

# **Pathology of Swine**

**Dr. med. vet. Matti Kiupel, BS, MS, PhD,  
DACVP**

**Diagnostic Center for Population and Animal Health  
College of Veterinary Medicine, Michigan State University**

**4125 Beaumont Road 152A, Lansing, MI 48910, USA**

**Tel.: \*\* 517 432 2670; Fax: \*\* 517 432 6557;**

**E-mail: [kiupel@dcpah.msu.edu](mailto:kiupel@dcpah.msu.edu)**



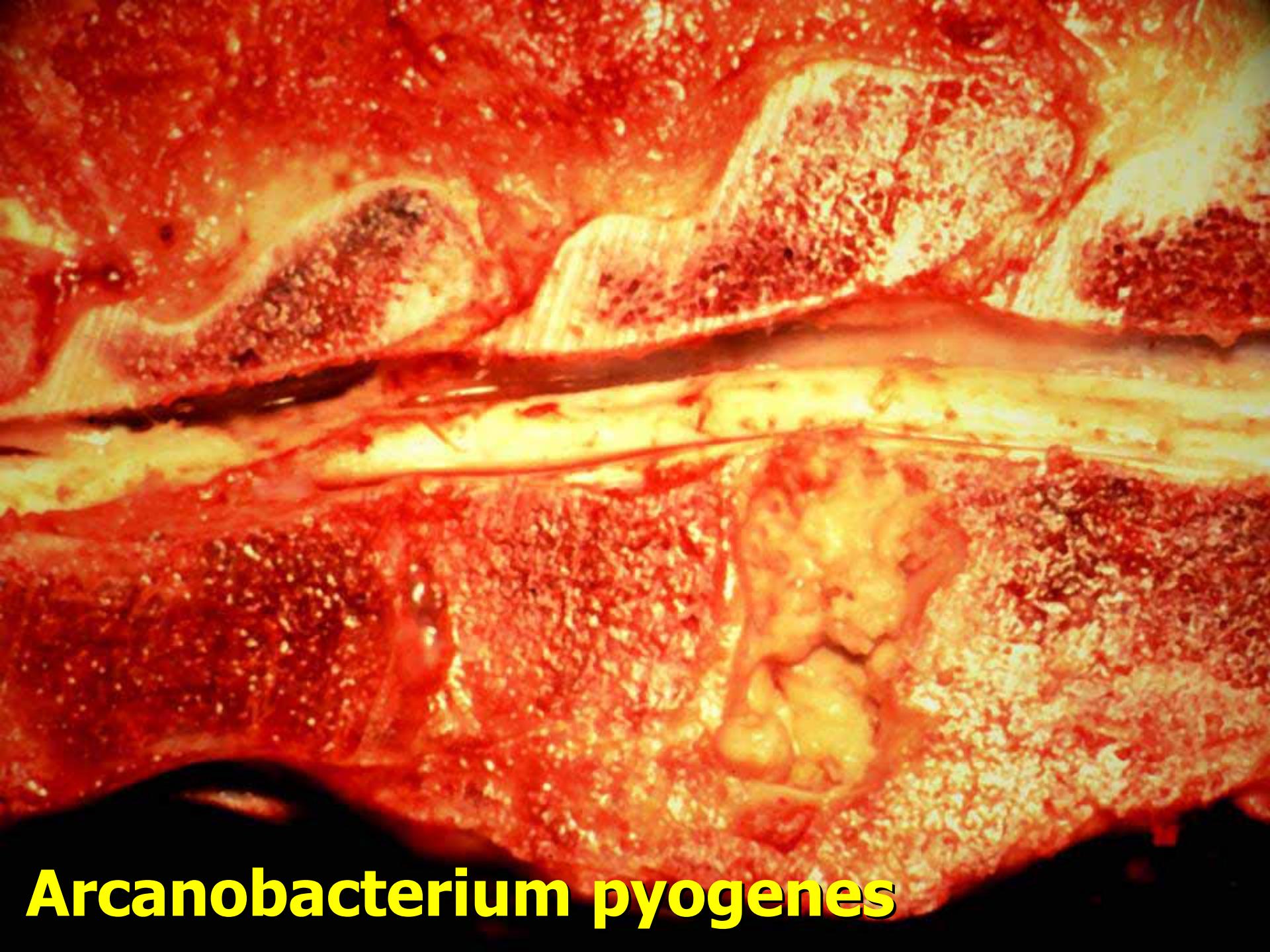
# Musculoskeletal System

# Posterior Paralysis/Paresis in Swine

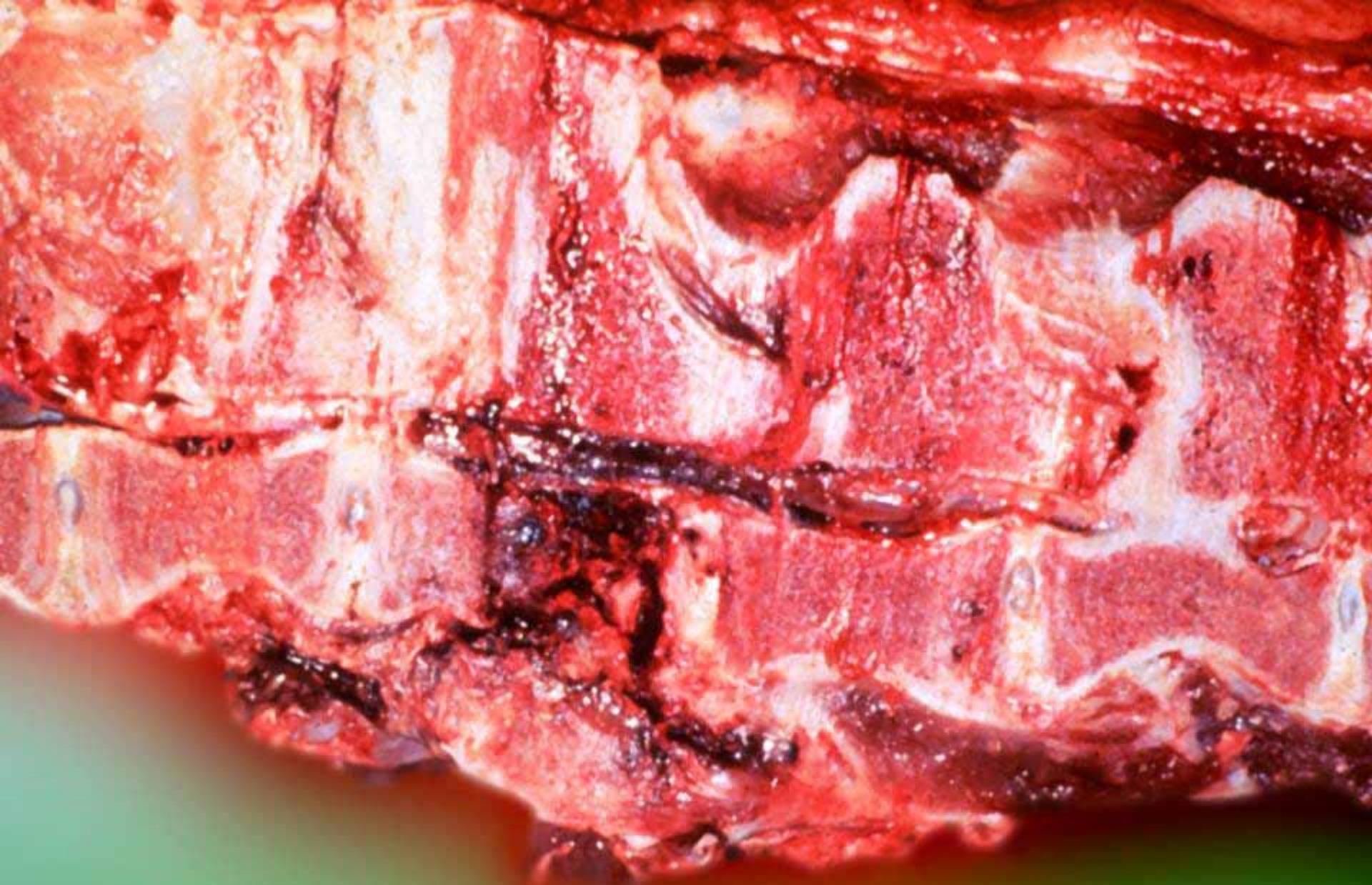
- Spinal cord
  - enterovirus
  - selenium toxicity
  - ruptured disk
  - trauma
  - lymphosarcoma
- Bones and Muscles
  - Ischial epiphysiolysis
  - Torn “hamstring”
  - Osteomalacia/osteomyelitis → fracture
- Vertebral column
  - osteomyelitis
  - osteomalacia
- Nerves
  - Organic arsenicals
  - Trauma



