MJF COLLEGE OF VETERINARY AND ANIMAL SCIENCE, CHOMU, JAIPUR

DEPARTMENT OF VETERINARY PATHOLOGY

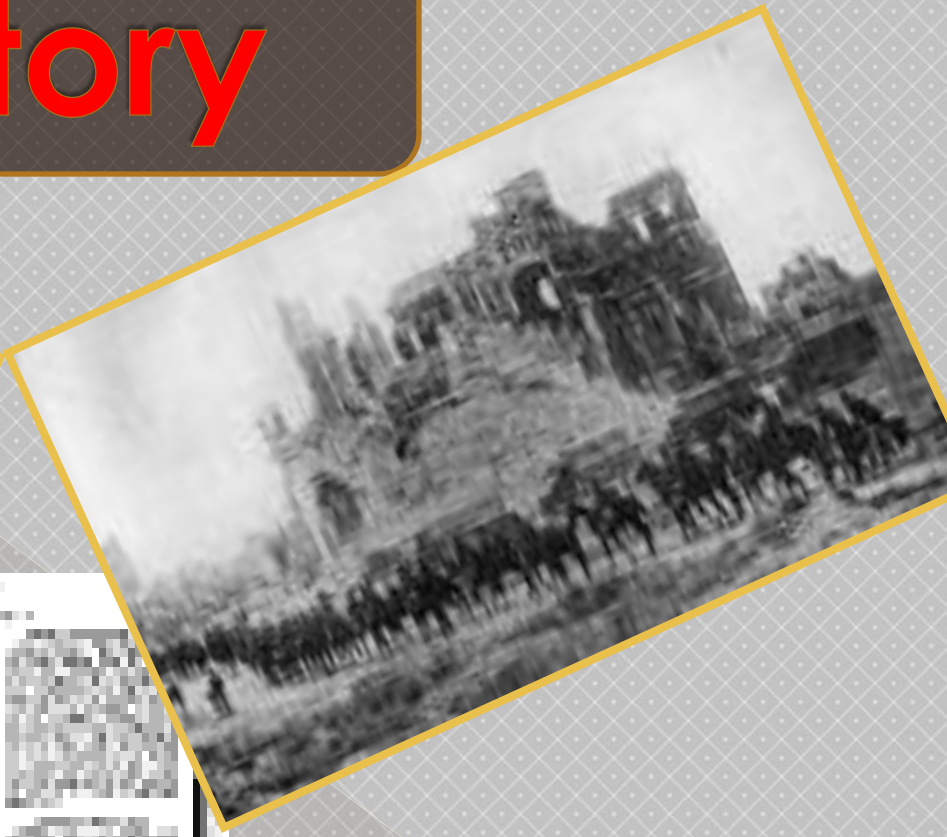
Glanders

Glanders

Droes, Farcy, Equine nasal phthisis, Maliasmus

- Fatal contagious and zoonotic disease of horses, mules and donkeys caused by *Burkholderia mallei*
- Acute or chronic form
- Nodular lesions in the lungs and other organs
- Ulcerative lesions in the skin and mucous membranes of the nasal cavity and respiratory passage
- Typically progressive course and poses a significant human health risk.

History



- **4th century BC - First described by Hippocrates**
- **3rd Century BC - Named by Aristotle**
  "Malleus" latin word means = Depicting a malignant disease
- **1664,France - Contagious nature recognized by Sollysel**

Cont.....

- **World war ll– Japanese infected horses, civilians**
  - Germany, used it as a biological weapon
  against enemy horses, later Russia and USA

- **1882 : Germany - organism was first isolated by Loeffler and Schutz (*Loefflerlla mallei/Pfeperilla mallei*)**

Global Scenario

- **1863: 3,000 horses and mules died form this disease**
- **1899 to 1902: South Africa- A major outbreak during the Anglo-Boer War – 240,000 horses.**

(Teigen and Saunders, 2006)

- **2000: Human case reported in USAMRIID**

(Srinivasan *et al*., 2001)

- **No. of Outbreak in race, military and pleasure horses in Asia, Eastern Europe, North Africa and South America is steadily increasing, and it is currently considered a re-emerging disease.**

(Wittig *et al*., 2006)

In India

- **1793: Horse of the Army of East India Company suffered**

(www.answer.com,2007)

- **1881: 1st record of Glanders in Bareilly – Ranibagh**

(Verma, 1981)

- **1881-1884: Outbreaks in the Royal Artillery horses – Nuseerabad**
- **1899: Glanders and Farcy act came in to force**
- **Remained prevalent in early 20th Century**

(Minett, 1930)

- **1960: probable reintroduction through imported horeses**

(Singh, 1964)

Cont.....

- **1950-80:** 23 outbreaks from Army equines
  10 outbreaks from Civilian equines

(Verma, 1981)

- **1979:** 1 outbreaks from Army horses in Gauhati

(Ray, 1984)

- **1984:** 3 outbreaks occurred in equine populations at Saharanpur (U.P.), Hissar and Karnal

(Misra *et al.*, 1985)

- **1998:** report of glanders from Rohtak (Haryana)

(www.news.webindia123.com)

Breaking Reports

- After a long period, the glanders reoccurred recently in several parts of the country – claimed about 120 equines.

