Zoonotic Diseases (Zoonoses)

- Primary diseases of animals (150)
- Animals domesticated/Wild primary hosts (Reservoir)
- Man accidental host (abnormal,aberrent, dead end)
- No human to human transmission

- Transmission by direct contact with animal/animal products or through vectors.
- Certain professionals more susceptible (Farmers, herders, shepherds, butchers, slaughter house workers, veterinary surgeons and lab workers.
- Disease runs severe course in abnormal hosts.

- Etiological agents bacteria, parasites, fungi and viruses
- Four genera of gram negative rods zoonotic
- 1: Brucella (B.obartus)
- 2: Yersinia (Y.Pestis)
- 3: Pasteurella (P. Multocida)
- 4: Francisella (F.Tularensis)

- Small, Gram Negative bacilli

- Intracellular parasites.
  (RE system, L.nodes, liver, spleen, b. marrow)

- Pathogens of animals.

- Zoonosis.

- No transmission from man to man.
- Abortion in animals.
- Excretion in milk.
- Contact with animals.
- Ingestion of milk & products.

Classification:

- Six species. Three important clinically.

1) B. abortus (Cattle, cow, buffallow, yak, camel, deer, dog, horse).

2) B. melitensis (sheep & goat, camel).

3) B. suis (pigs, small rodents).

Morphology:

- Small coccobacilli – 0.4 µm.
- Bacilli 1-2 µm.
- Single, pairs, short chains.
- Gram negative.

- Non motile.
- Non sporing.
- Non capsulated.
- Non flagellated.
-

Non fimbriated.

Culture:

Fastidious organism.

- Strict aerobe.

- 5 – 10 % $C^{o}2$ improves growth

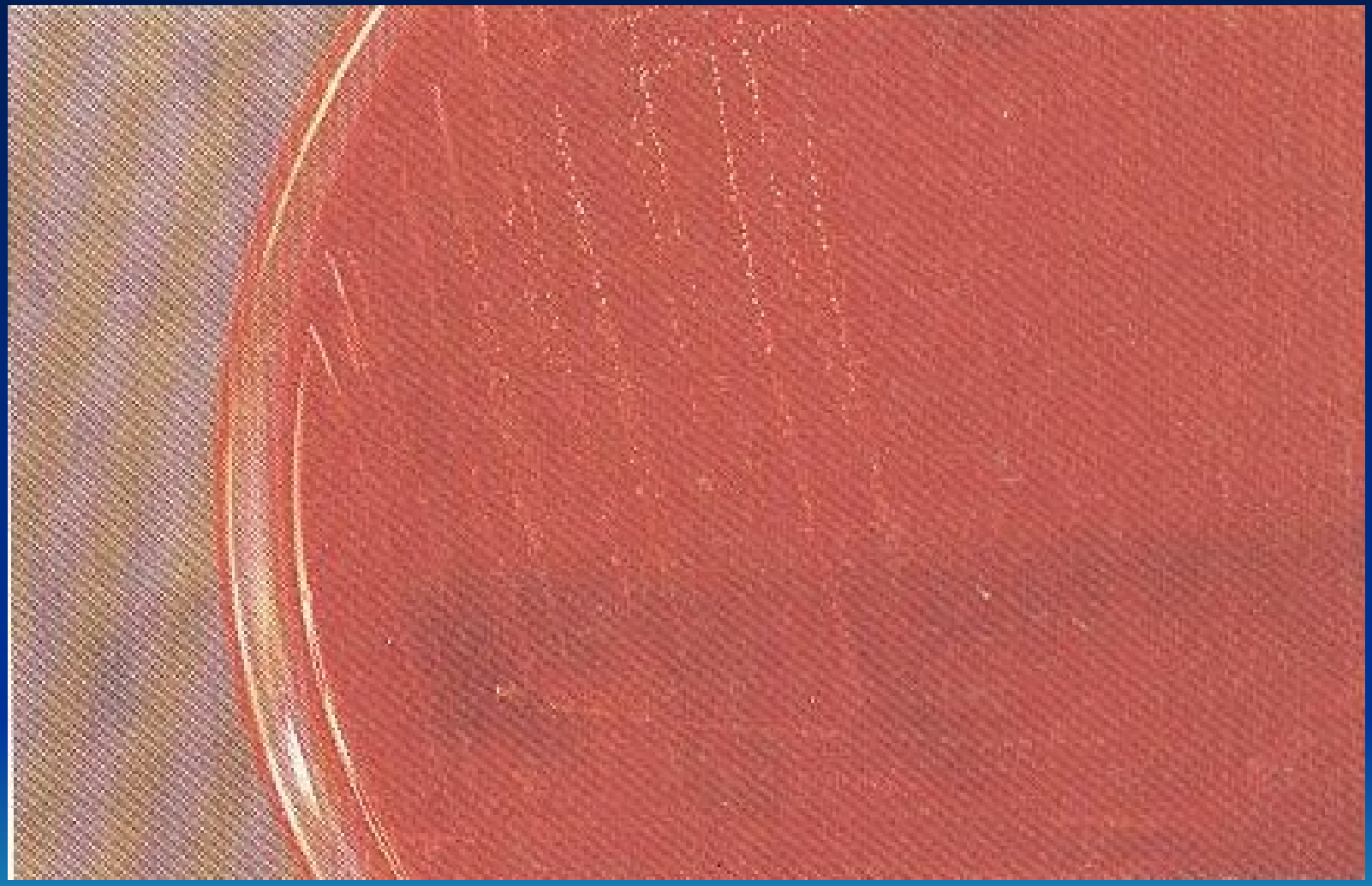
- Temp 37°C – (20°C – 40°C).