**Arcanobacterium pyogenes**



**Arcanobacterium pyogenes**



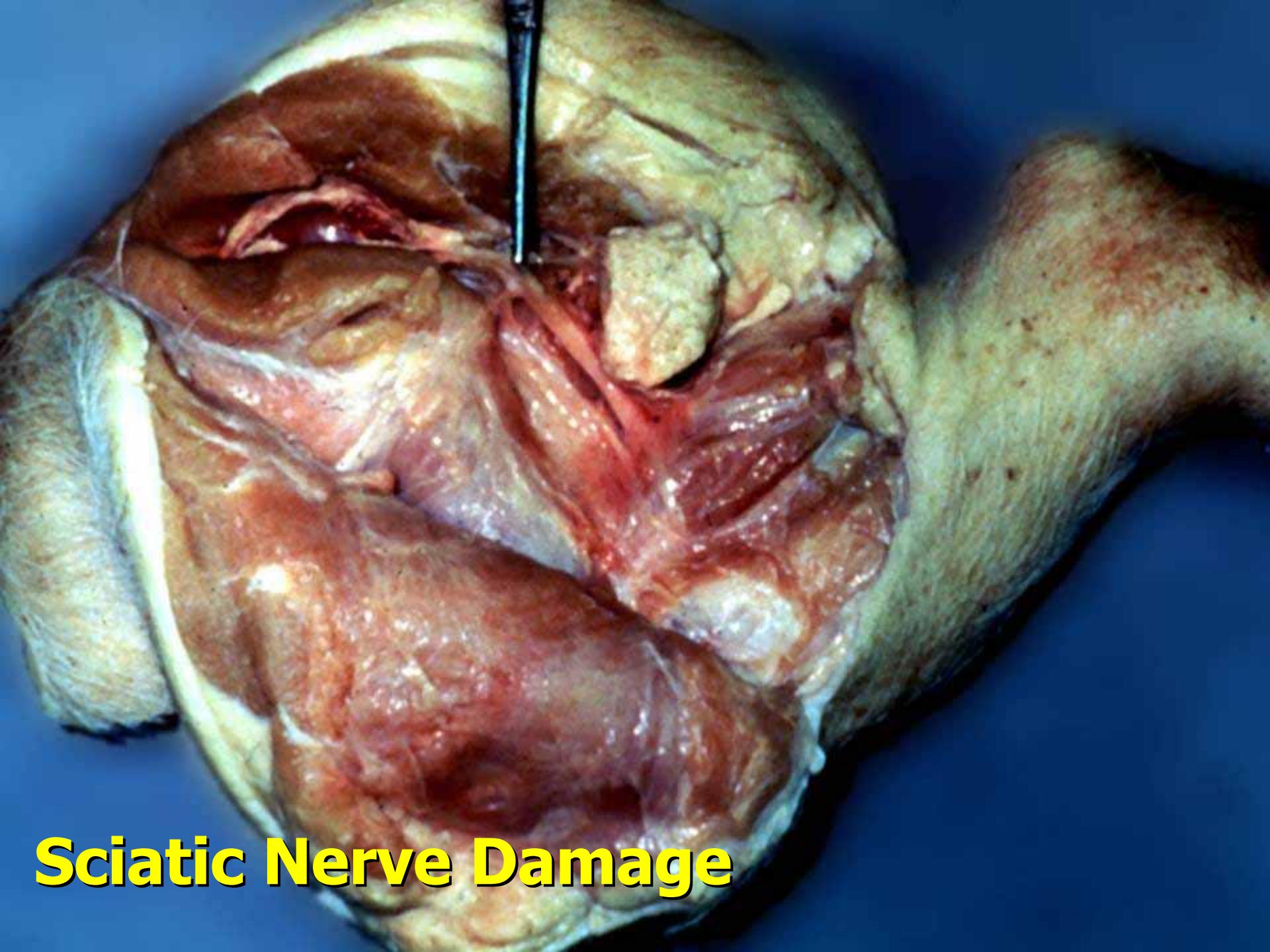
**Arcanobacterium pyogenes**



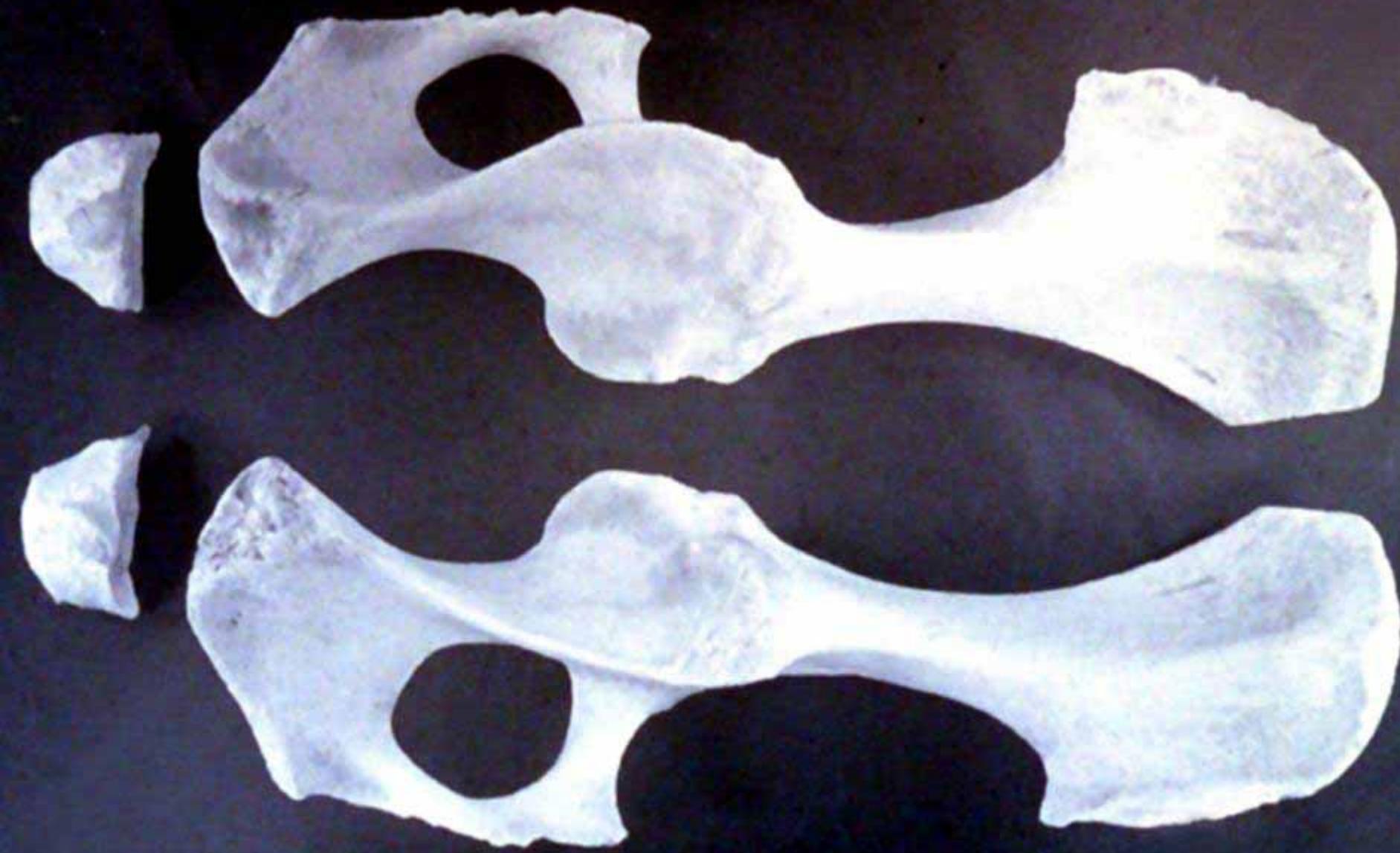
**Degenerative Disc Disease**



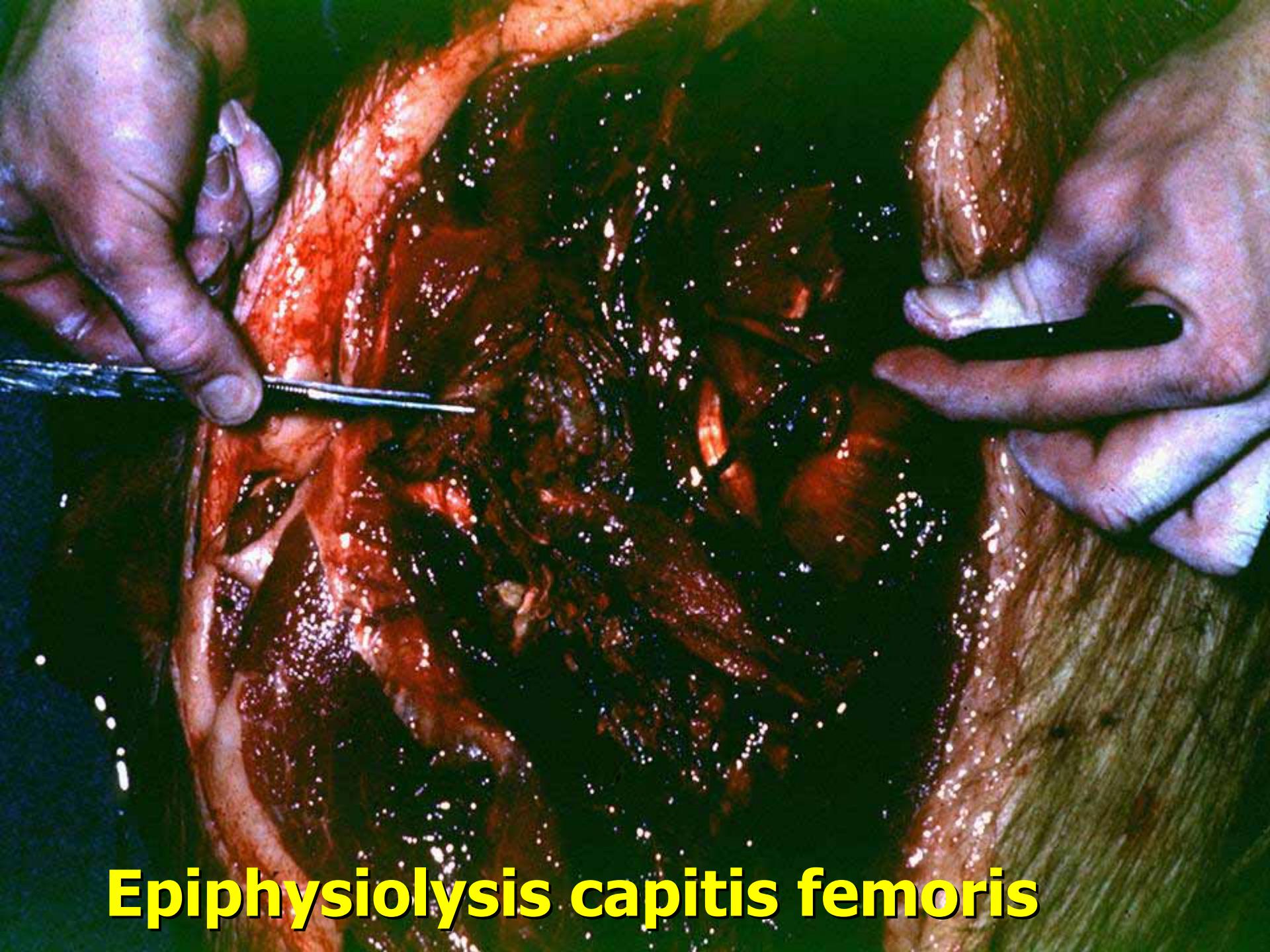
## Sciatic Nerve Damage



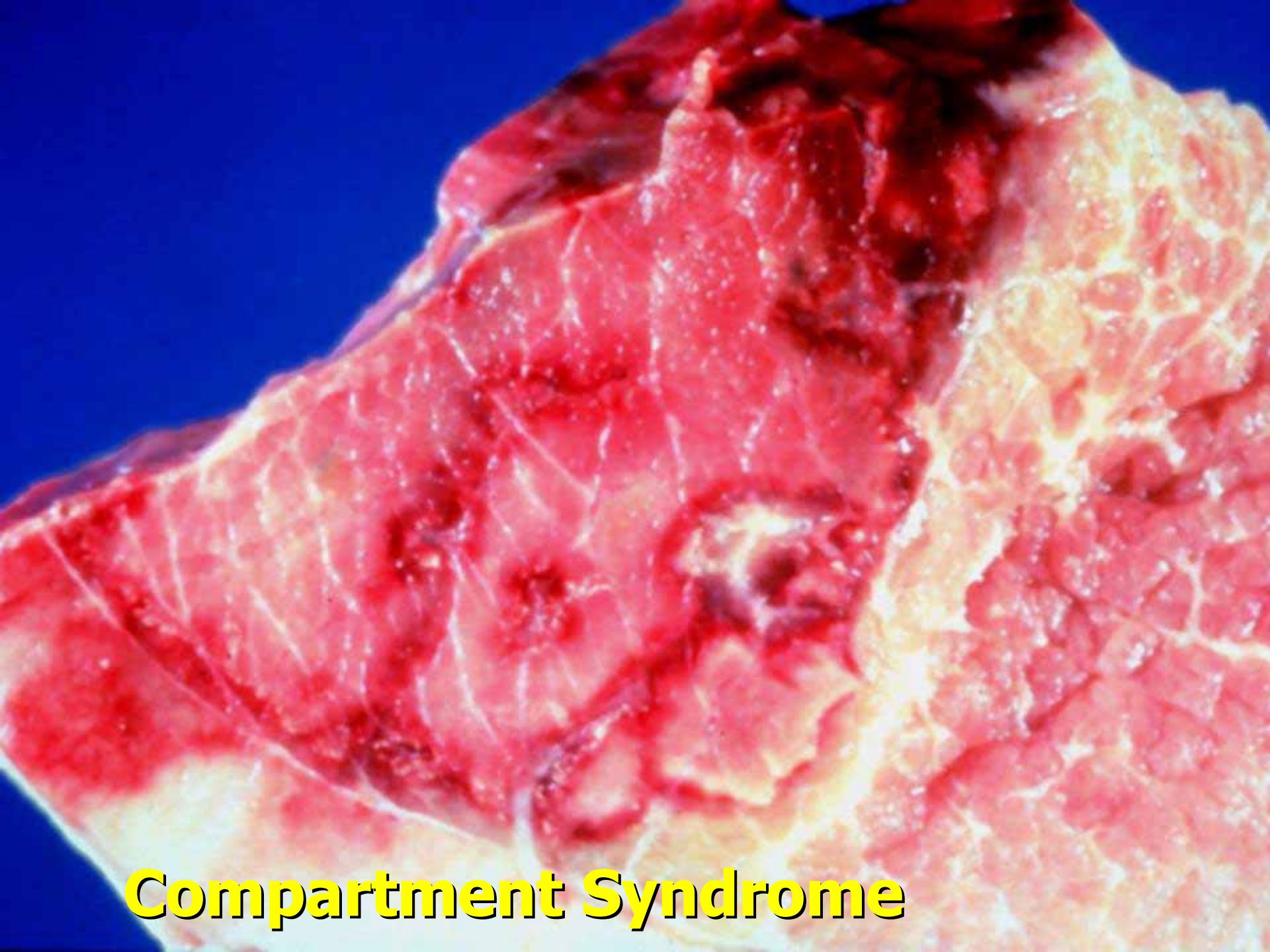
**Sciatic Nerve Damage**



**Apophysiolysis tuberis ischii**



**Epiphysiolysis capitis femoris**



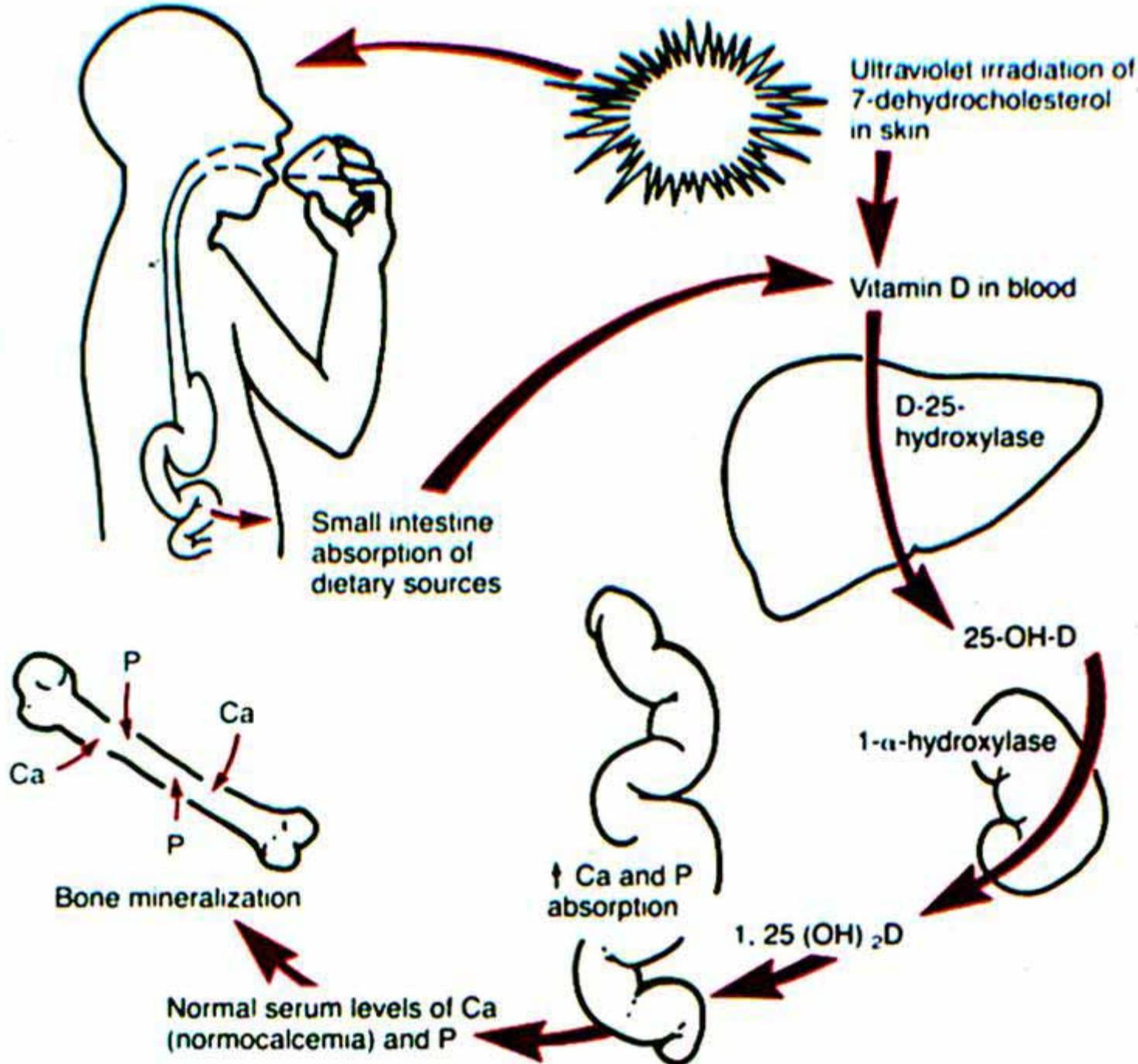
# Compartment Syndrome



## Lactogenic Osteoporosis

# **Hypovitaminosis D**

- Causes hypocalcemia
- Homeostatic mechanisms lead to normocalcemia, mobilization of bone calcium
- Hypophosphatemia persists, thus adds to impaired bone mineralization
  - Rickets in young growing animals
  - Osteomalacia in adult animals



# Rickets (and Osteomalacia)

- Classical manifestation of Vitamin D deficiency
- Basic derangement is an excess of unmineralized matrix and vascular invasion of cartilage