Month & Year	Cases reported from	No. of Cases
July, 2006	Pune and Panchgani of Maharashtra	23
Jan., 2007	Gautam Buddha Nagar and Meerut districts of U.P.	70
Feb., 2007	Ludhiyana district of Punjab	3
May and June, 2007	Kathgodam area in Nainital district of Uttarakhand	22
Aug., 2007	Haldwani area of Dehradun	11
Oct., 2007	Hyderabad district of Andhra Pradesh	16

Etiology

The Organism

Loeffler and Schutz (1882)-First time isolate

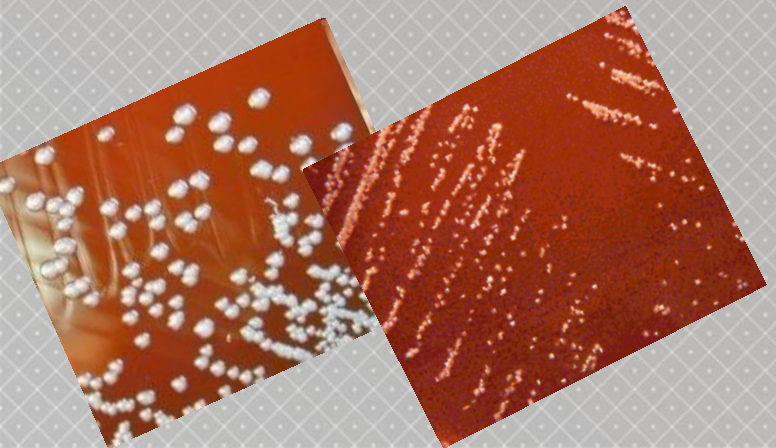
- **Formerly:** ***Pseudomonas mallei, Loefflerella mallei, Pfeifferella mallei, Actinobacillus mallei, Corynebacterium mallei, Bacillus mallei***
- **Family:** ***Burkholderiaceae***

Burkholderia mallei

- **Gram –ve,**
- **Non motile,**
- **Non-sporulating**
- **Obligate aerobic**
- **Glycerol required for growth**

Cultural character

- Loeffler's serum agar
- Sheep Blood agar
- Glycerin–potato media
- Chocolate agar
- Mc Conkey agar



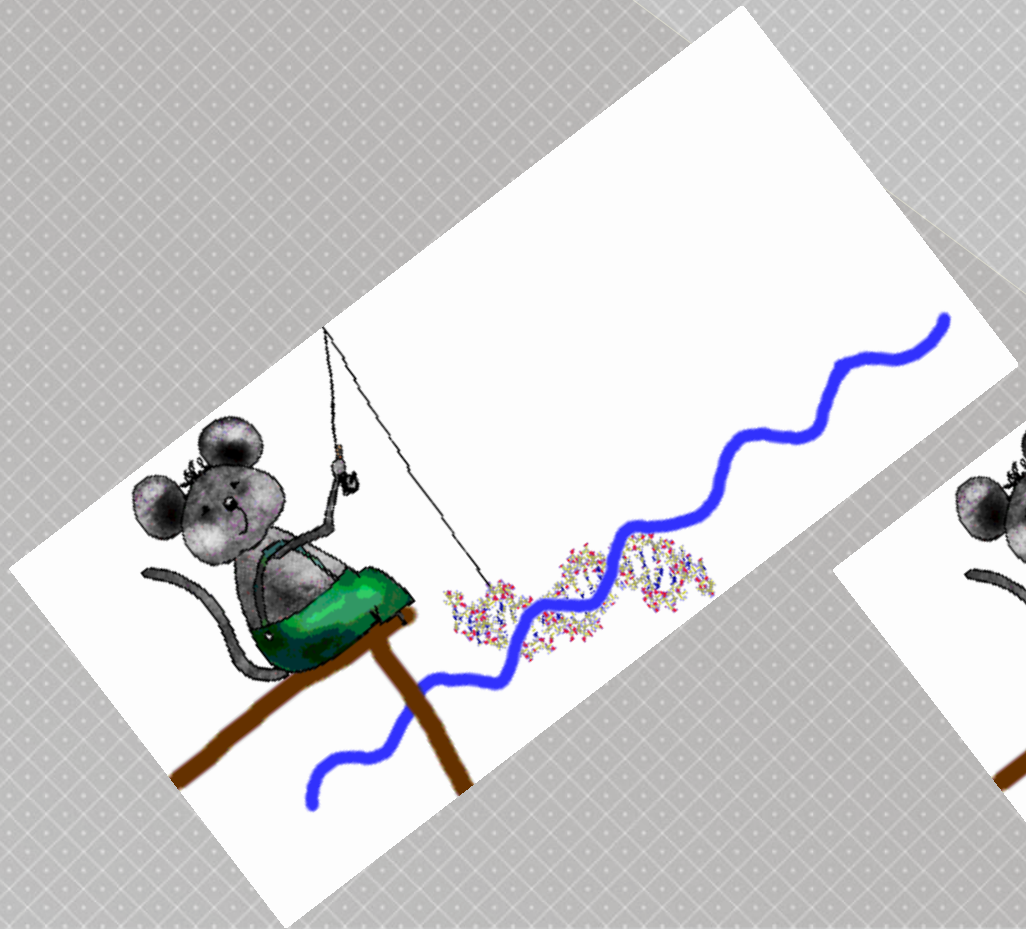
Greenish yellow pigment after which it become reddish-brown or brown

