

Corynebacterium species and
Rhodococcus equi

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Corynebacterium species and *Rhodococcus equi*

Clinically important Gram positive bacilli

■ Spore forming

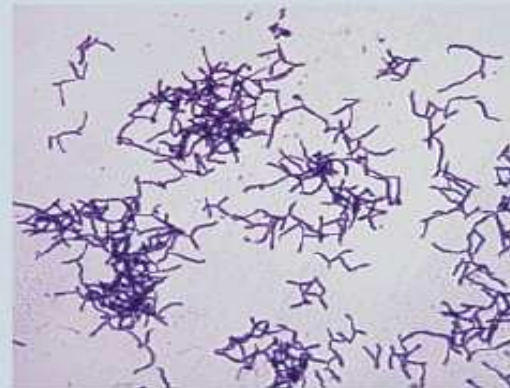
1. Bacillus
2. Clostridium

■ Non-spore forming

1. Corynebacterium
2. Listeria
3. Lactobacillus

■ Bacilli with branching filaments

1. Actinomyces
2. Nocardia



Corynebacterium species

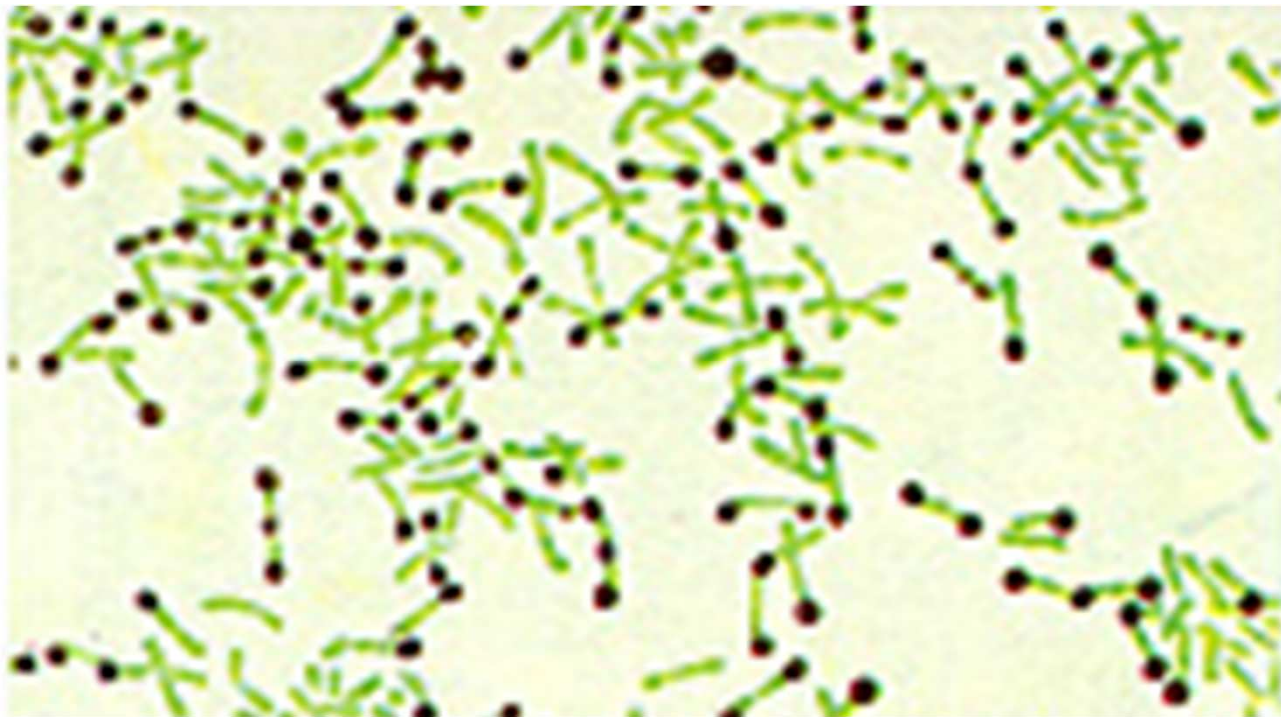
- *Corynebacterium bovis*

- **Scientific classification**

- Kingdom: • Bacteria
- Phylum: • Actinobacteria
- Order: • Actinomycetales
- Family: • Corynebacteriaceae
- Genus: • *Corynebacterium*
- Species: • *C. bovis*

General characteristic

- The Corynebacterium are small pleomorphic Gram positive rods ; that occur in rod ,coccid, club and filamentous shapes.