- Lesions most prominent in the physeal regions

# Rickets (and Osteomalacia) Histopathology

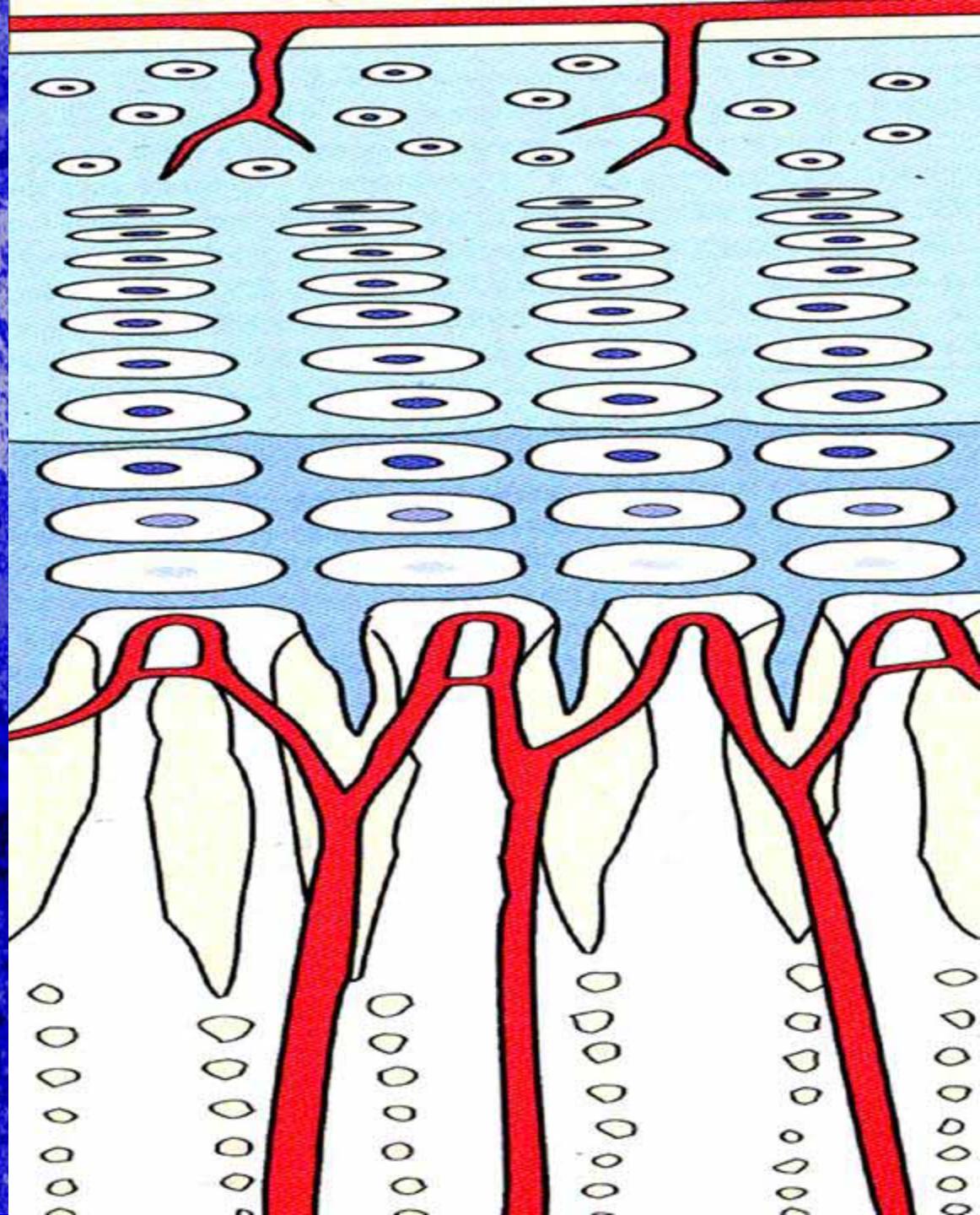
- Increased thickness of zone of hypertrophy
- Disorderly arrangement of the zone of hypertrophy
- Disorderly penetration of cartilage by blood vessels
- Excess of uncalcified osteoid in the metaphysis (*osteoid seams*)

## Epihyseal growth plate

Cartilage

Calcified cartilage  
(primary spongiosa)

Mature bone  
(secondary spongiosa)



A histological micrograph showing a cross-section of a long bone. The upper portion of the image shows a thin, curved layer of pink-stained tissue, likely the periosteum. Below this, the bone structure is visible, characterized by a dense network of small, irregularly shaped, and somewhat fragmented trabeculae. The overall appearance is less organized and more porous than normal bone tissue.