- Enriched medium with serum and glucose.

- Serum dextrose agar. (SDA)

- Trypticase – soy agar / broth.

- Takes 4-5 days to grow
- Colonies smooth, moist, transparent, glistening.



Biochemical Reaction:

- Catalase +ve
- Oxidase +ve.
- Reduction of Nitrates to Nitrites.
- Urea hydrolysis variable

Pathogenesis:

- Survive and multiply in cells.
- Inhibition of degranulation
- Inhibition of phagosome – lysosome fusion.
- Production of superoxide dismutase.

- Enter lymphatics go to L. nodes
- Enters blood
- Bacteremia
- Settles in R.E.system rich organs like liver,
- Spleen, b.marrow, & L. nodes
- Kidneys.

-Granuloma formation. Lymphocytes, plasma cells, epitheloid cells, giant cells & caseation

. Abortus mild infection with non – caseation granuloma.

- B. suis serious infection, suppurative lesions.

- B. melitensis – most severe with disabling symptoms.

- Granulomas heal & lead to fibrosis.

- Localization in placenta in pregnant animals.

- Relapse.

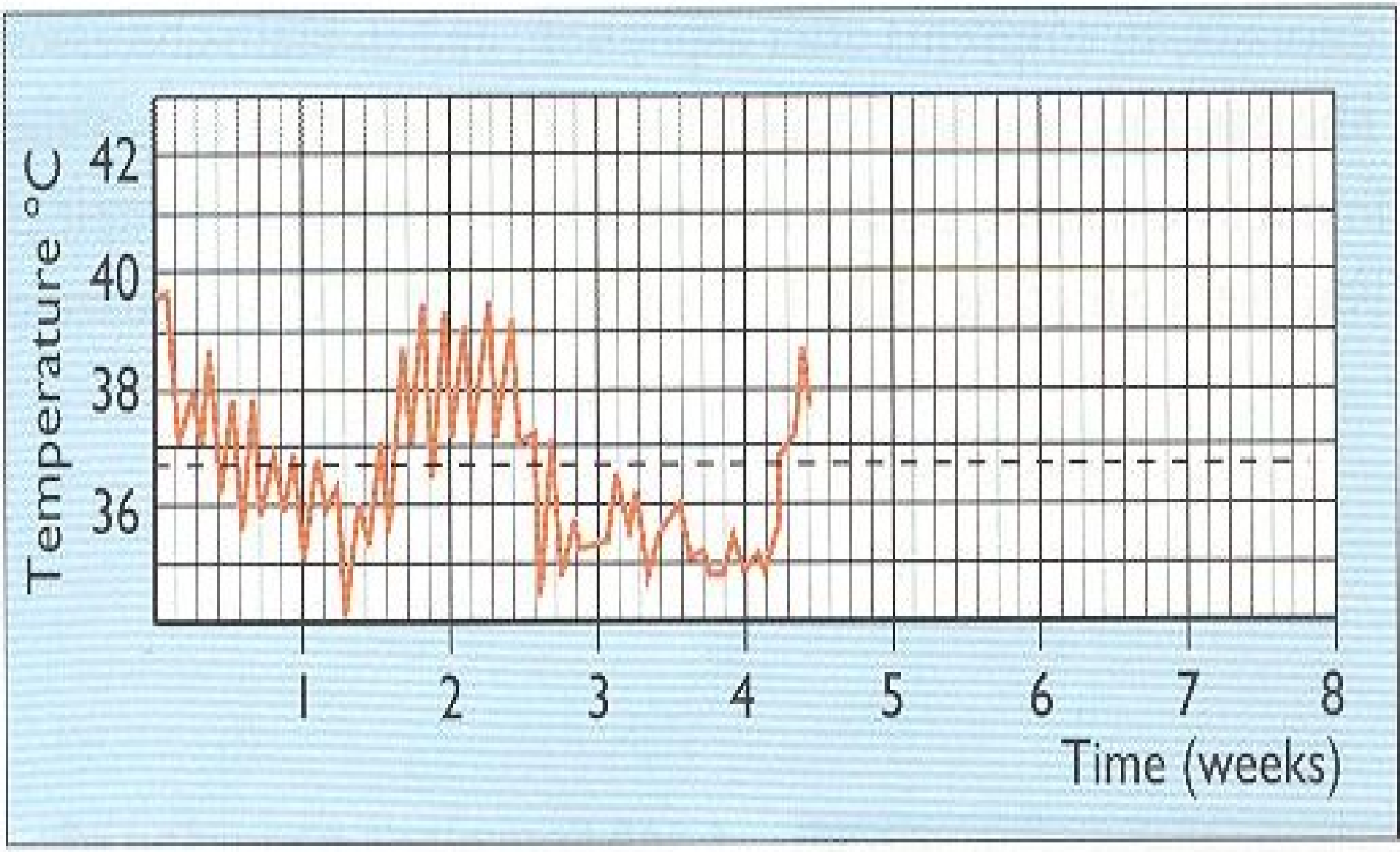
- Chronic state.