Corynebacterium species

Changes in Nomenclature

Previous Name

Corynebacterium equi

Corynebacterium murium

Corynebacterium ovis

Corynebacterium pyogenes

Corynebacterium suis

C. renale type I

C. renale type II

C. renale type III

Present Name

Rhodococcus equi

C. kutscheri

C. pseudotuberculosis

Actinomyces pyogenes (Chapter 11)

Eubacterium suis (Chapter 16)

<i>C. renale</i>	}	<i>Corynebacterium</i>
<i>C. pilosum</i>		<i>renale</i>
<i>C. cystitidis</i>		group

Corynebacterium and Rhodococcus **species**

- 1. Corynebacterium diphtheria*
- 2. C. Bovis*
- 3. C. Pseudotuberculosis*
- 4. Rhodococcus equi*

Corynebacterium diphtheria

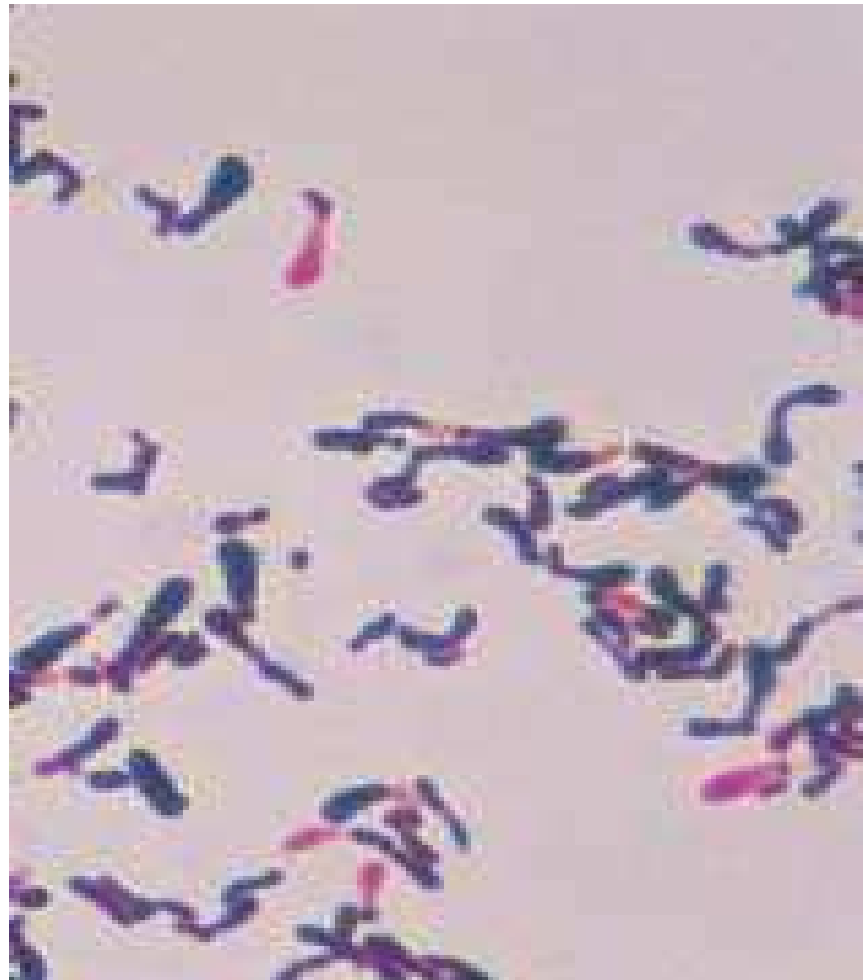
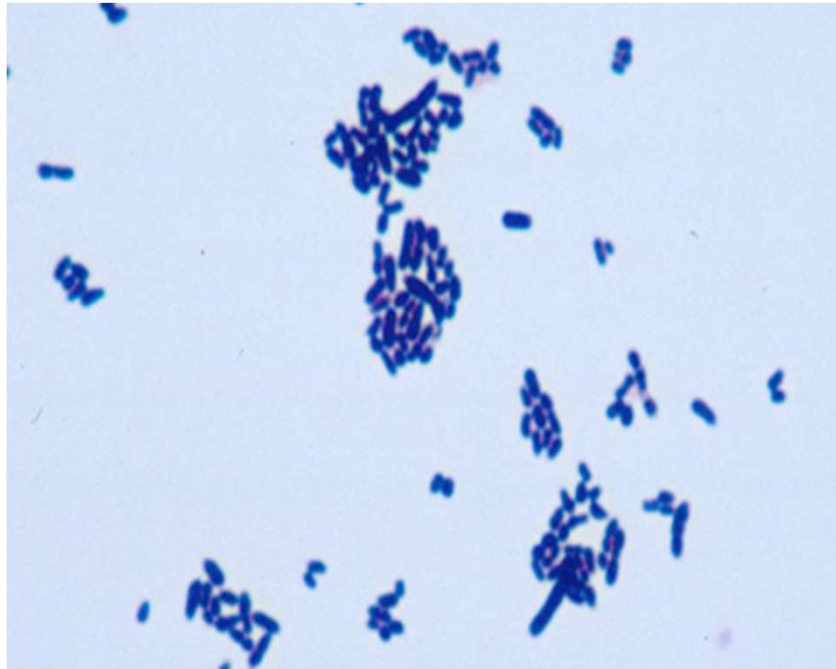
- **Corynebacterium diphtheria causes many diphtheria are commonly called diptheroids (by Loffler 1844)**

