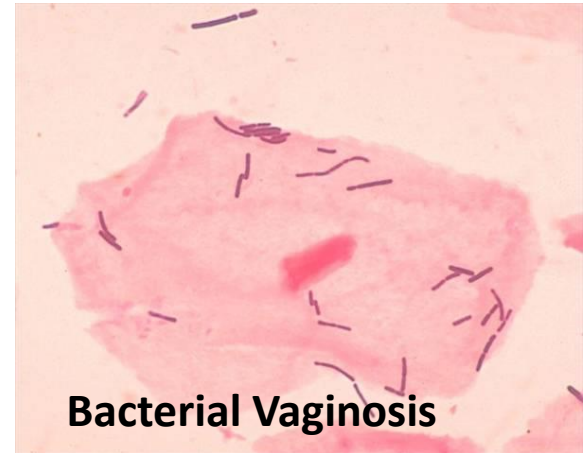
Erysipelothrix rhusiopathiae

- Gram positive pleomorphic rod. tends to become filamentous in old cultures
- Non motile- catalase negative- urease negative
- **H₂S production** on a TSI slant agar, differentiating it from *Listeria monocytogens*).
- Cause **occupational disease** of fish and meat handlers.
- **Mild cutaneous form:** Erysipeloid (**Whale finger**)
- **Systemic disease:** Bacteremia and endocarditis
- Shows **α-hemolysis** on Blood agar
- **Treatment:** Penicillin G



Gardnerella vaginalis

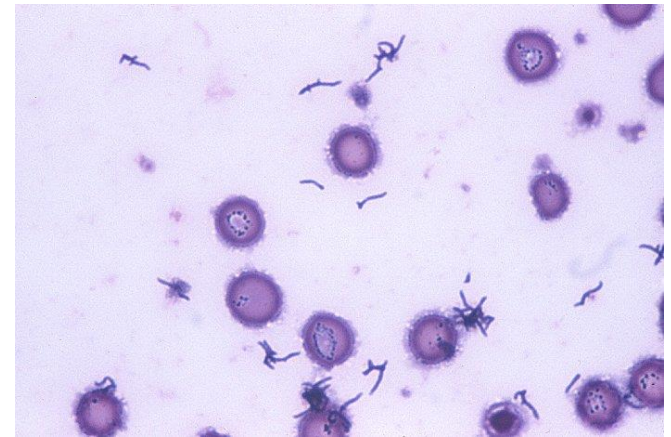
- vaginitis



Bacterial Vaginosis

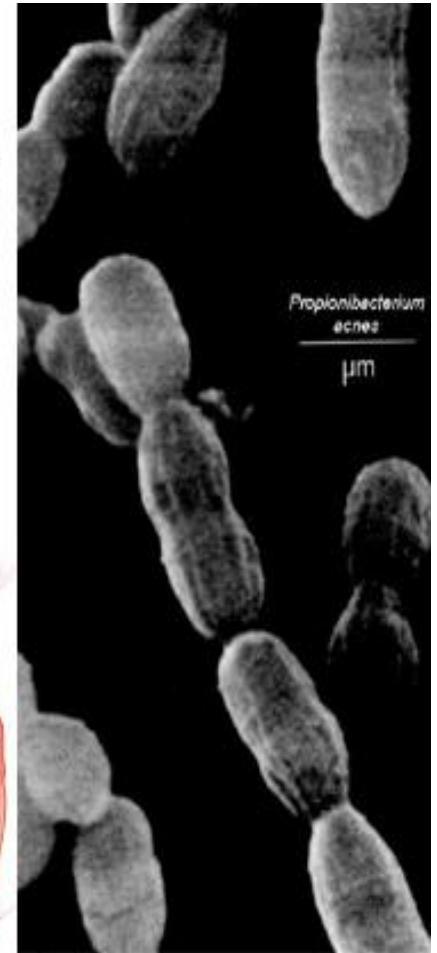
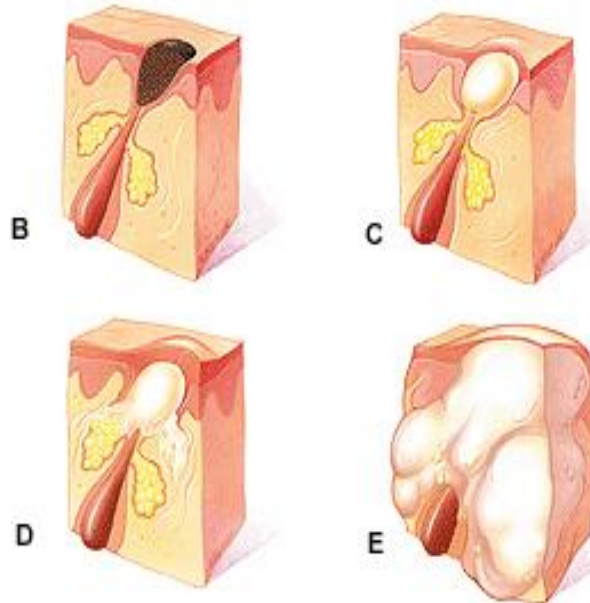
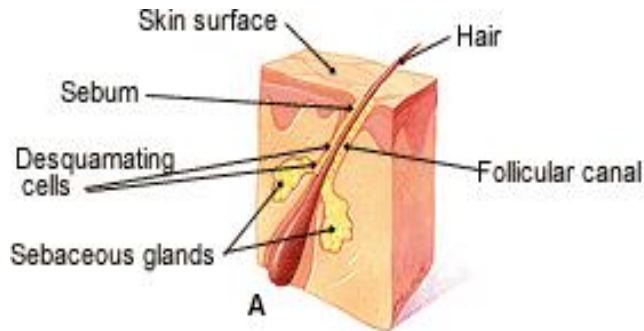
Propionibacterium acnes and *Propionibacterium granulosum*

- *Propionibacterium acnes* slow growing bacteria that is known to cause acne (**Acne vulgaris**). It is commonly present on all human skin.
- It lives on fatty acids and oil secreted by glands.



Acne vulgaris- (Reading)

Each skin unit contains sebaceous glands, hair follicles, and sebum. Hair and extra oil block hair follicles. The blockage does not allow the oil to exit the skin's pores. The blockage also draws P acnes bacteria to grow in the follicles as well. As bacteria produces chemicals, white blood cells are drawn to fight infection which leads to inflammation and swelling. The follicles eventually break open and spill into surrounding skin. The result is a breakout of acne.



There is no one reason for acne. However, many factors contribute to the condition:

Genetics: Acne tends to run in families, so when relatives have the condition, so do many other family members.

Hormones: Any period in life when a person's hormones become unbalanced will cause acne to occur. Puberty, pregnancy, and menopause are often the times in life when acne is heightened. During these times, the male hormone androgen leads to the overproduction of oil that causes acne.

Review Questions

- What is the disease which caused by *Erysipelothrix rhusiopathiae*, *Propionibacterium acnes*, *listeria monocytogenes*?
- Compare between *Erysipelothrix rhusiopathiae* & *L. monocytogenes*?
- What is the virulence factors of *L. monocytogenes*, it has two styles of motility, discuss?