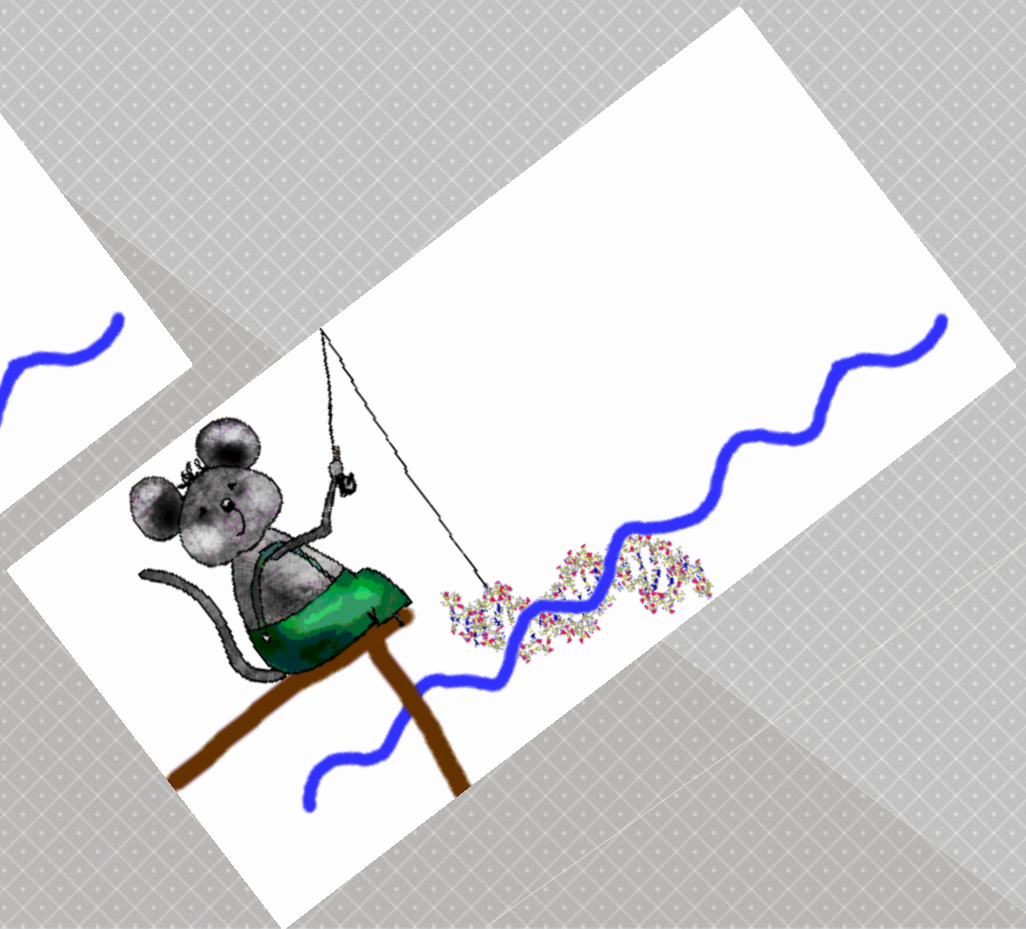
Growth on Blood Agar and Glycerol Potato Agar

Biochemical test

- Oxidase-Positive
- Catalase-Positive

Epidemiology





Animals at Risk

- All age groups are susceptible
- Horses – Chronic form
- Donkeys – Acute form
- Mules intermediate in susceptibility
- Carnivores - by consuming the infected meat

Cont……..

- **Lab animals – Hamsters, mice and Guinea pigs**
- **Goats, camels, bears, wolfs and dogs can be infected.**
- **Humans – occupational disease of Vets. and other Animal workers**
- **Pigs, cattle, sheep, rats and fowl are resistant**

Transmisson

- Organism in skin exudates and respiratory secretion
- Infection is acquired directly or indirectly from excretions and discharges only
- Chronic - horses - organisms are confined to the lesions and discharges
- Acute - Donkeys - organisms are distributed in most of the tissues and may be excreted in faeces, urine, saliva and tears

Although the disease in horses is respiratory form, the route of infection is probably oral

Cont.....

- Mostly spread - ingestion of contaminated feed and water.
- Spread - inhalation of nasal droplets can also occur.
- cutaneous form - contamination of skin abrasions by direct contact, or from harness or grooming tools
- Dogs, cats and other wild/zoo carnivores acquire - ingestion of contaminated or infected horse meat

Pathogenesis

Incubation period

- **2 to 6 weeks is typical**

- **Septicemic form develops after 1 - 5 days**

Pulmonary form develops after 10 – 14 days

Pathogenesis

Entry through GIT & Integument include mucous membranes

Mucosa to lymph nodes & hematogenously to the internal organs

Spreads through blood to cause nasal, cutaneous and nodular lesions.

Nodule formation by mononuclear cells and fibroblasts

Caseation and calcification

Cutaneous entry

Move along the lymphatic tracts

Lymphangitis and then spilling in the blood to seed various organs

Other visceral organs may become the sites of typical nodules

Cont...

Organism enter nasal mucosa and localizes

↓

Nodule formation on mucosa and turbinates

↓

Rupture and ulcers formed , excreting the organisms

↓

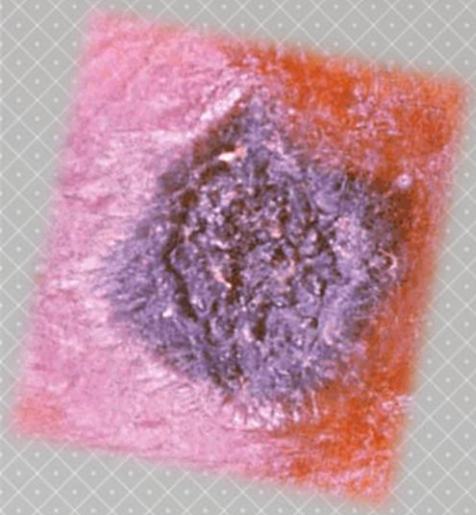
Heals leaving behind typical star shaped scar

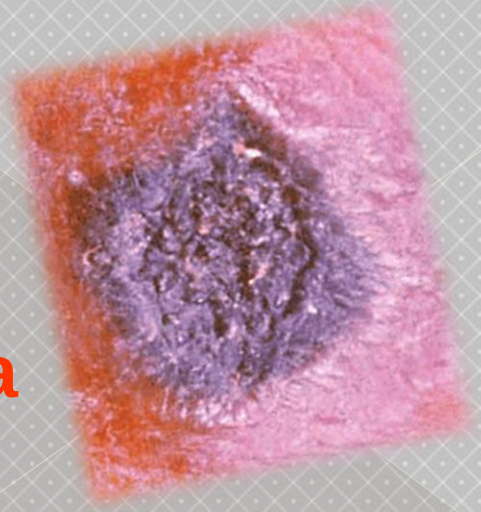
↓

Terminal signs are mainly bronchopneumonia

↓

Death due to anoxic anoxia





Clinical Presentation

Two forms:

1. **Acute disease (Septicemic)**
2. **Chronic disease**
   - **Pulmonary form**
   - **Nasal form**
   - **Cutaneous form**

(Visceral, Neural, Abortion)

Acute disease (Septicemic)

- High fever,
- Cough,
- Thick nasal discharge
- Rapidly spreading ulcers on the nasal mucosa
- Nodules on the skin of lower limbs or abdomen
- Sub maxillary lymph nodes- swollen and painful
- Lymphatic vessels on the face become thickened
- Death in 1 to 2 weeks due to septicemia