General characteristics

- The genus *Corynebacterium* is closely related to the genera *Mycobacterium* according to chemical composition of cell walls (Mycolic acid)
- Mycolic acids: Present in cell wall
- Stained smears from animal tissues often reveal groups of cells in parallel (palisades) or cells at sharp angles to each other (Chinese letters).

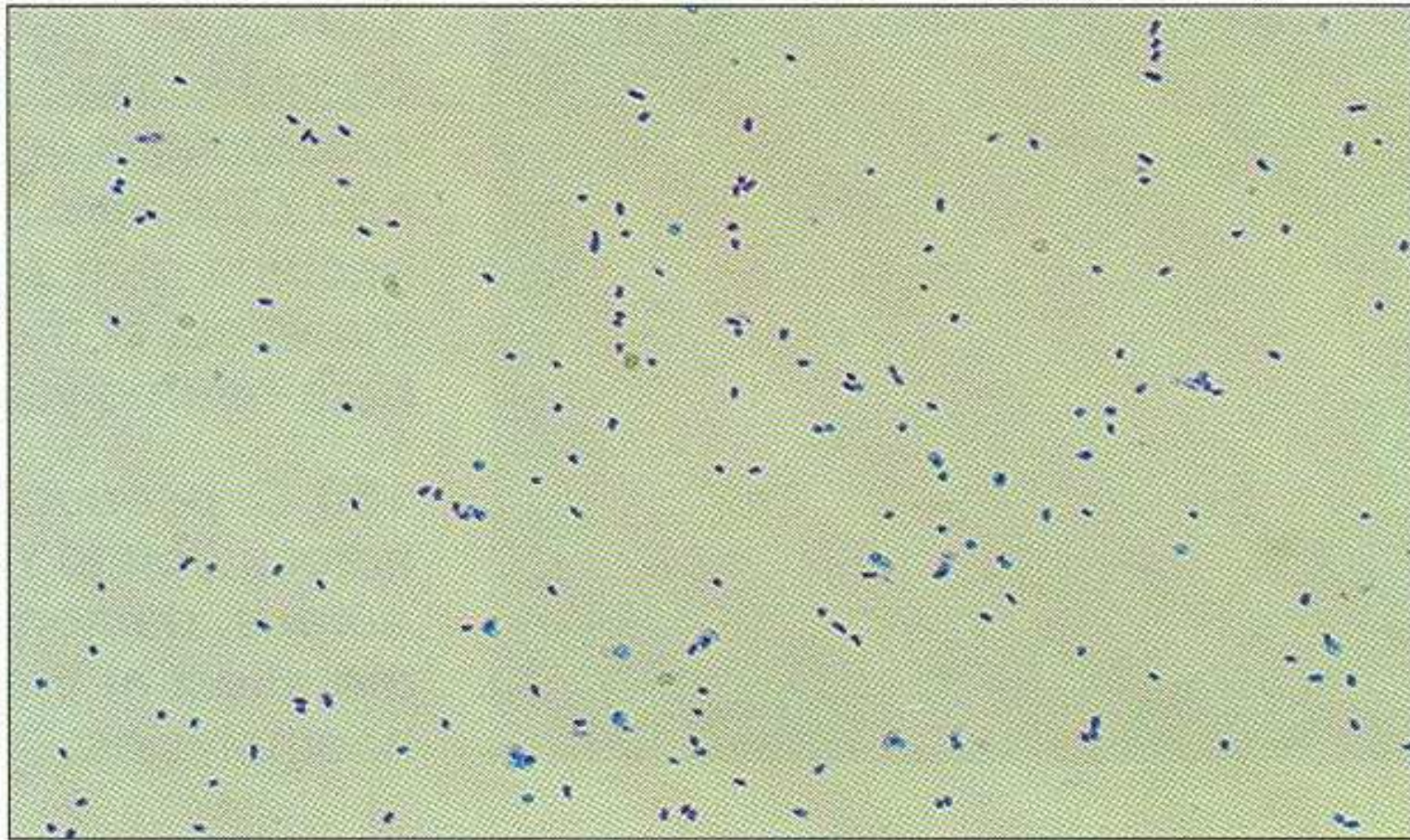
General characteristics

- **The Corynebacterium are non-spore – forming,**
- **non -acid fast ,**
- **catalase-positive,**
- **facultative anaerobic**
- **and the animal pathogens are non – motile.**



General characteristics

- **Rhodococcus equi can appear as a Gram positive coccus or as a rod. Its capsulated and sometimes weakly acid-fast**



148 *R. equi* in a Gram-stained smear from a colony with coccial forms predominating. ($\times 1000$)

Pathogenesis

- *Corynebacterium* is pyogenic bacteria causing a variety of suppurative conditions.

Pathogenesis

- **Corynebacterium bovis** is a pathogenic bacterium that causes
 1. subclinical mastitis in cattle
 2. pyelonephritis in cattle.

Pathogenesis

- *C. bovis* is spread from cow to cow most commonly through improper milking technique. However, it is usually a mild infection resulting in an elevated somatic cell count.

Pathogenesis

C. bovis

- It is a lipophilic bacterium : produced lipophilic enzyme.
- is the only pathogenic *Corynebacterium* species that does not produce urease.

Pathogenesis

- *C. Pseudotuberculosis* is an important animal pathogen.
- It is the etiological agent of a disease that is commonly called Caseous lymphadenitis (CLA) or cheesy gland .

Pathogenesis

- The virulence of *C. Pseudotuberculosis* is attributed to the:
 1. hemolytic toxin (phospholipase)
 2. cell wall lipids.

Rhodococcus equi

- *R.equi* can survive intracellularly through suppression of phagolysosomal fusion.
- The bacterium can multiply in soil enriched with equine faeces and may be a commensal in the intestine of horse.

Pathogenesis

- The pathogenesis of *R. equi* is attributed to :
- It produces (R. equi factors: phospholipase c and cholesterol oxidase).
- capsule and
- cell wall constituents probably play a part in the pathogenesis / Suppurative bronchopneumonia in foals, caused by *R. equi*, increases in prevalence where high stocking rates occur.