**Osteomalacia**

**Long Bone**

A histological micrograph showing a cross-section of a long bone. The upper portion displays a normal arrangement of osteocytes within their lacunae, separated by a regular network of collagen fibers and mineralized matrix. The lower portion, representing the diaphysis, shows extensive areas of osteomalacia. These areas are characterized by large, irregularly shaped, and somewhat disorganized clusters of osteocytes. The intercellular matrix appears less dense and organized than in the normal region, with some darker, more granular areas suggesting軟骨化 (chondrocalcinosis).

**Osteomalacia**

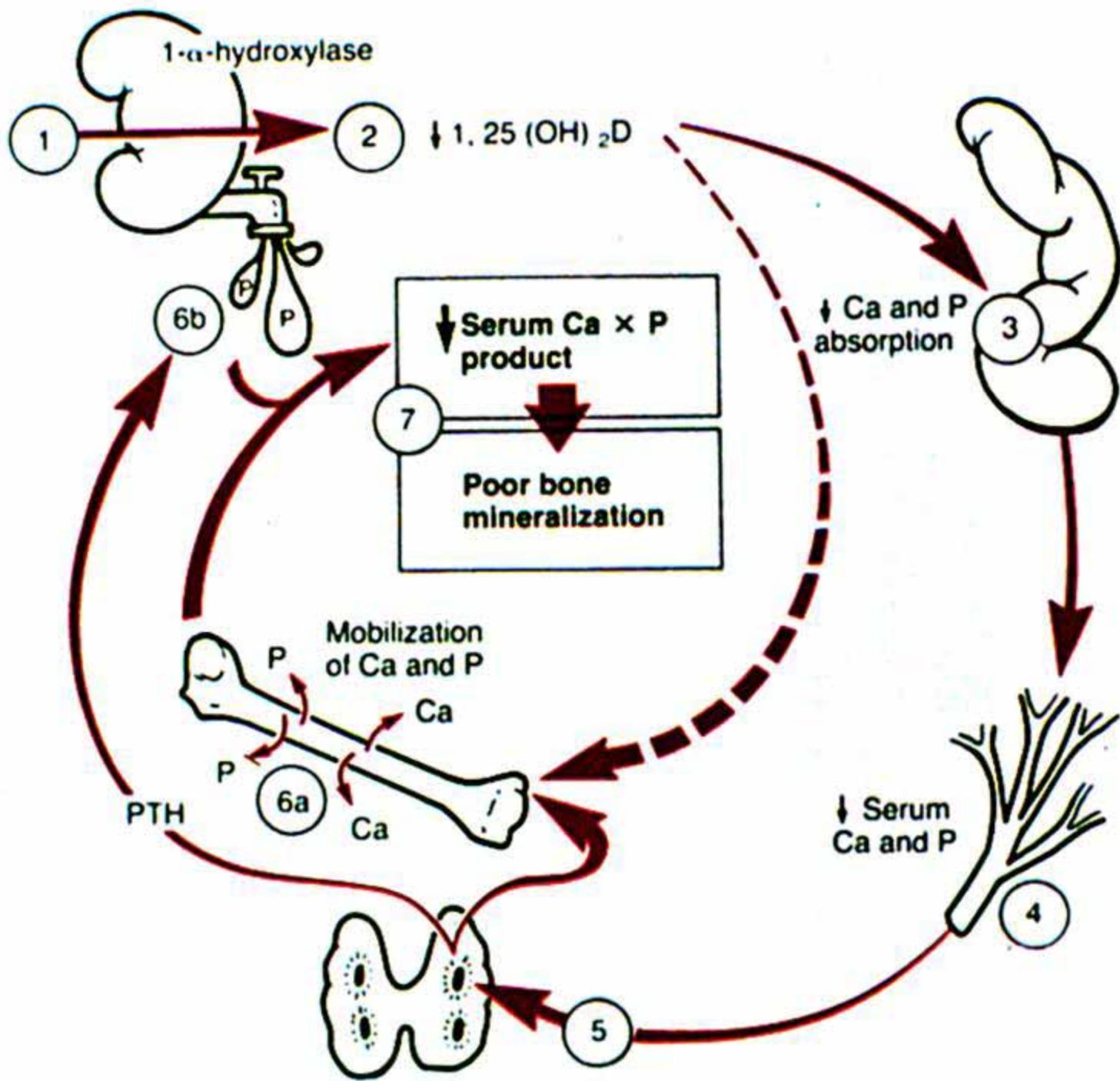
**Long Bone**

# Osteoporosis

- Caused by deficiencies of Ca, P, or Vitamin D
- Results when resorption rates exceed formation due to increased PTH
- Mainly affects flat bones of skull, scapula, ileum, and metaphysis of long bones
- Hypocalcemia complicated by Vitamin D deficiency produces more severe lesions
  - Uncomplicated hypocalcemia is rare
  - Impairment of homeostatic mechanisms

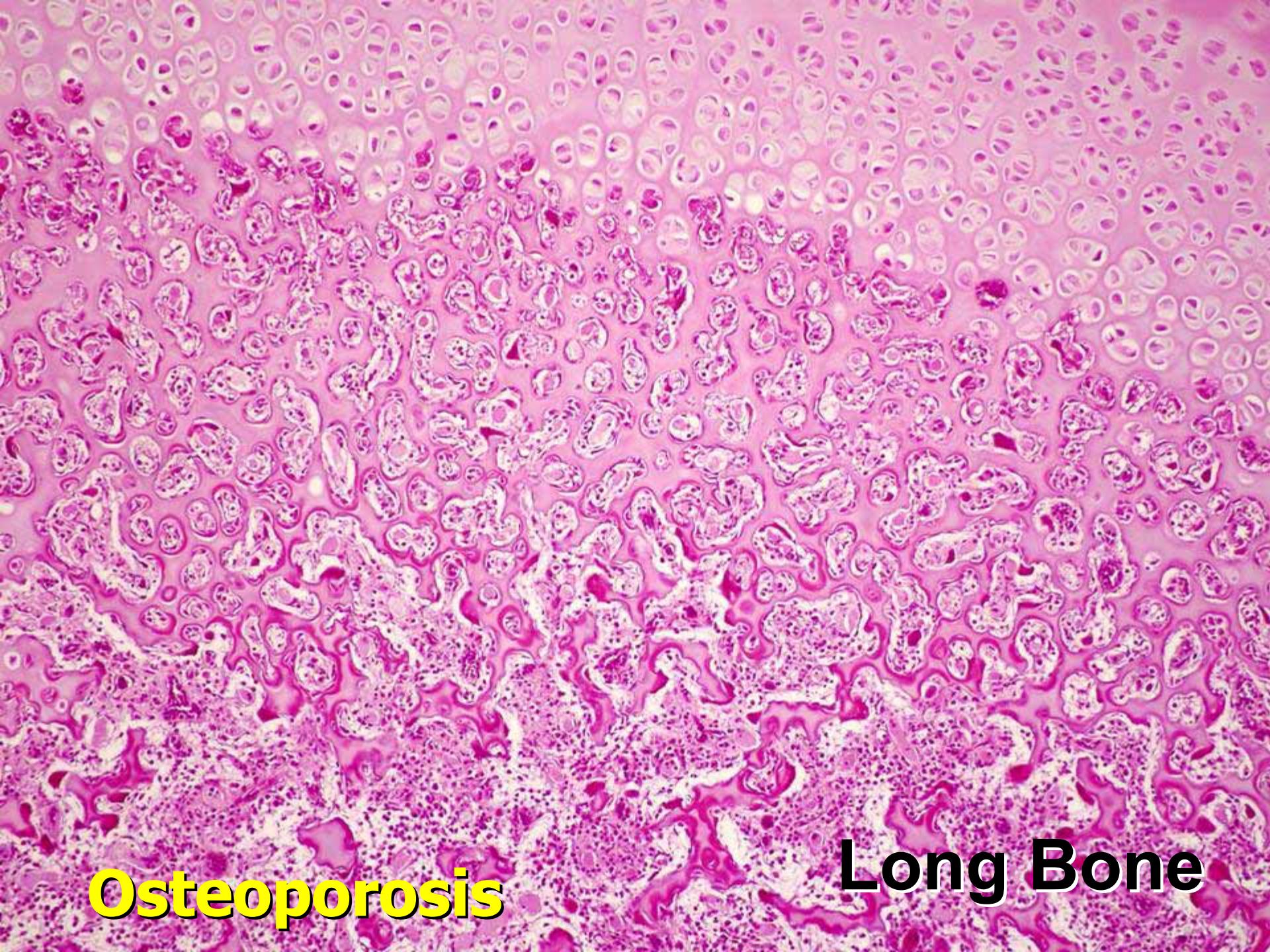
# Osteoporosis Histopathology

- Cortical bone is thin due to increased endosteal or intracortical (severe hypocalcemia) resorption
- Osteoid seams are of normal width and frequency
- Mineralization usually normal
- Decreased and or thinned trabeculae



