# **Listeria and Other Non-Sporing Gram-Positive Rods (Except *Corynebacterium*)**

This group includes small Gram-positive rods that do not form spores: **Listeria, Erysipelothrix, Coryne, Lactobacillus, Gardnerella,** *Arcanobacterium, Trueperella*, *Bifidobacterium*.

**Characteristics:**

* Most are regular to pleomorphic rods.
* Some can be mistaken for streptococci or diphtheroids on Gram stain.
* They can be tricky since they share some features but also have key differences in motility, catalase, and other tests.

**Listeria**

19 species, 6 clinically relevant: L. monocytogenes, ianovii, seeligeri, innocua, welshimeri, grayi

short, rounded, non-sporing, non acid-fast, facultative anaerobes, no capsule

**Listeria monocytogenes:**

1. Small Gram-positive rods, often in short chains or pairs (resembling cocci).
2. **Catalase positive** (bubbles, unlike streptococci).
3. **Motile** – shows a distinctive **tumbling motility** in a hanging drop. Motility is much reduced at 37°C.
4. **“umbrella” pattern** of motility in semisolid agar at 20–25°C.
5. *Listeria* is β-hemolytic on blood agar (narrow zone).
6. hydrolyzes **aesculin** (blackening of bile esculin agar)
7. **CAMP test positive** (produces an enhanced hemolysis arrowhead with *S. aureus*, similar to GBS reaction).
8. *L. monocytogenes* ferments **rhamnose** (a sugar differentiation test) whereas some other Listeria (like *L. ivanovii*) do not.
9. **Hippurate positive**. These biochemical traits, along with motility and hemolysis, distinguish *L. monocytogenes*. (Note: *Listeria* is often identified by biochemical kits or MALDI in practice.)
10. *Listeria monocytogenes* causes listeriosis (sepsis and meningitis, especially in neonates, elderly and pregnant women, immunocompromised) and must be correctly identified for public health (implicated in foodborne outbreaks: from soft cheese, milk, pate, packed meats, sandwiches).

**Erysipelothrix rhusiopathiae:**

* Thin pleomorphic Gram-positive rods that may form long filaments.
* **Catalase negative** (unlike Listeria).
* Non-motile.
* On blood agar: **narrow α-hemolysis** after prolonged incubation.
* A key test is **H₂S production in TSI** – *Erysipelothrix* is one of the few Grampositive rods that produce hydrogen sulfide (blackening along the stab line in triple sugar iron agar).
* It’s also **gelatin stab positive** with a characteristic **“test-tube brush” growth** pattern in gelatin media.
* Causes erysipeloid skin infections (classically in fishermen or butchers) and occasionally endocarditis;
* Resistant to vancomycin

**Lactobacillus species:**

* Long Gram-positive rods occurring in chains.
* **catalase negative**
* **non-motile**.
* are often small α-hemolytic on blood agar.
* They are highly **acid-tolerant** (pH 5) and produce lactic acid
* **Rogosa agar** they produce pinpoint colonies.
* Differentiation from *Erysipelothrix* and *Listeria*: *Lactobacillus* is nonmotile and H₂S-negative, and most species will not hydrolyze esculin
* Lactobacilli are normal flora (especially in the female vaginal tract and GI tract) and rarely cause disease (occasionally implicated in endocarditis or bacteremia in immunocompromised).
* Intrinsic resistance to glycopeptides, aminoglucosides, fluoroquinolones, cefoxitin

**Gardnerella vaginalis:**

* A small **Gram-variable rod**
* It is catalase and oxidase negative.
* *Gardnerella* grows as tiny gray colonies on chocolate agar and exhibits **β-hemolysis on human blood bilayer (tween) agar** (HBT agar), but not on sheep blood.
* It’s associated with bacterial vaginosis (presence of “clue cells” in microscopy). In identification, *Gardnerella* can be distinguished by its unique growth requirements and **hippurate hydrolysis positive** (like GBS).
* Often identified by clinical context and PCR, but in culture, its tiny colonies and Gram-variable nature are clues. –

**Arcanobacterium (Trueperella) haemolyticum:**

* A small Gram-positive rod (often club-shaped, resembling corynebacteria)
* Catalase negative
* Non motile
* B haemolytic
* distinctive test is the **reverse CAMP test** – *A. haemolyticum* will **inhibit the hemolysis** of *S. aureus* in a CAMP setup (a “reverse” CAMP effect, appearing as an area of reduced hemolysis where the streaks meet, rather than an arrowhead of enhanced hemolysis). This is opposite of the positive CAMP seen with *Listeria* or GBS.
* *A. haemolyticum* is also **phospholipase positive** on egg yolk agar and **gelatin negative**.
* *i.e.* can be differentiated from *Listeria* by catalase (Listeria is catalase +; Arcanobacterium is –) and from β-hemolytic strep by Gram stain (rod vs cocci, and negative PYR).
* that causes pharyngitis and skin ulcers, mostly in adolescents > can be penicillin resistant and macrolides can be used.

**Identification Algorithm Highlights:** For a Gram-positive rod isolate:

1. Perform **catalase test**. If positive, think *Listeria* (or *Bacillus/Corynebacterium* groups); if negative, think *Erysipelothrix*, *Lactobacillus*, or *Arcanobacterium*.
2. 2. If **catalase positive and small β-hemolytic colonies**, consider *Listeria*. Check **motility** at room temp (tumbling motility suggests *Listeria*). Also perform **CAMP** and **esculin hydrolysis** – *Listeria monocytogenes* will be positive for both. If catalase-positive but non-motile and H₂S-positive, that points to *Bacillus licheniformis* or similar spore-formers (not in this group) – but non-sporing rods with catalase usually are Listeria.
3. 3. If **catalase negative** and H₂S produced in TSI, identify as *Erysipelothrix*. If catalase negative and no H₂S, consider *Lactobacillus* (especially if the source is a clinical site like vagina or mouth and the organism is not strongly hemolytic).
4. 4. If **β-hemolytic, catalase negative rod** from throat or wound, consider *Arcanobacterium*. Use the **reverse CAMP** test to confirm *A. haemolyticum*.
5. 5. If **Gram-variable tiny rod** from vaginal swab, consider *Gardnerella* – check for growth on human blood agar and hippurate hydrolysis.