Clinical Features:

- Incubation period 2 – 4 weeks.
- Asymptomatic. Sub-clinical.
- Can be divided into.
    a) Acute brucellosis.
    b) Localized brucellosis.
    c) Chronic brucellosis.

Acute brucellosis;

- Low grade fever.
- Non specific symptoms.
- No physical signs.
- Undulant fever pattern.



1.149 Temperature chart in brucellosis, showing typical 'undulant' fever, which is remittent and variable in character.

Localized brucellosis:

- Can involve any tissue / organ.
- Osteomyelitis of lumbosacral vertebrae.
- Arthritis
- Knee joint commonly involved.

- Urinary tract infection.
- Renal involvement → Excretion of brucellae in urine.
- Genital tract infection.
- Splenic abscesses.

- Endocarditis.
- CNS involvement rare
- Meningoencephalitis
- Myelitis
- Vasculitis.

Chronic brucellosis:

- Persistence of symptoms more than 12 months.
- Fatigue.
- Malaise.
- Depression.

- Suppurative lesions in
- Bones
- Liver
- Spleen.
- Relapse of acute symptoms.

Diagnosis:

Samples for culture

- Blood (multiple blood cultures)
- Bone marrow
- Abscess material
- Liver & spleen biopsy

- CSF
- L. Node biopsy.
- Urine.
- Pleural / Peritoneal fluid

- Difficult to grow
- Positive culture in acute stage.
- Subculture twice weekly on serum Dextrose agar for 8 weeks.
- 5 – 10 % Co_2 improves growth

Serology:

Brucella antibodies detected by

1) Standard agglutination test. (SAT) (IgG + IgM)
- Complement Fixation test.
- ELISA.
- PCR.
- Brucellin skin test.

(Erythema + induration in 24 hrs)

Epidemiology:

- World wide.
- Mediterranean region.
- Saudi Arabia.
- Kuwait.
- Indo Pakistan subcontinent.
- Central and south America.

YERSINIA

YERSINIA
(Enterobacteriaceae)

- 11 species.
- Medically important – 3.
- Yersinia pestis.
- Y. entercolitica.
- Y. pseudotuberculosis.

- **Plague – By Y. pestis (vector rat flea)**

Bacterial enterocolitis.

By Y. enterocolitica

- **Acute mesenteric lymphadenitis.**

- **By Y. pseudotuberculosis**

-Zoonosis in small animals (Rodents)

- Rats, Squirrels, skunks, wild dogs

- Rabbits,
- Vector Flea
- Man accidental host
- No human to human transmission except pneumonic plague

Yersinia pestis

- Gram Negative weakly.
- Short
- Oval
- Plump coccobacilli.
- 1.5 x 0.7 µm
- Single / Pairs.