Chronic disease

- **Three forms:**

1. **Pulmonary form**
2. **Nasal form**
3. **Cutaneous form**

} **Usually occur together**

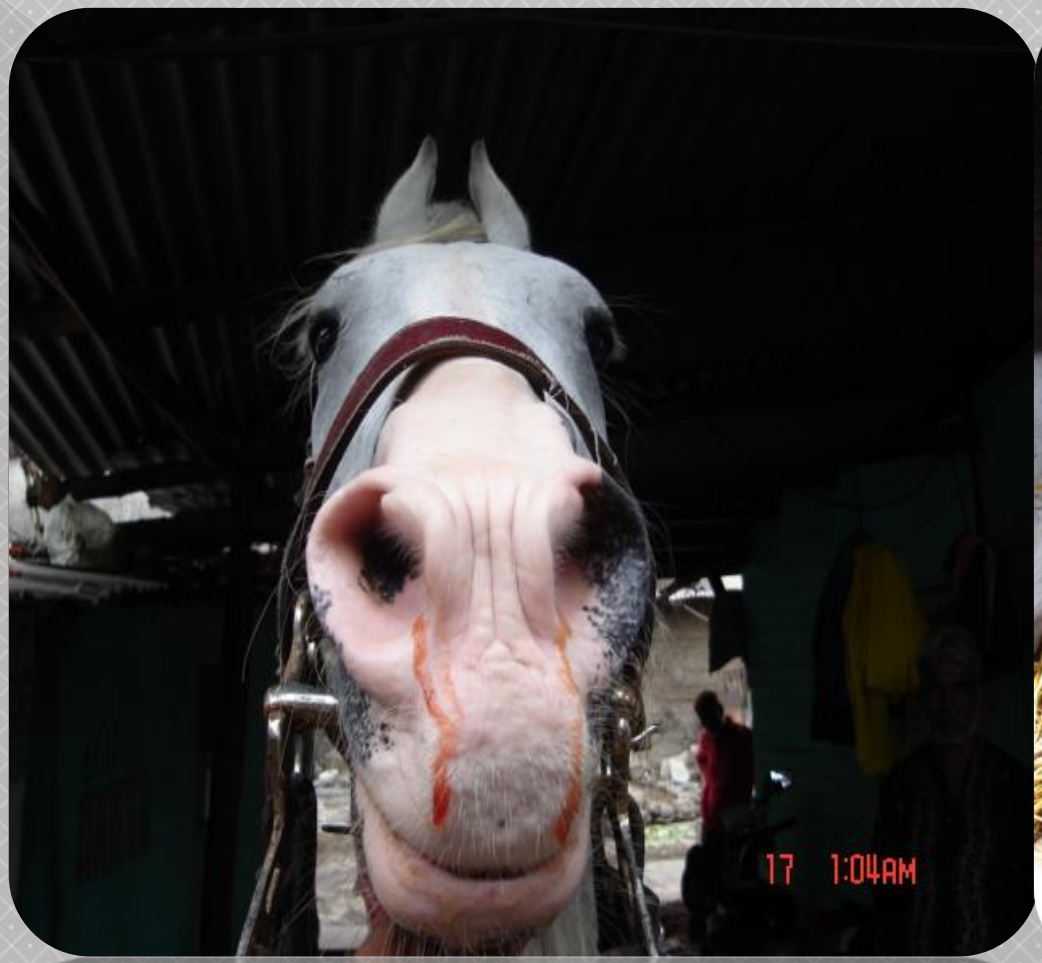
Pulmonary form

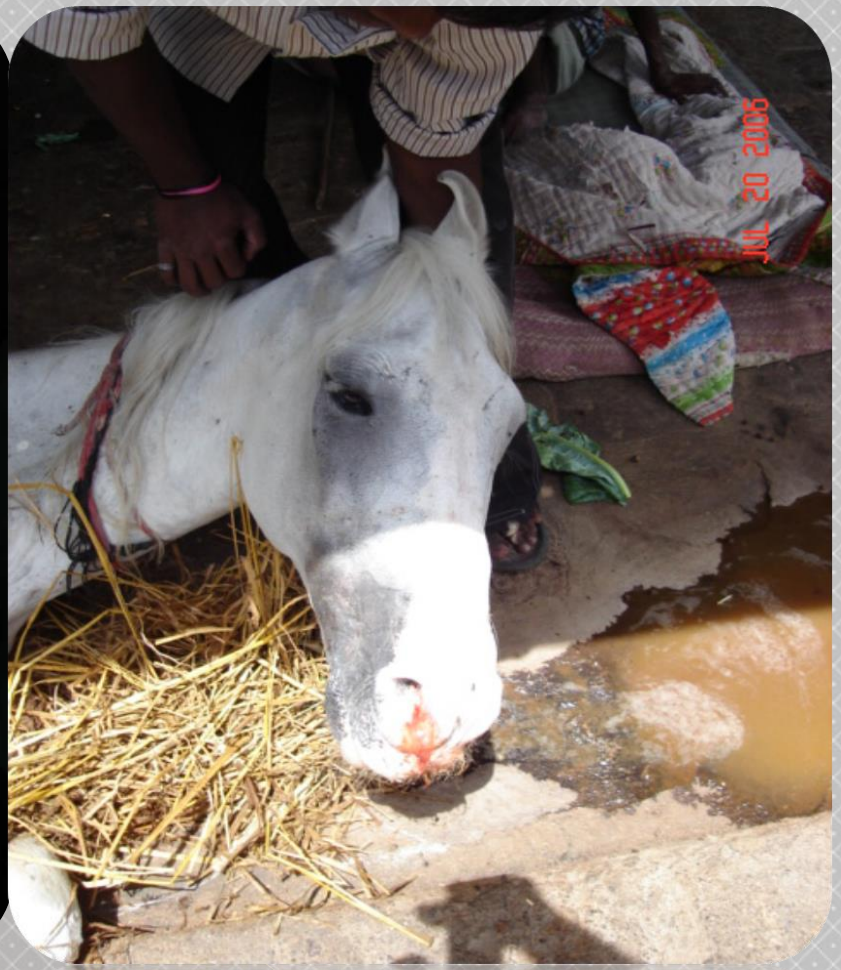
- Nodule in the lungs develop along with nasal and cutaneous lesions
- Chronic and diffuse pneumonia with severe coughing, dyspnoea and epistaxis
- In male animals, orchitis is a common feature