- The main disease of *Corynebacterium*

Species	Animals	Disease
<i>Corynebacterium bovis</i>	Cattle	Uncertain pathogenesis
<i>C. Pseudotuberculosis</i>	Sheep ,goats	Caseous lymphadenitis
<i>C. renal</i>	Cattle	Pyelonephritis and cystitis
<i>R.equi</i>	Foals	Suppurative bronchopneumonia

Laboratory diagnosis

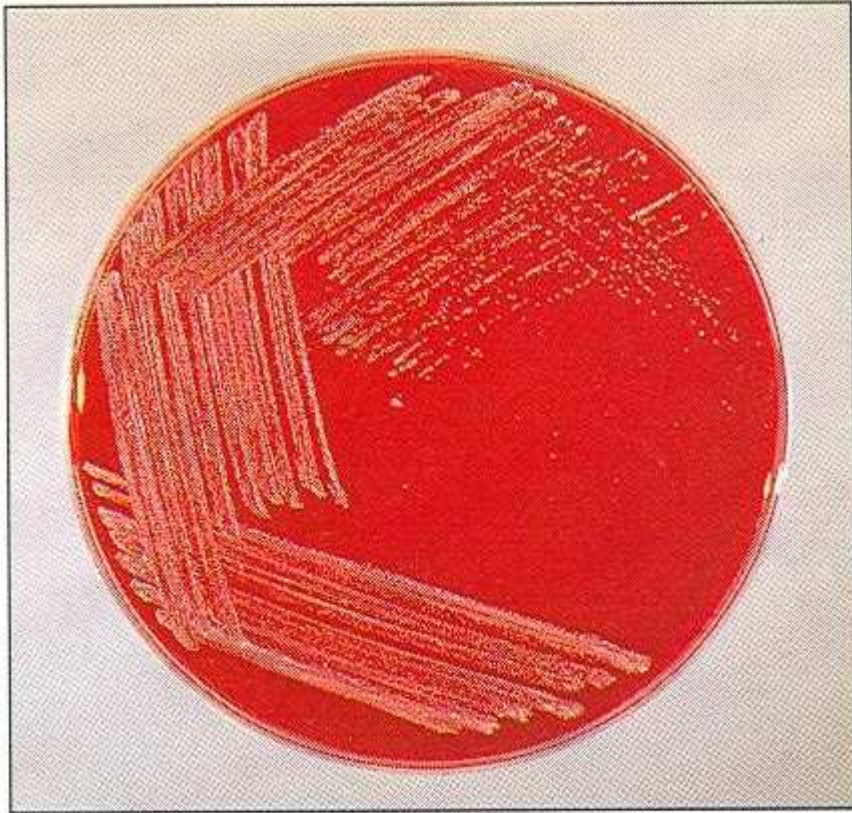
1-Specimens :

- Pus ,exudates from suppurative conditions
- Mid-stream urine for isolation of *C. renal*

