بسم الله الرحمن الرحيم

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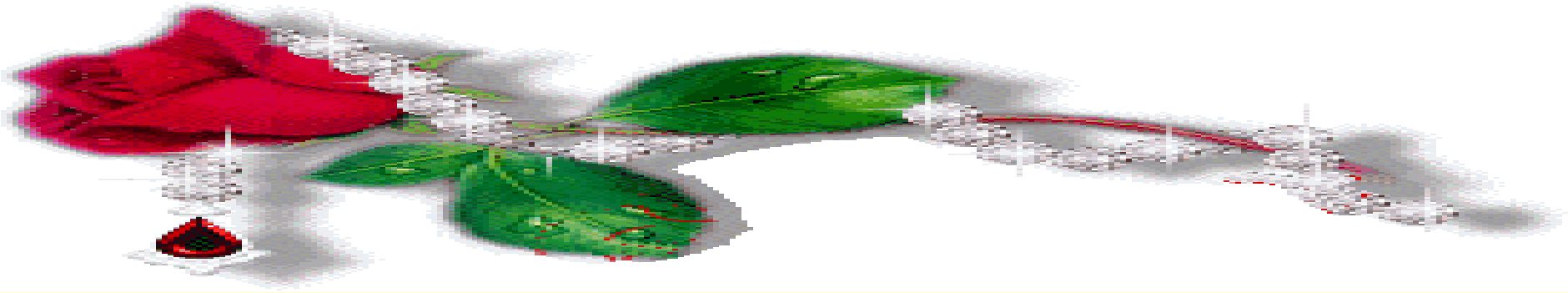

F. Pasteurellaceae

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G. Pasteurella

G. Mannheimia

G. Lonepinella

G. Haemophilus

G. Actinobacillus

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General characters of *Pasteurella* species and *Mannheimia haemolytica*

- ✓ It is considered as normal commensal in upper respiratory tract of man, animals and birds. Under stress condition, it converted into pathogenic causing septicemia.
- ✓ They are small, Gram negative rods, characterized by bipolarity due to accumulation of metachromatic or volutin granules at the two poles of bacterial cell (appear in smears from infected tissues stained by Leishman's or Giemsa stains).
- ✓ Non motile, non sporulated, capsulated (hyaluronic acid). Capsule appears only in freshly prepared samples?????
- ✓ Aerobic and facultative anaerobic.
- ✓ Can grow on ordinary media but they grow best on media supplemented with blood or serum.
- ✓ Some species, such as *M. haemolytica*, *P. trehalosi* and *P. aerogenes* can tolerate the bile salts in MacConkey agar.

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General characters of *Pasteurella* species and *Mannheimia haemolytica*

- ✓ Ferment glucose without gas production.
- ✓ Oxidase and catalase test +ve and nitrate is usually reduced to nitrite.
- ✓ *Pasteurella aerogenes*, *P. trehalosi*, and *P. pneumotropica* are more closely related to members of G. Actinobacillus than they are other *Pasteurella* species.
- ✓ *P. trehalosi* is now used to denote *P. haemolytica* biotype T isolates while *P. haemolytica* biotype A have been allocated to a new genus and renamed *Mannheimia haemolytica*.

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Morphology

- Gram –ve coccobacilli
- Arranged singly or in pairs rarely in chains
- Non motile
- Non sporulated
- Capsulated by hyaluronic acid capsule which rapidly disappear due to hyaluronidase enzyme
- It could be stained by Giemsa, Leishman´s stain in blood smear or Loeffler´s M.B. from animal tissue showing bipolarity

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Culture characters

- Aerobic and facultative anaerobic
- Optimum temperature 37C (can grow at 37-44C)
- pH is slightly alkaline (7.2-7.4)
- On nutrient agar media: colonies are fine translucent (pin point) with semen or semineferous odour
- Colonies present in 3 forms:

1- Mucoid (due to capsule) or intermediate colonies

2- Smooth fluorescent colonies

3- Rough or blue colonies

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- On broth: uniform turbidity + semen odour
- Blood agar: no haemolysis
- MacConkey agar: no growth (bile salt inhibitors)
- Selective media for Pasteurella as:

  - Trypticase soya agar (TSA)
  - DAS media
  - Dextrose starch agar (DSA)

  + 8% CO_2

N.B. Colonies of *M. haemolytica* and *P. trehalosi* are β-haemolytic and odourless. Moreover, they grow on MacConkey`s agar as pin-point, red colonies.

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Biochemical reactions

- Sugar fermentation: *P. multocida* ferment most sugars except lactose and maltose are –ve
- Oxidase, catalase, Indole, Ornithine decarboxylase and Nitrate reduction tests: +ve.
- Urease: -ve.
- G. Mannheimia includes trehalose-negative members of the *P. multocida* complex. All strains in the genus ferment mannitol, while not ferment D-mannose is a key by which *Mannheimia* species are differentiated from members of the G. Pasteurella.