Nasal form:

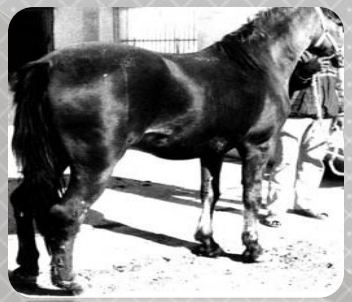
- Nasal discharge: unilateral or bilateral,
-
- Nodules and ulcers on mucosa
- Ulcerate and heal as star shaped scars

Blood stained discharge from nostril





Blood stained discharge from nostril



Cutaneous form or Farcy

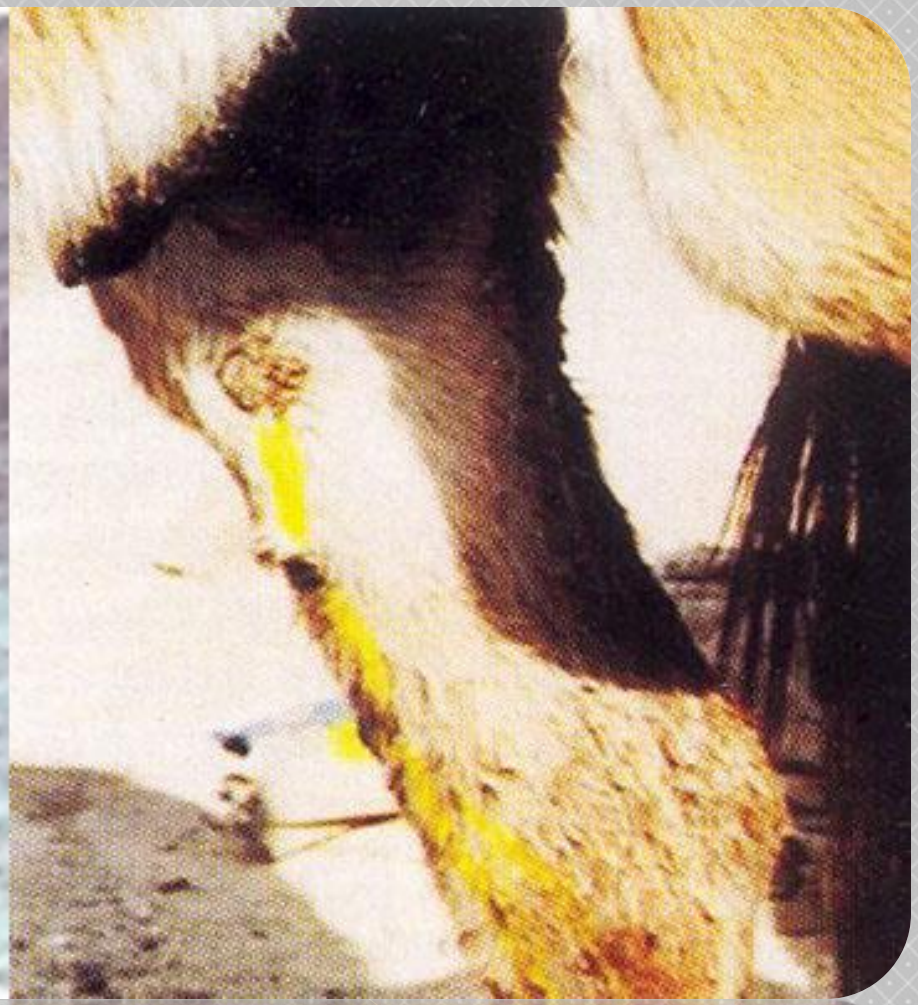
- Subcutaneous nodules (1-2 cm) which Ulcerate and drain a honey-colored discharge (pus)
- Thickened fistulous lymphatics radiate from the lesions and connect one to the other
- Mainly Cutaneous lesions in medial aspect of the hock, but can occur any where in the body
- Lymphadenopathy and cording of lymphatics is common (referred as Farcy pipes)
- Oil eating bacteria / Oily pus

Sulfar color granule in pus

Subcutaneous multiple nodule

Horse with Cutaneous nodules of glanders on the legs

Discharge from lesion



Cutaneous nodules in the medial aspect of hock (Draining lymphatics marked by yellow colour)