2-Direct microscopy

3-Isolation

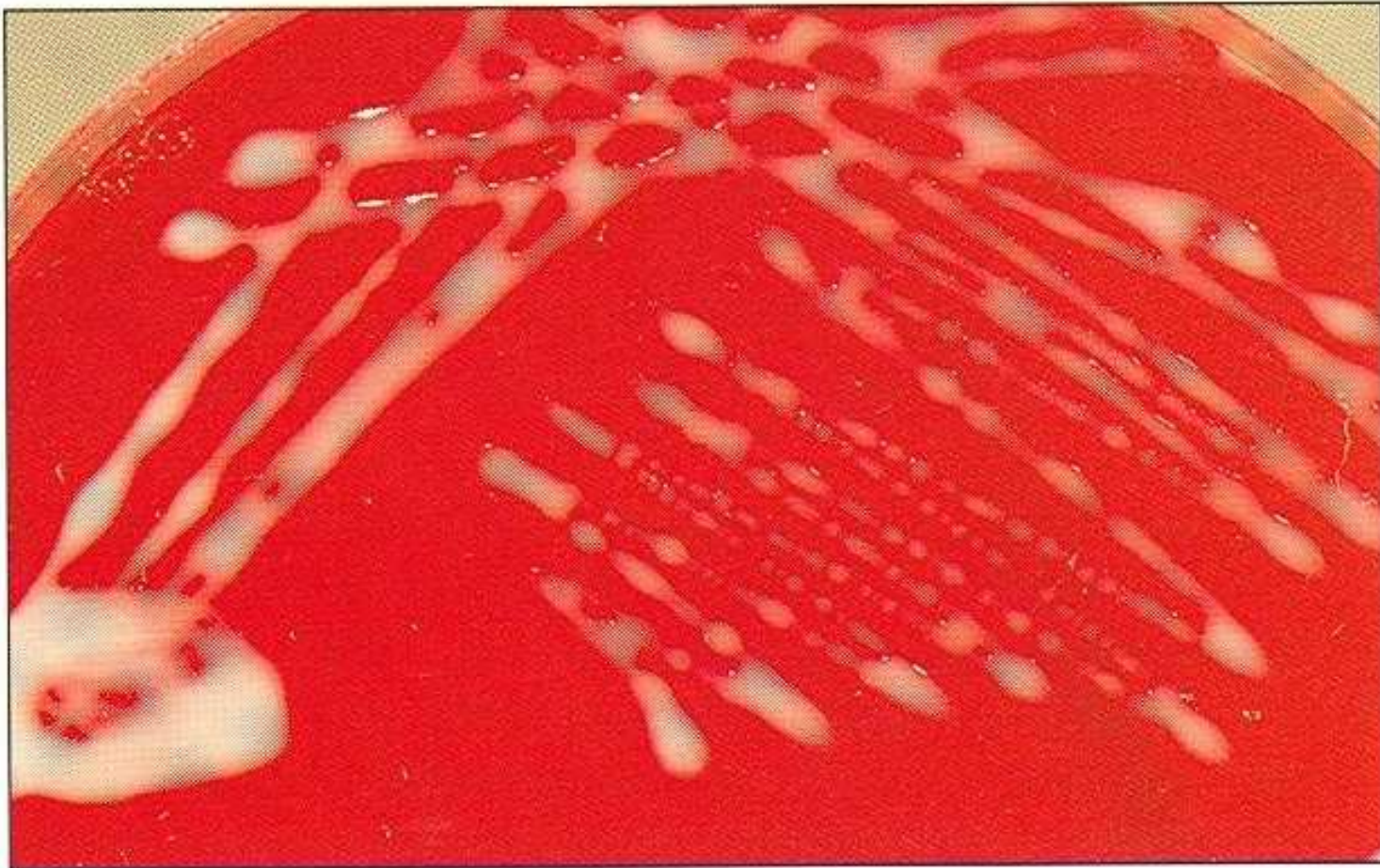
- For routine isolation Sheep or ox blood agar is used with macConkey agar to detect the gram negative contaminants that may be present.
- *Rhodococcus equi* produced pigments on nutrient agar after 48hr



142 *C. pseudotuberculosis*: small, white and dry colonies on sheep blood agar. Non-haemolytic at 24 hours' incubation (see **143**).



143 *C. pseudotuberculosis* on sheep blood agar demonstrating haemolysis after 72 hours' incubation.



145 *Rhodococcus equi* on sheep blood agar showing the typical mucoid colonies (4-day culture). The salmon-pink pigmentation is not easily seen against a red background.



146 *Rhodococcus equi* on nutrient agar (4-day culture) demonstrating the mucoid colonies and salmon-pink pigmentation.



147 *R. equi* on pigment-enhancing medium after 48 hours' incubation, showing the typical (but enhanced) pigment and mucoid colonies.