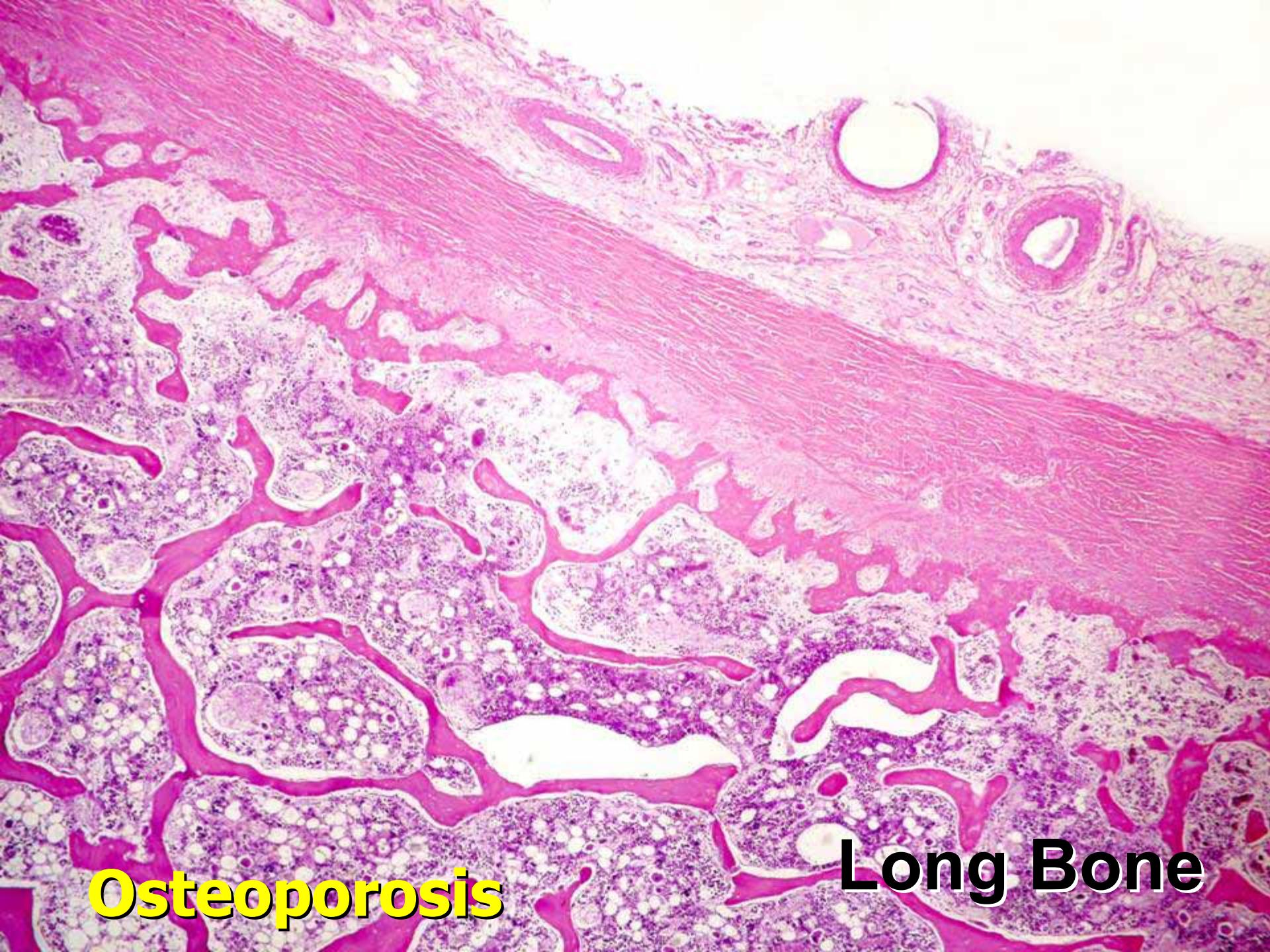
# Osteoporosis Histology

- Cortical thinning
- Trabecular fragmentation
- Abnormal mineralization with retention of cartilage cores
- Retained osteoid in epiphyseal growth plate of few bones
- Periosteal fibrosis

A high-magnification micrograph showing the trabecular bone structure of a long bone. The image displays numerous small, irregularly shaped bone lacunae (pores) filled with pink-stained osteocytes. The overall appearance is one of reduced bone density and increased porosity compared to normal bone tissue.

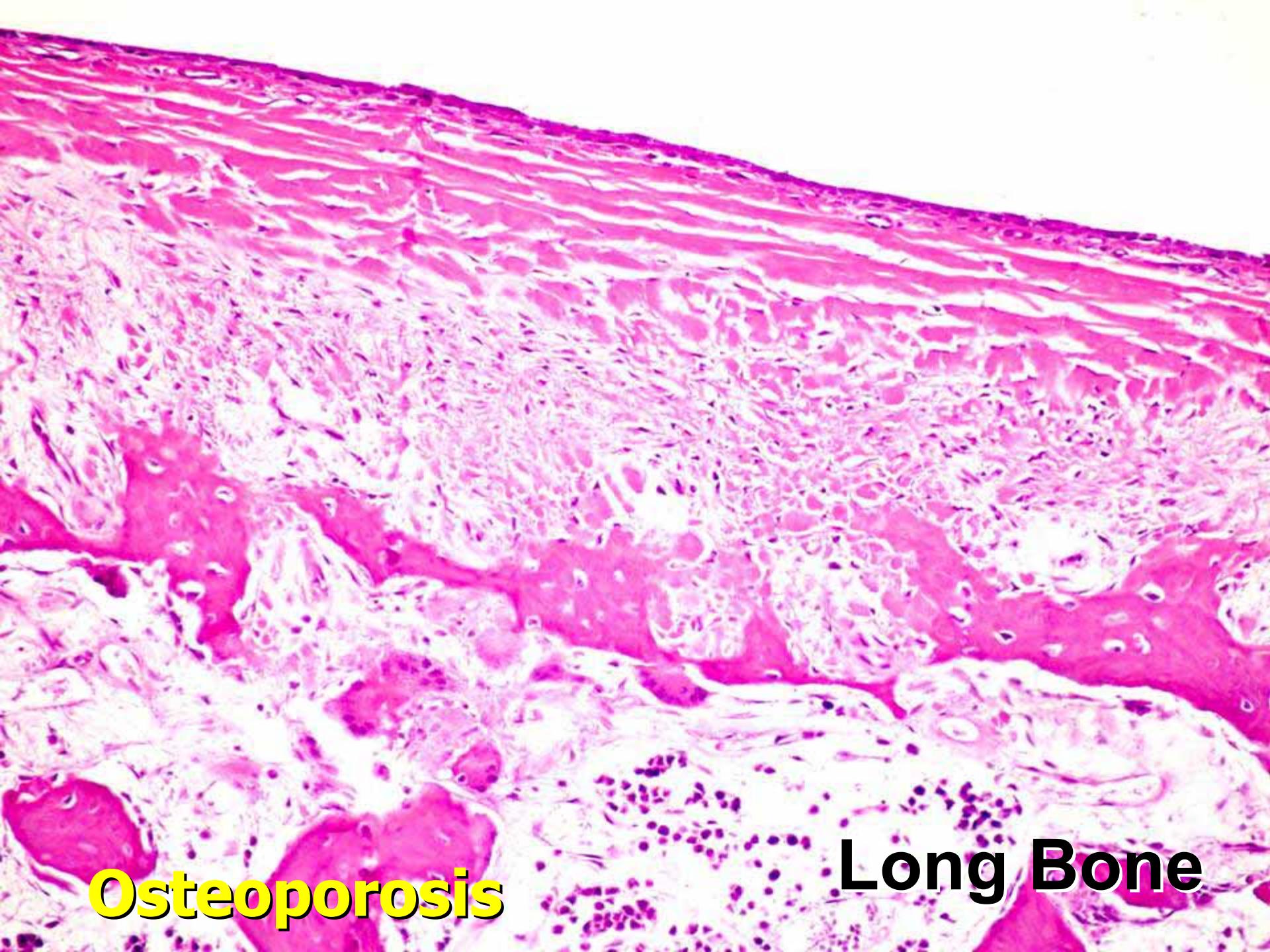
**Osteoporosis**

**Long Bone**

A histological micrograph of a long bone section stained with hematoxylin. The image shows a dense network of trabeculae (small bone structures) in the lower half, transitioning into a thick layer of compact bone with horizontal lamellae in the upper half. A prominent feature is a large, irregularly shaped cavity on the left side, which is a sign of osteoporosis. The cavity contains some cellular debris and is surrounded by thin-walled osteoclasts. The overall color palette is dominated by shades of pink and purple.

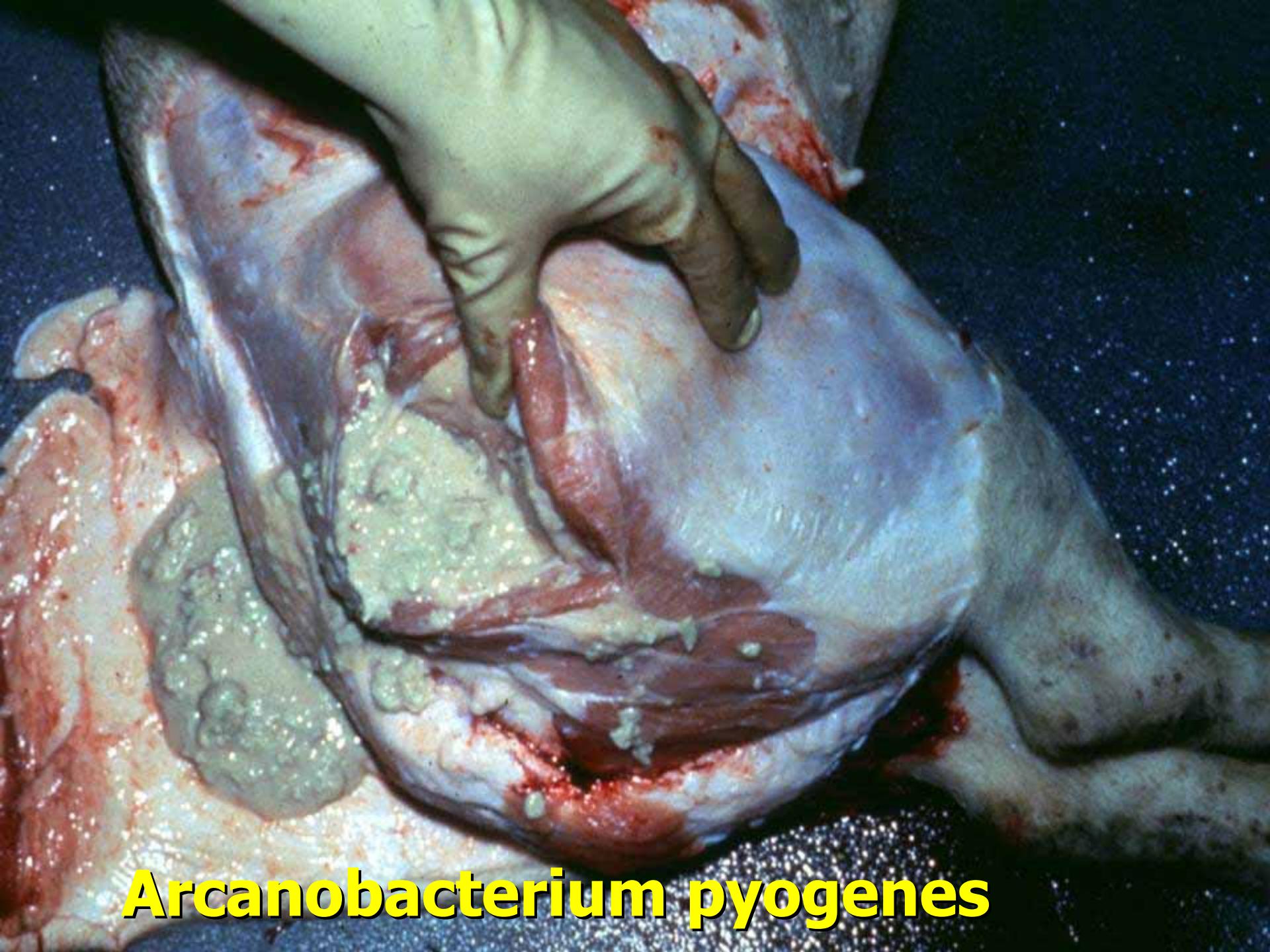
**Osteoporosis**

**Long Bone**

A high-magnification light micrograph of a long bone section. The image shows a dense arrangement of pink-stained collagen fibers and white spaces representing trabeculae. In the lower-left area, there is a prominent, irregularly shaped, and somewhat disorganized cluster of trabeculae, which is characteristic of osteoporotic bone. The overall structure appears less dense than normal.