Stains best with Giemsa & Wayson.

- Prominent bipolar staining.
- “Safety pin appearance”.
- Non motile
- Non sporing.

- Capsulate on first isolation or at 37^0 C, not at 27^0 C.

- Pleomorphic in old cultures.

Culture:

- Sensitive some what to oxygen.
- Temp 14^{o}C – 37^{o}C (27^{o}C)
- Growth slow – 72 hrs.
- Can grow on MacConkey agar.
- Non Lactose Fermenter. (NLF)

- Blood Agar Colonies
- Small
- Minute
- Transparent

or

- Large & Opaque.

Biochemical Reactions:

- Catalase - +ve
- Oxidase - -ve
- Nitrates - Reduced
- Urease - -ve

- Glucose
- Maltose.
- Mannitol
- No gas.

- **Fermented**

- **Sucrose**
- **Lactose.**

Not Fermented

- **TSI**

Alkaline Slant

Acid butt.

Pathogenicity:

- Capsule – Fraction 1 (F1) at 37^{o}C.

Produced poorly in flea &
first inoculation in humans.

Produced in later generations

Resistance to phagocytosis

- Plasmid encode two somatic antigens.
- V & W
- Protect intracellular killing.
- Lipopolysaccharide (Endotoxin)

- Coagulase
- Active below 30^{o}C.
- Inactive 35^{o}C or above.
- Blockage of flea fore gut.
- Flea becomes hungry & bites.

Pathogenesis:

- Blood Meal by flea from infected animal
- Bacteria Multiply within body of flea
- Coagulase production
- Blockage of foregut
- Inability to swallow

-Regurgitation.

-Inoculated bacteria multiply locally.

- Rapidly migrate to lymphatics.

- Reach regional lymph nodes.

Phagocytosis by macrophages (less F1).

- Resist intracellular destruction.
- Multiplication
- Toxin & enzyme production.

- Acute inflammatory response.
- Enlargement of L. Nodes (Buboes).
- Haemorrhagic necrosis of L. nodes.
- Lysis of macrophages.

- Bacteremia massive.

- Localize and produce

- Purulent, haemorrhagic & Necrotic lesions in
- Lungs, Heart & Meninges.

Clinical Features:

- One of the most serious infections.
- Most virulent organism (L D_{50} 1-10)
- Subclinical infections Common.

Classification.

1.Bubonic.

2.Pneumonic.

3.Septicaemic.

Bubonic Plague:

- Most Common
- Incubation Period 2 – 7 days.
- Sudden fever, chills & headache.
- Enlarged lymph nodes (Buboes).

- Inguinal
- Axillary
- Cervical
- Submaxillary
- Rarely other sites.
- Swelling (1-10 cm)

- Skin lesions in some extremely tandis

- Vesicles, Pustules, Purpura, Gangrene.

- Marked Prostration & delirium.

- Other organs involvement.

- If untreated

- Generalized sepsis, hypotension & death.

Pneumonic Plague:

- Epidemics (Highly contagious)
- Primary exposure to droplets.
- Secondary to bubonic plague
- Through blood stream
- Haemorrhagic pneumonia.
- Multi lobar
- Bronchopneumonia
- Often fatal

Septicemic Plague:

- Massive bacteraemia but no enlarged L. node.
- Fever, rigors & malaise
- Vomiting & diarrhoea
- Endotoxic
- Untreated -- Shock & death.

Plague meningitis:

- Untreated or
- Inadequately treated bubonic plague
- Meninges involved
- Acute Purulent meningitis
- Serious infection, often fatal

Diagnosis:

- History of exposure to rodents.

Specimens

- Blood
- L. node aspirate
- Sputum
- CSF.

- Direct microscopy
- Giemsa //
- Wayson //
- Direct Immunoflourescence.

Serology

- Agglutination.

- ELISA

- Passive haemagglutination (PHA).

- Radioimmunoassay.

- Culture

- Blood agar

- MacConkey.

- Growth slow may take 72 hrs.

Yersinia Pseudotuberculosis.

- Wild & domestic animals & man.
- Acute mesenteric lymphadenitis in man.
- Fatal septicaemia in animals.
- Motile at 25^{o}C, Non motile at 37^{o}C.
- NLF & urea + ve.

- Human infection due to contaminated eatables by animal excreta.
- Vomiting & Diarrhoea
- Bacteremia
- Acute mesenteric Lymphadenitits.
- Self limiting disease
- Isolation from blood
- Serology. (Agglutination)

Yersinia enterocolitica:

- Resemble Y. pseudotuberculosis in morphology and culture.
- Rodent & domestic animals reservoir.
- Heat stable enterotoxin
- Human infection by contamination of food by animals excreta.