Feature	*M. haemolytica*	*Pasteurella species*	
		P. multocida	*P. trehalose*
Haemolysis (sheep blood agar)	+	-	+
Growth on MacConkey agar	+	-	+
Indole production	-	+	-
Catalase activity	+	+	-
Ornithine decarboxylase test	-	+	-
Acid production from: - Lactose - D-trehalose - Maltose	 + - +	 - V -	 - + +

Classification

P. multocida classification

Lewis Pasteur

Pasturella M.O. is named by Pasteur who described it in cases of:

Fowl cholera → Avian

Snuffles → Rabbit

Septicemia → Swine, wild animals

Pneumonia → Animals

He refer them as Bacterium bipolar multocidum or (*P. septica*)

Bergey´s manual classification

P. multocida	*P. haemolytica*	*P. pneumotropica*
P. ureae	*P. gallinarum*	*P. aerogenes*

P. anatipestifer (infectious serositis of duckling)

Ligniere (1900)

Classify Pasteurella according to host:

Aviseptica → Fowl cholera

Boviseptica → Pneumonia in cattle

Suiseptica → Swine

Equiseptica → Equine

- **Classification on the basis of capsular and surface polysaccharide (somatic) Ag into 5 groups (A, B, D, E, F)**

Antigenic structure of Pasteurella

It is detected by both capsular and somatic polysaccharide antigens which are used to designate a specific serotype.

Robert	Classify Pasteurella according to the Serum protection test in mice. Designated by Latin numbers (I, II, III, IV).
Carter	Serogrouping on the basis of differences in capsular polysaccharides using Indirect haemagglutination test (A, B, D, E and F).
Namioka and Murata	subdivided *P. multocida* into 16 somatic types on the basis of serological differences in the cell wall LPS using HA absorption test. Designated by numbers (1, 2, 3, 4,..)

Examples for antigenic formula:

IIA5,8,9 (Fowl cholera).

- IB6& IE6 (HS in bovine).

- A11 (Snuffle in rabbit).

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Biotyping of *P. multocida*

Biotyping of *P. multocida* revealed 3 biotypes or subspecies namely:

- ✓ *P. multocida* subspecies Multocida.
- ✓ *P. multocida* subspecies Septica.
- ✓ *P. multocida* subspecies Gallicida.

Diseases caused by *Pasteurella* and *Mannheimia* spp.

Species	Hosts	Diseases
P. multocida: -Type A	Cattle Sheep Horse Poultry Rabbits	-Shipping fever, pneumonia in calves and mastitis. - Pneumonia, encephalitis, septicemia and mastitis. - Pleuropneumonia - Fowl cholera. - Snuffles (purulent rhinitis)
- Type B	Cattle, buffaloes	- Haemorrhagic septicaemia; barbone (Asia)
- Type E	Cattle, buffaloes	- Haemorrhagic septicaemia; barbone (Africa)
- Type D	Swine	Pneumonia and a tropic rhinitis
- Type F	Turkey	May cause septicaemia
M. haemolytica (*M. haemolytica* biotype A)	Cattle Sheep	- Bovine pneumonic pasteurellosis (shipping fever). -Septicaemia (3 months of age), pneumonia, gangrenous mastitis.
P. trehalosi (*M. haemolytica* biotype T)	Sheep	Septicaemia in lambs (5 to 12 months of age)
P. anatipestifer	Duckilng	Infectious serositis

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Fowl cholera

Lab. Diagnosis of Pasteurella and Mannheimia Diseases

- **Specimen:** According to the disease and its stage. Samples are sent to the lab within 1-3hrs after collection..

❑ Blood sample from suspected animals or birds during fever or acute septicaemia.

❑ **Living animals:** Nasopharyngeal swabs or larynopharyngeal swabs or mastitic milk.

❑ **Dead animals or birds:** parts of lung showing pneumonia, trachea, heart blood, liver, spleen or bone marrow.

❑ Specimens should be cultured on blood and MacConkey agars. Blood agar supplemented with neomycin, bacitracin and actidione can be used for the isolation of *P. multocida* from heavily contaminated specimens.

Identification of the isolates

- **Morphology.**

- Gram stained smear.
- characteristic bipolar organisms can be detected in blood or tissue (bone marrow, liver or spleen) smears stained with Leishman′s or Giemsa stains and *P. multocida* can be isolated.

- **Culture characters.**
- **Biochemical reactions.**
- **Serogrouping and serotyping.**
- **Experimental infection (Lab animal pathogenicity test):**

✓ Mice, rabbit and pigeon are more susceptible while G. Pigs are resistant.
✓ Chicken are susceptible to avian strains.
✓ Sample is injected S/C or I/P in the lab animal. Death overnight due to acute septicemia.
✓ N.B. Laboratory animals are resistant to experimental infection with *Mannheimia* species.

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Thank You