**Osteoporosis**

**Long Bone**



**Arcanobacterium pyogenes**

# Lameness in Swine

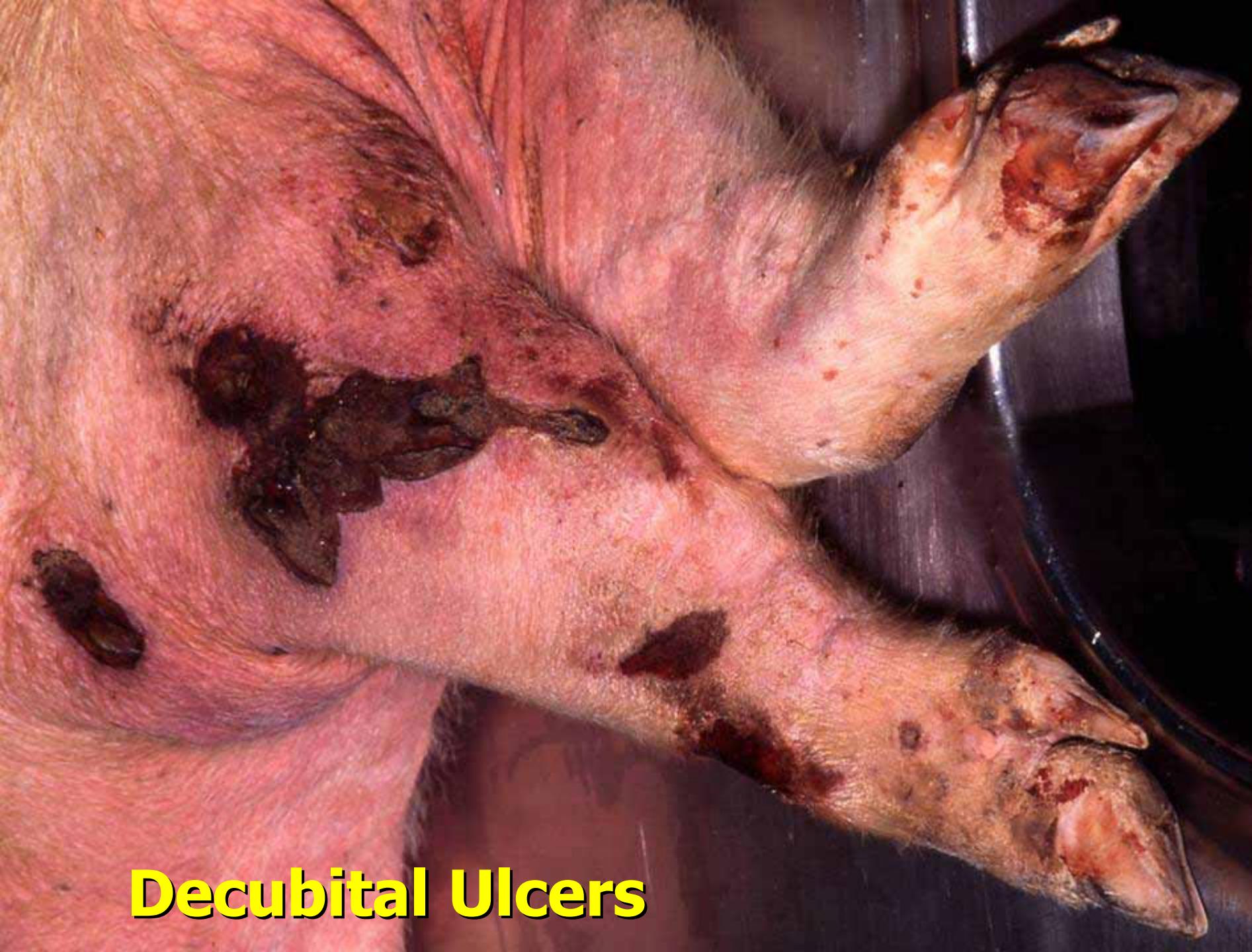
- Bacterial arthritis
  - *S. suis*
  - *H. parasuis*
  - *M. hyorhinis*
  - *S. equisimilis*
  - *E. rhusiopathiae*
  - *M. hyosynoviae*
  - *A. pyogenes*
- Degenerative arthritis
  - OCD
- Other
  - Fractures
  - Ruptured cruciates
  - Overgrown hooves
  - Hoof and heel abscesses