4-CAMP tests

The CAMP test is a test to identify Group B β -streptococci based on their formation of substance (CAMP factor) that enlarges the area of hemolysis formed by β -hemolysin from *Staphylococcus aureus*. It is frequently used to identify *Listeria* spp. CAMP tests can be also used as quick test for *C. . Pseudotuberculosis* , *R.equi*, *C. renal* interacting with beta-hemolysis of *Staphylococcus aureus* the results are as follows:

Corynebacterium sp.

beta-hemolysis of *Staphylococcus aureus*

C. Pseudotuberculosis

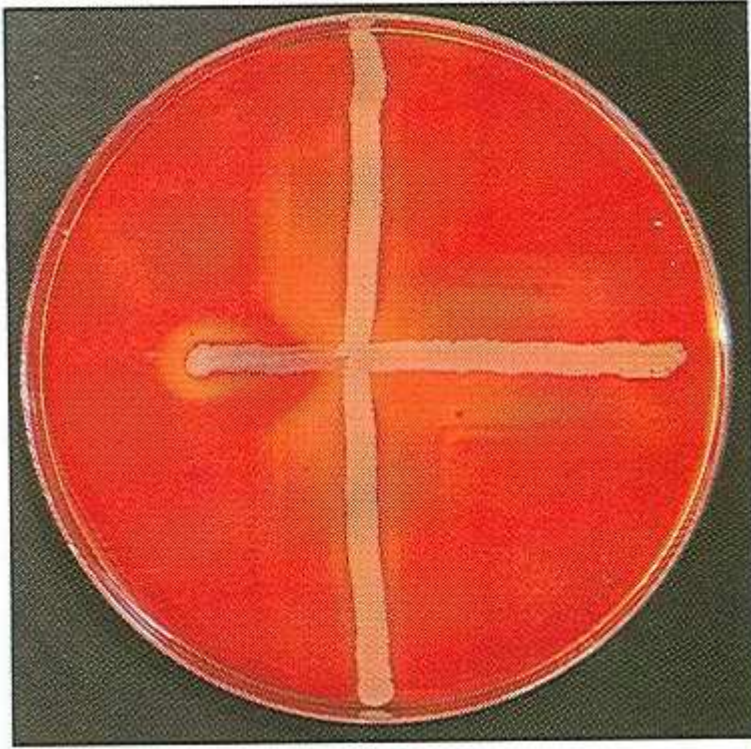
Inhibition

R.equi

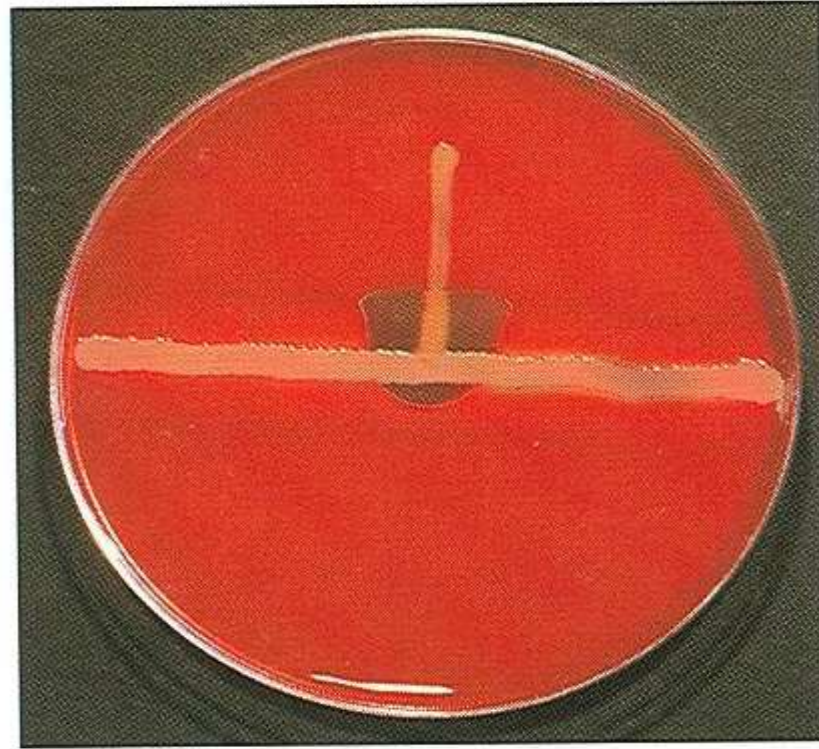
Enhancement

C. renal

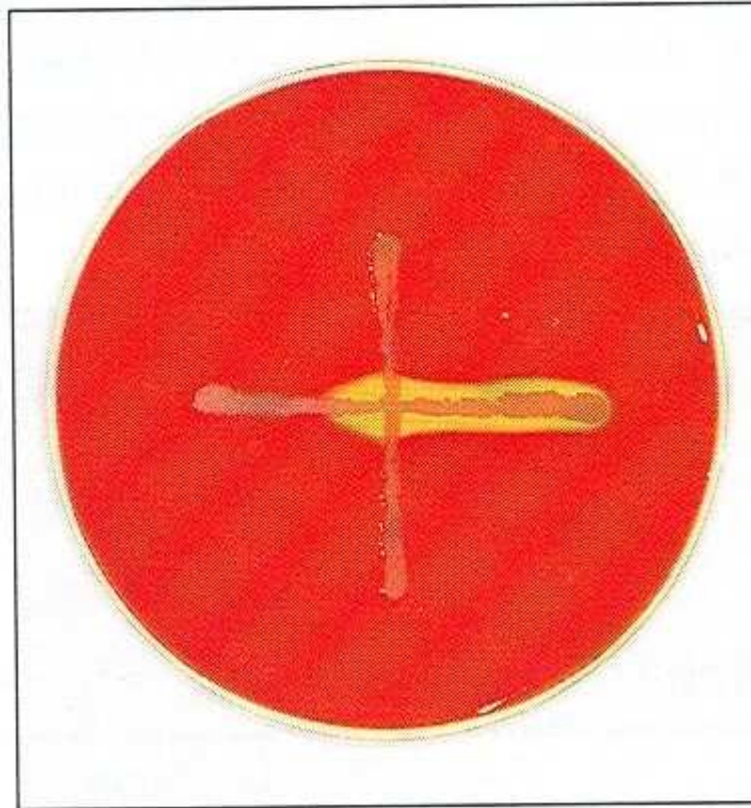
enhancement



150 *C. pseudotuberculosis* drawn across (left to right) *Staphylococcus aureus*, demonstrating inhibition of the effect of the staphylococcal haemolysins.



151 CAMP test with *R. equi* against *S. aureus* (horizontal) showing the typical shovel-shaped enhancement of the effect of the staphylococcal betahaemolysin that tends to extend to the opposite side of the *S. aureus* streak.