Horse with Cutaneous nodules of glanders

Pathology

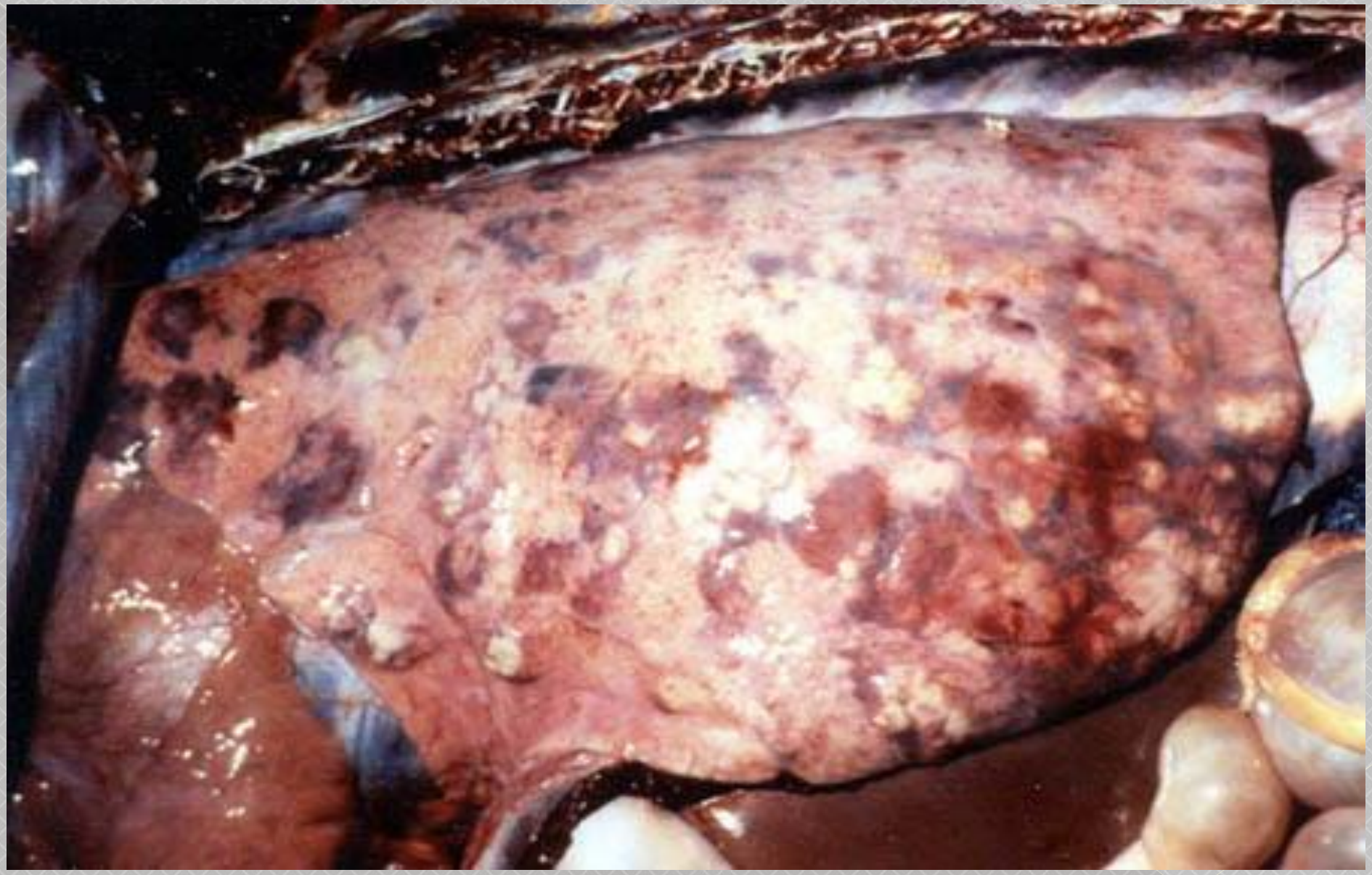
Gross Lesions

- Ulcers, nodules and stellate scars in the nasal cavity, trachea, pharynx, larynx, skin and subcutaneous tissues.
- Catarrhal bronchopneumonia with enlarged bronchial lymph nodes.
- The lungs, liver, spleen and kidneys may contain firm, rounded, encapsulated miliary gray nodules similar to tubercles.
- The lymphatic vessels may be swollen, the lymph nodes are typically enlarged and fibrotic and contain focal abscesses.
- Cord-like thickening of the subcutaneous lymphatics (farcy pipes)

granulomatous lesion

Cont...

- **In addition, necrosis may be noted in the internal organs and testes**
- **In intact male animals orchitis is often noted in addition to other lesions**



Extensive pyogenic granulmatous pneumonia with Multiple nodules in lung of Donkey