# Pododermal Abrasions



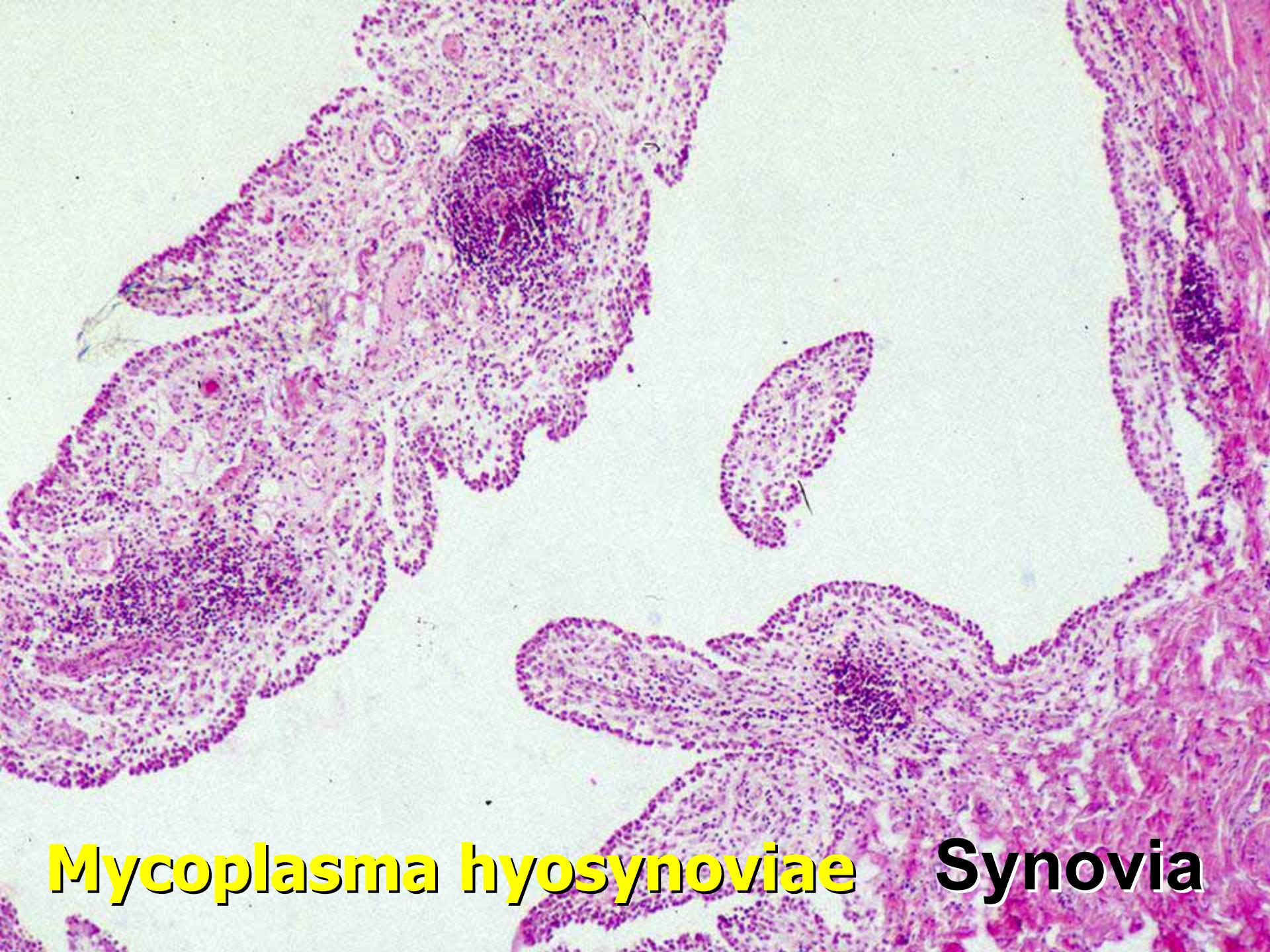
**Phalangeal Arthritis**



**Decubital Ulcers**



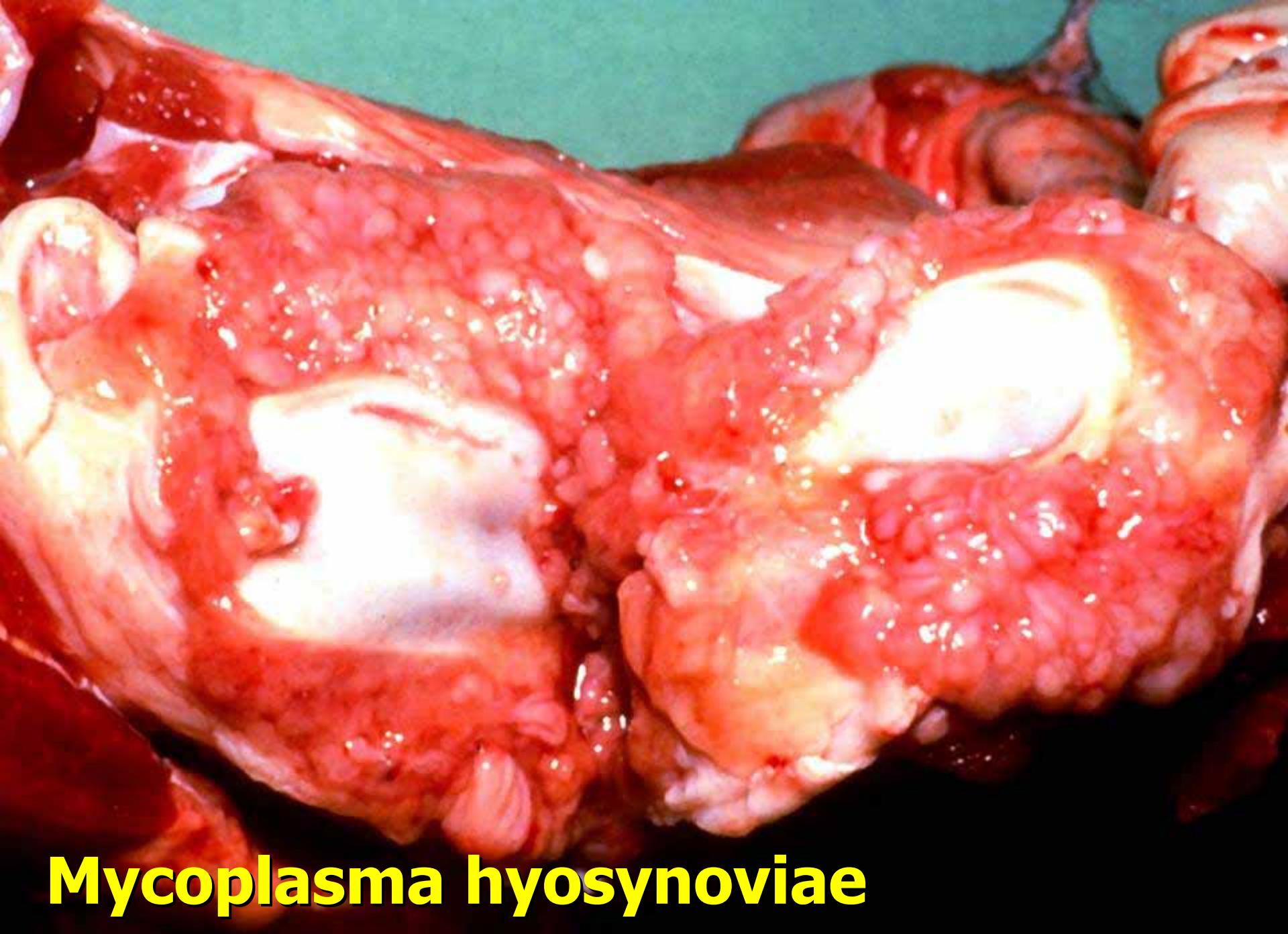
***Mycoplasma hyosynoviae***



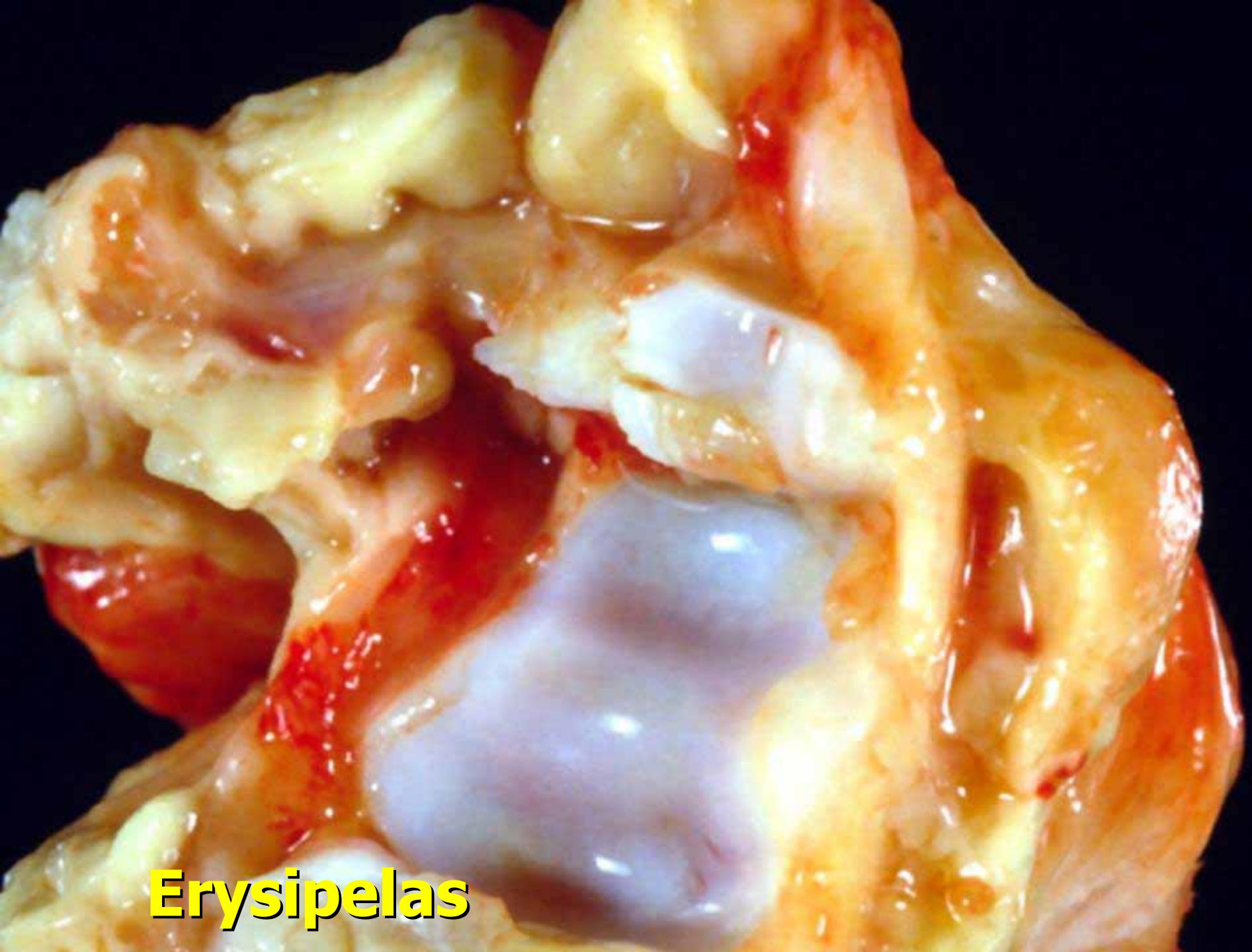
**Mycoplasma hyosynoviae**      **Synovia**

A light micrograph showing a dense infiltration of small, dark-staining, pleomorphic bacteria within a tissue section. The bacteria are scattered throughout the interstitium and appear to be associated with the lining of small vessels or cellular structures.

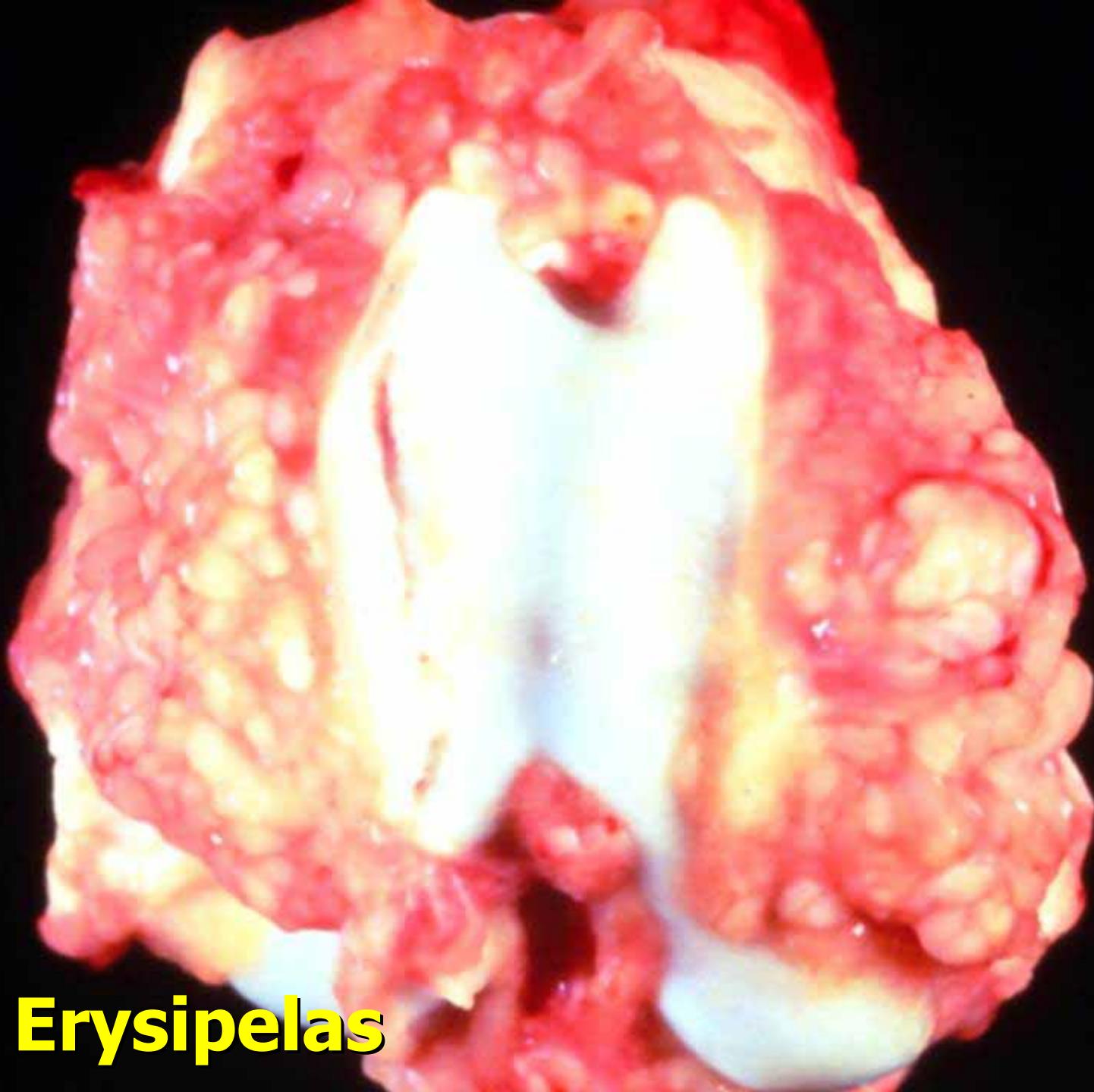
**Mycoplasma hyosynoviae**      **Synovia**