- Acute bacterial enterocolitis

- Septicaemia
- Abscesses
- Self limiting.
- Isolation from stools
- Serology (Passive haemagutination inhibition)

FRANCISELLA

FRANCISELLA

Genus: Francisella

Species: One F. TULARENSIS

- Primary pathogen of animals (wild)

- Human infection → Tularemia.

Morphology:

Small

Coccobacillus 0.2 x 0.2 – 0.7 µm.

Gram negative, Bipolar staining.

(Carbol Fuchsin)

- Non motile.

- Non spore forming.

- Capsulate.

Culture:

- Strict aerobe.
- Blood agar
- Glucose +cystein.
- Chocolate agar
- Thioglycolate broth.

- Temp 37^{o}C.

- Growth 5 – 10 C^{o}2.

- Minute drop like colonies in 72 hrs.

BIOCHEMICAL REACTIONS:

Maltose + ve

Urease - ve

PATHOGENESIS:

- Penetration through inapparent skin abrasions mucose
- Tricks bite
- Local multiplication
- Papule
- Ulcer (2 – 4 days)

- Regional
- L. nodes
- Bacteremia
- Multiple organs.
- Facultative intracellular pathogen.

- Focal necrosis.
- Inflammation
- Neutrophilis
- Lymphocytes
- Macrophages
- Epitheloid cells
- Granuloma.

- Caseation (Mistaken for TB).
- Lung
- Liver
- Spleen
- L. nodes
- Bone .marrow,

- Conjunctiva
- Cornea
- Pharynx
- Pleura.

Clinical Features:

1) Inapparent (Sub clinical).
2) Ulcer glandular.
3) Oculoglandular
4) Glandular.

4) Oculoglandular.

5) Oropharyngeal.

6) Typhoidal.

7) Peneumonic.

- Fever
- Chills
- Malaise
- Headache
- Anorexia
- Fatigue.
- Ulcer at the site of entry
- Draining lymph nodes swollen & tender

DIAGNOSIS:

- Blood
- Sputum
- Pleural fluid
- Aspirate from L. Nodes
- Wound swab.
- Glucose cystein blood agar.
- DFA.

- Antigen in urine.
- PCR.
- Antibodies detection by.
- Agglutination.
- Haemagglutination.
- ELISA.

PASTEURELLA

PASTEURELLA

- 11 species.
- Primary animal pathogens.
- Focal abscesses
- Human infections
- Septicaemia
- Endocarditis.

HUMAN PATHOGENS

- P. multocida subsp multocida.
- P. multocida subsp septica.
- P. canis.
- P. stomatis.
- P. damatis.

PASTEURELLA MULTOCIDA

- Normal commensal in
- Resp & GIT of wild & domestic animals.
- Human infections due to cat and dog bite or licking
- Non bites cases in persons exposed to animals.

MORPHOLOGY:

- Gram negative

- Coccobacilli 0.3 x 0.7µm.

- Non sporing

- Non motile.

- Bipolar staining

- Giemsa stain

- Single, pairs

- Small bundles

- Capsulate at 37ºC.

CULTURE:

- Facultative anaerobe.

- Optimum temp 37^{o}C.

- Grow well on ordinary media.

- Non haemolytic.

- Circular colonies 0.5 – 1mm.

- Do not grow on MacConkey.

- Colonies smooth, mucoid.

Biochemical Reactions:

- Oxidase +ve
- Catalase +ve
- Urease Negative
- Glucose & Sucrose. Ferment – No gas.

Pathogenesis:

- Multiply extracellularly
- Capsule
- Hyaluronidase.
- Acute localized suppurative infections
- Bacterinamia

Clinical Features:

- Focal soft tissue infections on hands, arms, leg, neck, face.
- Local abscess, lymphadenitis, cellulitis, osteomyelitis,

  arthritis.

- Non bite animal contact
- Resp tract infections
- Pleurisy
- Pneumonia
- Empyema
- Bronchitis
- Sinusitis

- Bacteraemia
- Meninges
- Lungs
- Kidney
- Cornea
- Microabscess & hges

Diagnosis:

- History of cat or dog bite/ lick.
- Pus, CSF, Sputum.
- Culture on blood agar at 37^{o}C.
- Bipolar staining by direct microscopy.

THE END