152 *C. pseudotuberculosis* (horizontal) drawn across *R. equi* (left to right) demonstrating synergistic haemolysis.

5-Biochemical test:

The main biochemical test includes:

1-Beta-hemolysis

2-Aesculin hydrolysis

3-Nitrate reduction

4-urease

5-Casein digestion

6- carbohydrate fermentation (glucose, maltose, sucrose)

Table 30. Differentiation of corynebacteria and *Rhodococcus equi*.

	<i>C. bovis</i>	<i>C. kutscheri</i>	<i>C. pseudo-tuberculosis</i>	<i>C. renale</i> group	<i>R. equi</i>
Beta-haemolysis	–	v	+	–	–
Aesculin hydrolysis	–	+	–	–	–
Nitrate reduction	–	+	v*	v	+
Urease	–	+	+ (>18 hours)	+ (<1 hour)	+ (>18 hours)
Casein digestion	–	–	–	v	–
Glucose	+	+	+	+	–
Maltose	–	+	+	–	–
Sucrose	–	+	–	–	–

+ = positive reaction; – = negative; v = variable; v* = equine strains positive and ovine strains negative.

References and Textbooks

Quinn PJ, Cater ME, Markey BK, Carter GR". In:
clinical Veterinary Microbiology .2004; 2nd ed.

Thank you