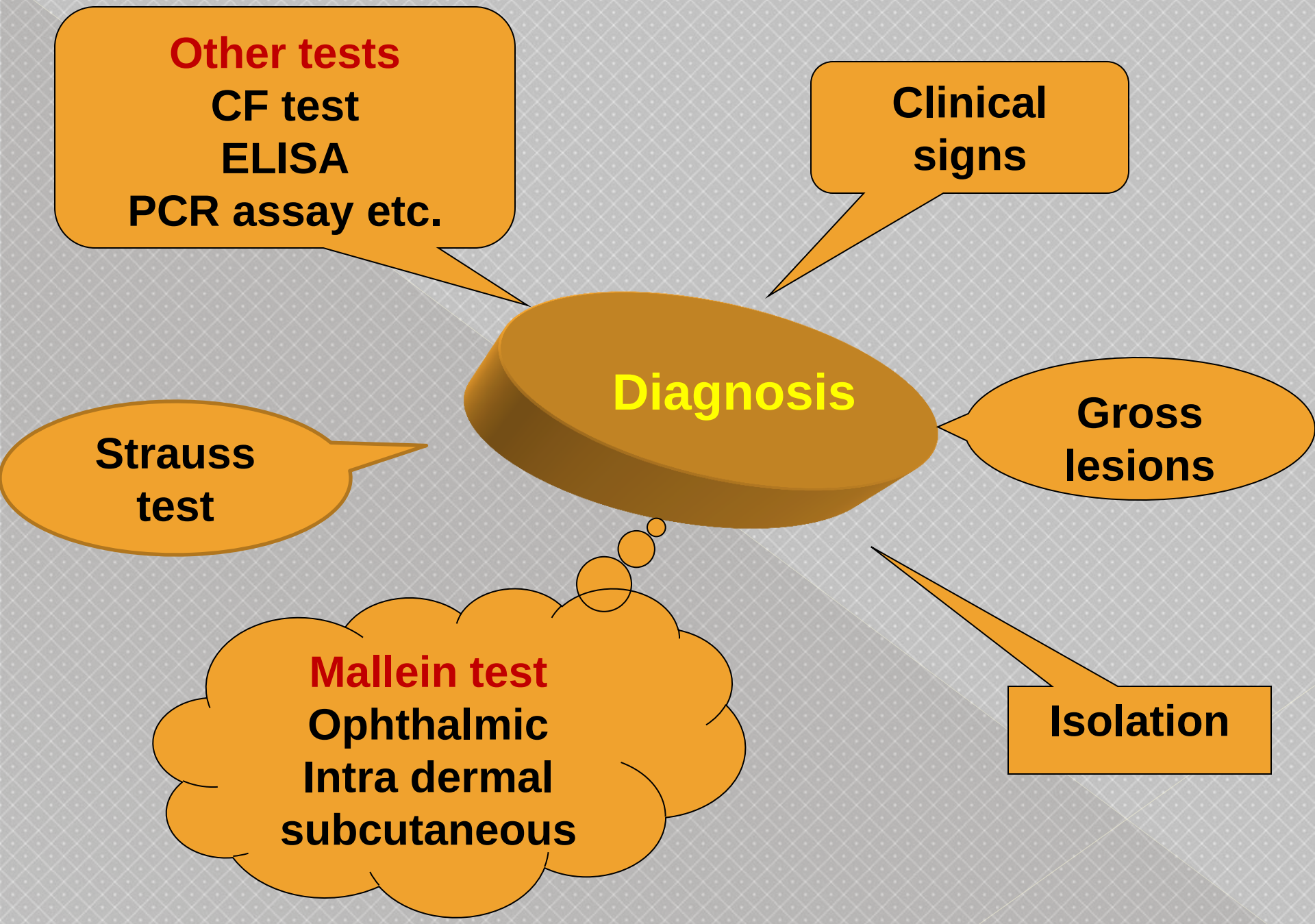
Lungs: Pyogranulomatus nodular lesions

Cont...

- **The proliferative nodules develop a grayish white core of granulomatous tissue comprising of epithelioid and giant cells admixed with leukocytes in fibroblastic stroma**
- **Diffuse lobular pneumonia has similar components as the nodules but there is no clear demarcation**
- **Hematogenous metastasis are common in spleen**
- **Equine Farcy - severe suppurative lymphangitis**

(Vegad and Katiyar, 2001)

Diagnosis


Other tests
CF test
ELISA
PCR assay etc.
Clinical signs
Diagnosis
Strauss test
Gross lesions
Mallein test
Ophthalmic
Intra dermal
subcutaneous
Isolation

Isolation

Sample collection: Nasal discharge, Lung, Pus

- 1.Gram staining-Gram negative bacilli

- 2.Cultural isolation-

  Loeffler's serum agar

  Sheep Blood agar

  Glycerin–potato media

  Chocolate agar

  Mc Conkey agar

3. Biochemical test

- Oxidase-Positive
- Catalase-Positive
- Urease- Positive

- **Main test for field diagnosis**
- **An allergic test due to delayed type hypersensitivity reaction**
- **Mallein PPD is an antigen use for this test and it is glycoprotein extracted from *B. mallei***

Perform by 4 route:

1. S/C, 2. Cutaneous, 3. Opthelmic,

4. Intradermo palpebral test (Mostly use)

Mallein and CFT are prescribed tests for international trade of equines

Intra dermo- palpebral Mallein test

- **Most sensitive, reliable and specific test**
- **0.1ml of Mallein is injected I\D into the lower eyelid and read at 24 and 48 hours.**
- **Positive - marked oedematous swelling of the eyelid with purulent discharge from the inner canthus or conjunctiva along with rise in temperature**
- **Negative – usually no reaction or only a little swelling of the lower lid.**

Procedure to carry out Mallein Intra dermopalpebral test in a horse

Positive IDP Mallein test

Doubtful IDP Mallein test

Ophthalmic Mallein test

- less reliable than the intradermo-palpebral test
- A few drops of Mallein are instilled into the eye at the canthus. After 6-8 hr
- Positive - Eyelids, and sometimes the side of the face, become swollen
  - Little discharge from the eye
  - Severe purulent conjunctivitis within 6 to 12 hr

Subcutaneous Mallein test

- 1ml to 2.5 ml of Mallein is injected s/c into the centre of neck region
- Measure temp after 9, 12,15,24 hour, next day morning and evening of injection
- **Positive** – If temp increase more then 2 F then normal (104 F) and a painful swelling seen within 24 hours at the site
- **Negative** - no or minimal transient local swelling.

Strauss reaction

- Infectious material injected **intraperitoneally** into male guinea pigs
- **Positive -** severe localized peritonitis and orchitis within 2-3 days
- The testes become **enlarged, painful** and ultimately **necrotic**
- Strauss reaction is not specific for Glanders, and other organisms can also elicit it. (***Brucellosis, C.ovis, Actinobacillus lignieresi)***

Other tests

- **Complement fixation test:** Widely used with accuracy of **90 - 95%**
- **ELISA: mainly Dot ELISA, Blot (Plate and membrane) ELISA, Competitive ELISA**
- **PCR assays**
- **Counter-Immunoelectrophoresis Test**
- **Indirect Hemagglutination,**
- **Immunofluorescence**

} **Inexpensive, rapid and easy**

- **Agglutination tests and precipitin – unsatisfactory**
- **The most accurate and reliable tests in horses are complement fixation and ELISA.**

Differential diagnosis

Diagnostic Features	Glanders	Strangles	Epizootic lymphanaitis	Ulcerative lymphangitis	Meliodosis
Etiology	*B.mallei,* Gram -ve rod	*Streptococcus equi,* Gram +ve cocci	*Histoplasma Farciminosum* fungus	*C.Pseudo tuberculosis* Gram +ve rod	*B. pseudomallei,* Gram -ve rod
Symptoms and Lesions	Fever, unilateral mucopurulent nasal discharge, ulcers in nasal cavity,submaxillay lymph node swollen and painful, Farcy nodes and Farcy buds. Grey nodules in lung, liver, spleen, kidneys.	Fever, swollen sub- mandibular lymph node, bilateral mucopurulent nasal discharge, abscess on liver and visceral organs, Empyema,Skin and lung lesions absent, purpura haemorrhagica.	Cutaneous nodules on lymph vessels, lymphangitis, conjunctivitis ulceration of skin.	Lameness, dermatitis, abscess on skin of abdomen, nodules around the fetlock, discharging creamy green pus, leading to ulcer.	Dyspnoea, lameness multiple abscess, acute pneumonia with high fever, granulomatous nodules in lungs with caseation in the centre, oedema and consolidation of lungs.
Mallein	Positive	Negative	Negative	Negative	false reaction
Strauss	Positive	-	-	-	Positive

