# Pasteurella

# **1) Taxonomy & medically important species**

* Family **Pasteurellaceae** (incl. Pasteurella, Actinobacillus, Aggregatibacter, Avibacterium, Bibersteinia, Mannheimia, etc.).
* **P. multocida** is the type species;
* several former “Pasteurella” now in other genera (e.g., *P. haemolytica* → **Mannheimia haemolytica**; *P. trehalosi* → **Bibersteinia trehalosi**).
* Human-relevant **Pasteurella**: **P. multocida**, **P. canis**, **P. pneumotropica** (common); [less common: **P. dagmatis**, **P. stomatis**, **P. aerogenes**, **P. bettyae**, **P. caballi**, **P. oralis**. ]

## **2) Ecology & transmission**

* Animal oral/URT commensals—especially **cats and dogs**
* human infection after **bites, scratches or saliva contamination**
  + Can spread to cause bacteraemia and septic arthritis/OM
  + Endocarditis and meningitis rare
* also respiratory disease in underlying lung pathology.

## **3) Virulence & pathogenesis (viva angles)**

* **Capsule**, **LOS/LPS**, outer-membrane proteins; some strains carry **toxA** (toxigenic *P. multocida*—PCR detectable).

## **5) Bench microbiology (what you’ll see)**

* **Microscopy:**
  + small GN coccobacilli;
  + **bipolar staining common**;
  + capsules may be present.
  + **Actinobacillus** can show a “**Morse-code**” Gram look.
* **Primary isolation:**
  + **blood agar**, **5–10% CO₂**, **35–37 °C**, **16–48 h**.
  + Colonies **grey, viscous, non-haemolytic**; “mucinous/**H. influenzae-like**” odour; rough variants occur.
  + **No satellitism**/**no X/V dependence** (helps separate from *Haemophilus*).
* **MacConkey/CLED:** most **Pasteurella** (and **Avibacterium**) **do not grow**;
  + **Actinobacillus spp.** and **P. aerogenes** **grow on MacConkey**

## **6) Biochemical profile & species pointers (exam-useful)**

* Genus pattern:
  + **oxidase +**, **catalase +**, **nitrate +**
  + **P. bettyae and P. caballi are catalase negaive**
  + fermentative (acid, no gas)
* **P. canis:** **ODC +**, **urease −**; **biotype 1 indole + / biotype 2 indole −**; dog-mouth commensal, bite wounds.
* **P. dagmatis:** **urease +**, **indole +**, **ODC −**; acid from maltose (trehalose usually +).
* **P. stomatis:** typically **ODC −**, **urease −**; dog-bite wounds.
* **P. pneumotropica:** 1 mm, non-haemolytic; **no MacConkey growth**; strong *H. influenzae-like* odour.
* **P. aerogenes:** **grows on MacConkey**; **catalase +, indole +, urease +; porphyrin +**.
* **P. bettyae:** small, slow carbohydrate reactions; **oxidase −, catalase −, urease −**.

### **Mini-crib: quick differentiation table**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Species** | **Indole** | **Urease** | **ODC** | **MacConkey growth** | **Pearl** |
| **P. canis** (bio1/2) | + / − | − | **+** | − | Dog mouth; bite wounds. |
| **P. dagmatis** | **+** | **+** | − | − | Maltose +; trehalose usually +. |
| **P. stomatis** | (±) | − | − | − | Dog-bite context. |
| **P. pneumotropica** | — | — | — | **No** | 1 mm grey; odour; no MAC. |
| **P. aerogenes** | **+** | **+** | — | **Yes** | Porphyrin +. |
| **P. bettyae** | **−** | **−** | — | — | Oxidase −, catalase −. |

## **7) Look-alikes you must separate (from SMI flowchart)**

* **Mannheimia/Bibersteinia**: often **β-haemolytic** on bovine blood; small grey colonies (fresh **M. haemolytica** shows clear β-haemolysis).
* **Actinobacillus spp.**: **most grow on MacConkey** (except **A. pleuropneumoniae**/some **A. suis**); **A. ureae** is **urease +** and Pasteurella-like in humans (think respiratory isolates).
* **Avibacterium spp.**: butyrous, opaque colonies on sheep blood; **no MacConkey growth**.
* **SMI algorithm**: Gram GN coccobacilli → oxidase/catalase (note exceptions) → **penicillin disc zone** → consider MAC behaviour & colony haemolysis → **MALDI-TOF**/confirmatory tests.

## **8) Identification & typing (modern methods)**

* **MALDI-TOF MS** recommended—rapid, accurate for *P. multocida*; practical alternative to 16S sequencing for difficult isolates.
* **NAATs**: PCR for **P. multocida**/**M. haemolytica**; **toxA** PCR (toxigenic *P. multocida*); **P. pneumotropica** 16S rDNA PCR.
* **Advanced** (mainly reference labs): **16S rDNA**, **sodA sequencing**, **MLSA**, **ribotyping**—useful for tricky identifications/epidemiology.

## **9) Susceptibility & therapy (exam-level summary)**

* **Typically penicillin-susceptible** (hence the disc screening tip). For bite-wound empiric cover use **amoxicillin–clavulanate** to cover mixed flora; de-escalate to a **narrow β-lactam** once Pasteurella confirmed and source controlled. (Apply local AST/EUCAST.)

## **10) Safety, reporting & referral (SMI expectations)**

* **Hazard Group 2**; two LAIs historically reported—use MSC for aerosol-generating steps and follow local COSHH.
* **Report** promptly if from **normally sterile sites**; follow local protocols for clinician notification and public-health reporting responsibilities; **retain isolate on a blood-agar slope** if referral needed (reference lab contacts provided).

### **Viva takeaways (say these out loud)**

1. **Grey, non-haemolytic**, **no MacConkey**, **penicillin-susceptible** → think **Pasteurella**; **β-haemolysis** nudges **Mannheimia/Bibersteinia**.
2. Don’t forget **A. ureae** (urease + Pasteurella-like human respiratory organism).
3. **MALDI-TOF** for routine ID; **PCR/16S/sodA/MLSA** if unresolved or for typing.

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