	P.aeruginosa	B.mallei,	B. pseudomallei
Colony odour	Grape like	*None*	*Musty*
Diffuse pigment production	+	--	----
motility	+	----	+

- Pseudomonas ferment only glucose

Prevention and control

- ✓ **Eliminate the diseased animals- slaughter**
- ✓ **Carcasses are burnt or incinerated along with manure, beddings, feed residues**
- ✓ **Protective clothing during examination of animal and necropsy and use proper disinfectants**
- ✓ **Avoid common feeding and watering in endemic area**
- ✓ **Strict quarantine for 60 days**

Zoonotic aspects

Disease in Humans

- The role of ingestion in human infection is uncertain, spread by contact

- Human - natural infections incubation period is 1 to14 days whereas in case of aerosolized forms in biological weapons it is 10-14 days

(Womack and Wells,1949)

- Four forms of infection
  - Septicemia
  - Pulmonary infection
  - Acute localized cutaneous infection
  - Chronic infection

(O.I.E., 2000)

Cont.....

- **Septicemic form –**

  Fever, chills, myalgia, pleuritic chest pain, generalized erythroderma, jaundice, photophobia, lacrimation, diarrhoea and granulomatous or necrotizing lesions.

  Death usually occurs in 7 to 10 days.

- **Pulmonary form –**

  Pneumonia, pulmonary abscesses and pleural infusions

  Incubation period of about 10-14 days.

- **Localized form –**

  Nodules, abscesses and ulcers in the mucous membranes, skin, lymphatic vessels and subcutaneous tissues.

- **Chronic form –**

  Multiple abscesses, nodules or ulcers can be seen in the skin, liver, spleen or muscles

(Rega, 2007)

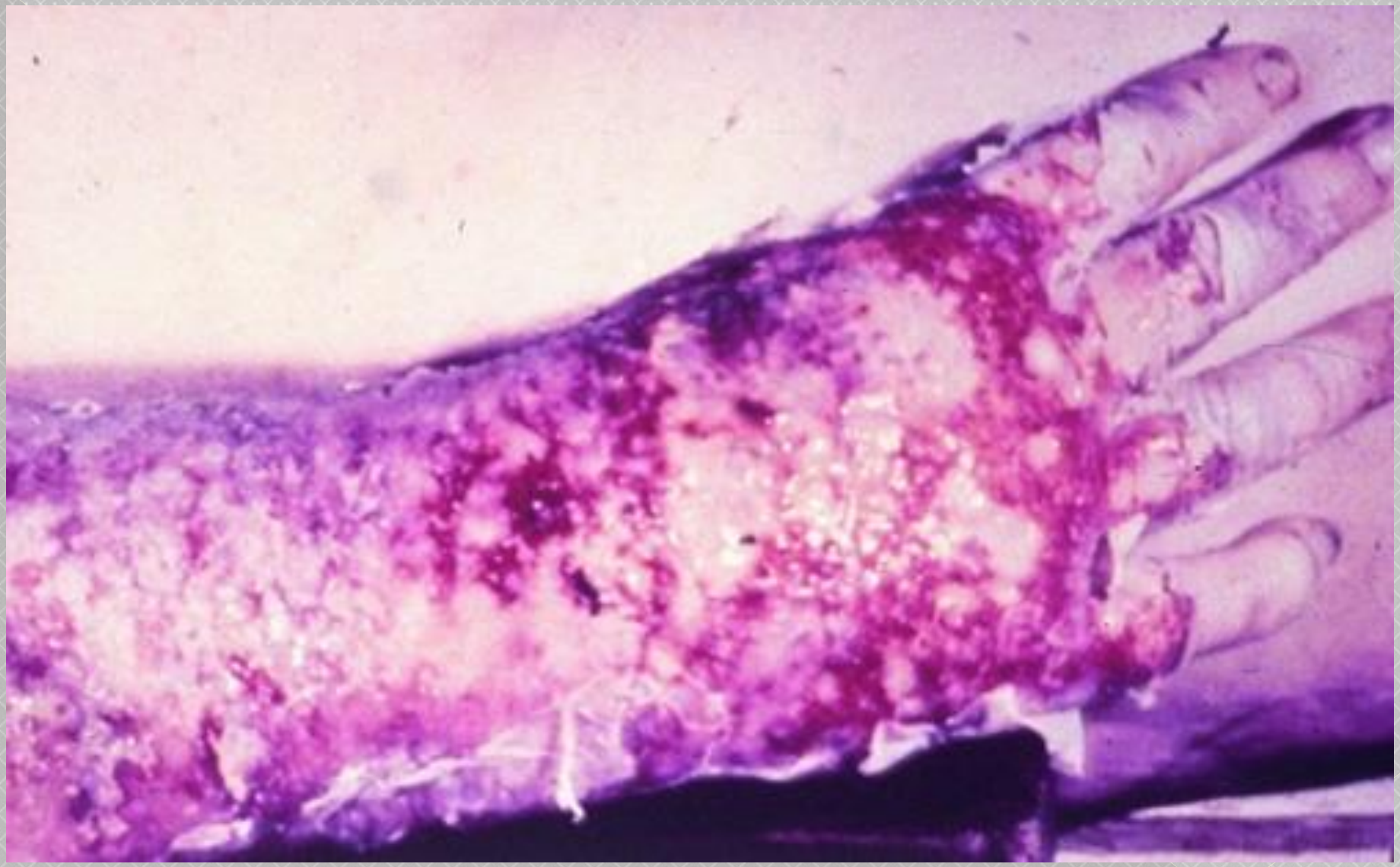
Cont.....

- The case fatality rate is - 95% (untreated cases)
  - more than 50% (treated)
- The mortality rate for localized disease is 20% (treated)
- The overall mortality rate is 40%

(Rega, 2007)

Glanders in a veterinary student

Maisons-Alfort, France, 1834



Extensive ulceration and sloughing of the skin of the forearm and hand

Thank You . . .