**Mycoplasma hyosynoviae**



**Erysipelas**



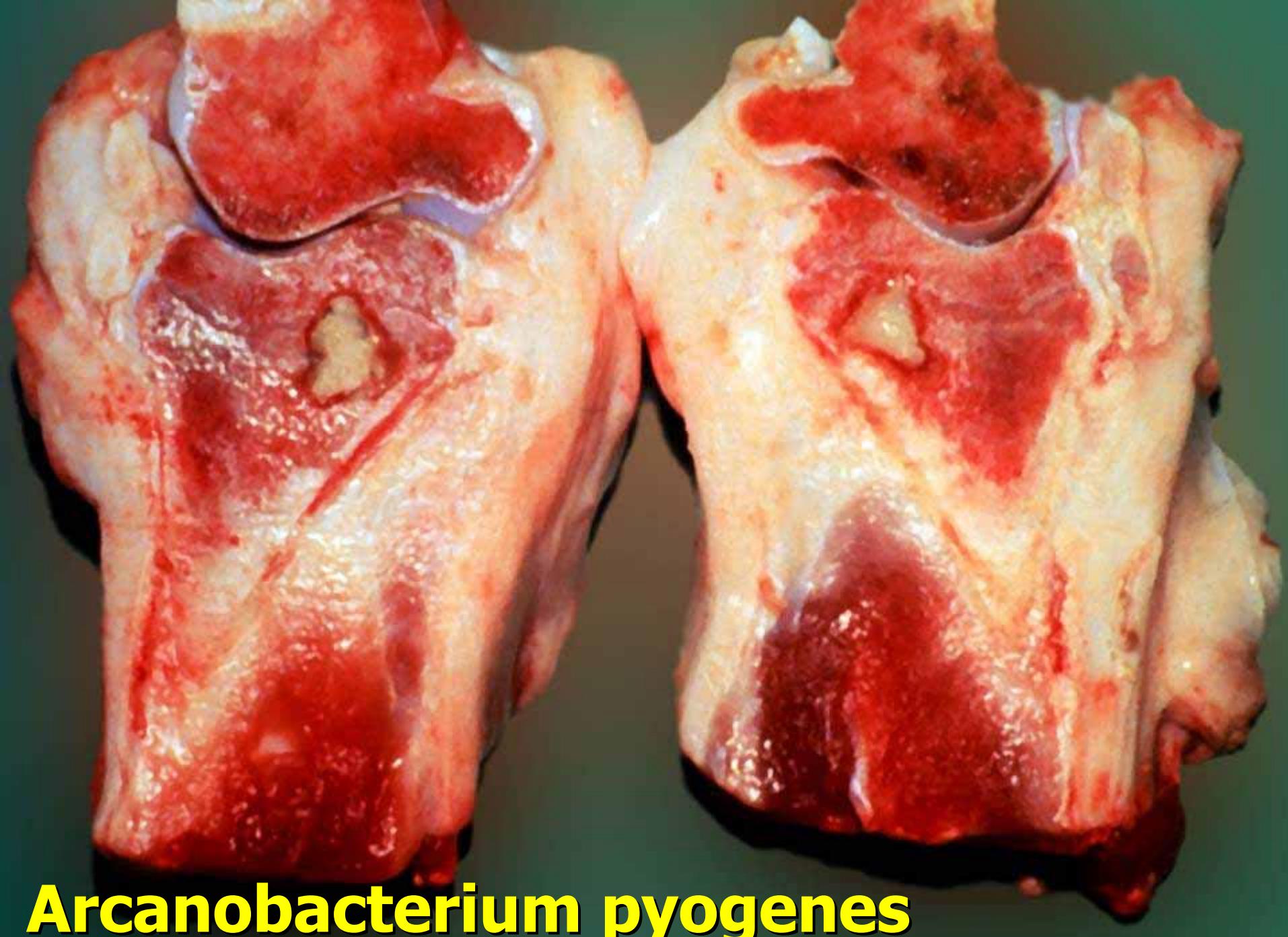
**Erysipelas**



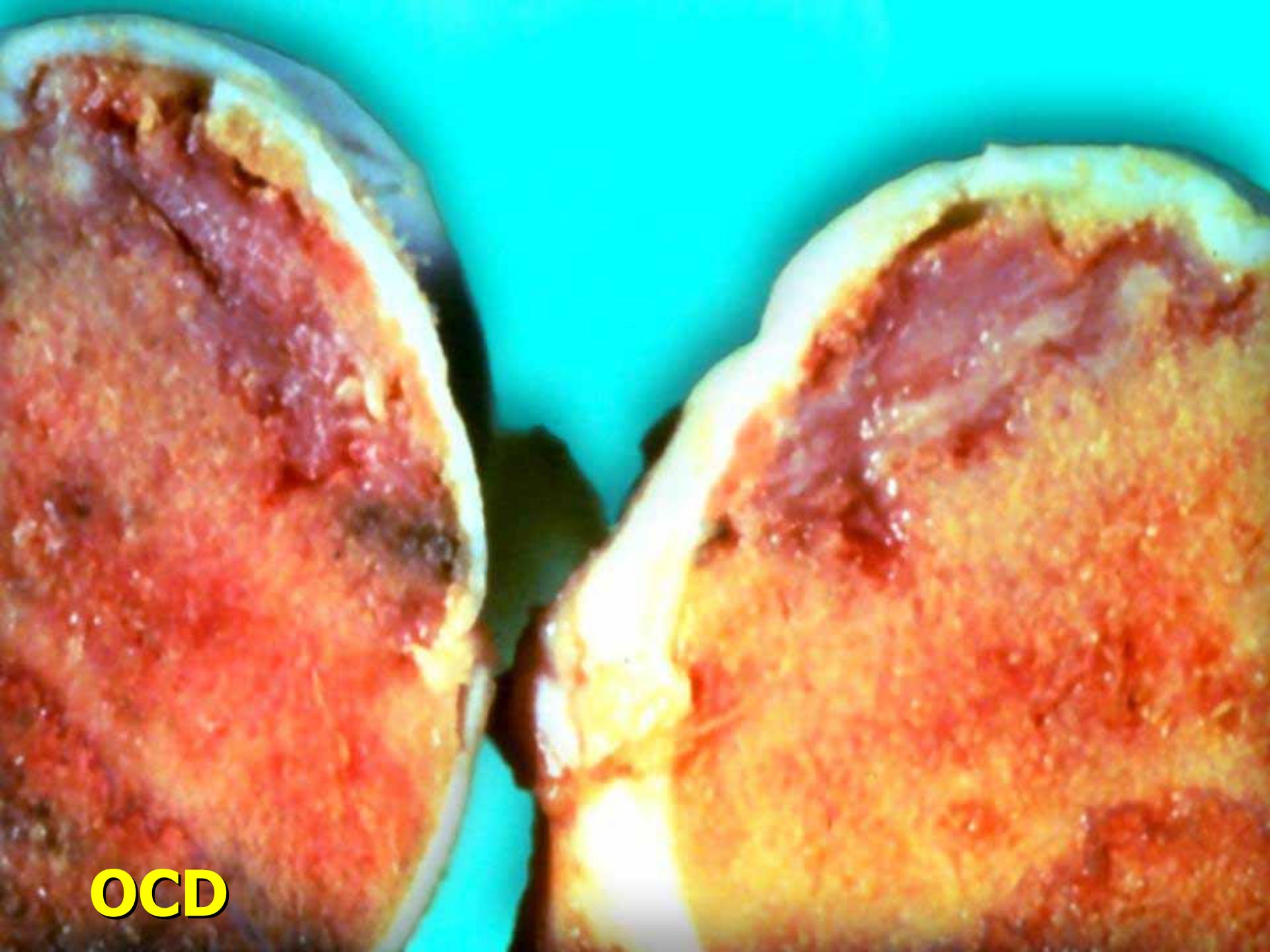
**Hemophilus parasuis**



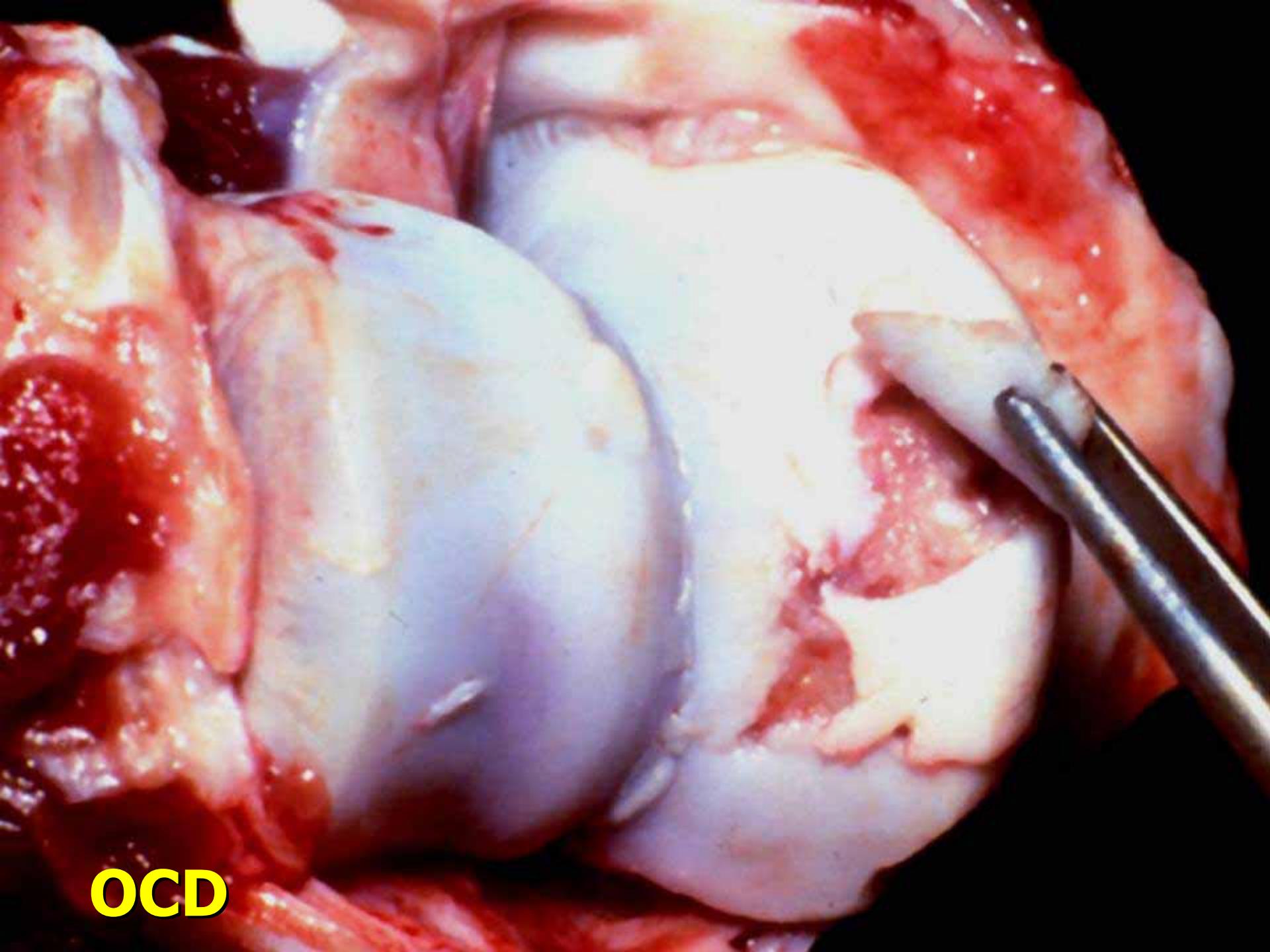
**Streptococcus equisimilis**



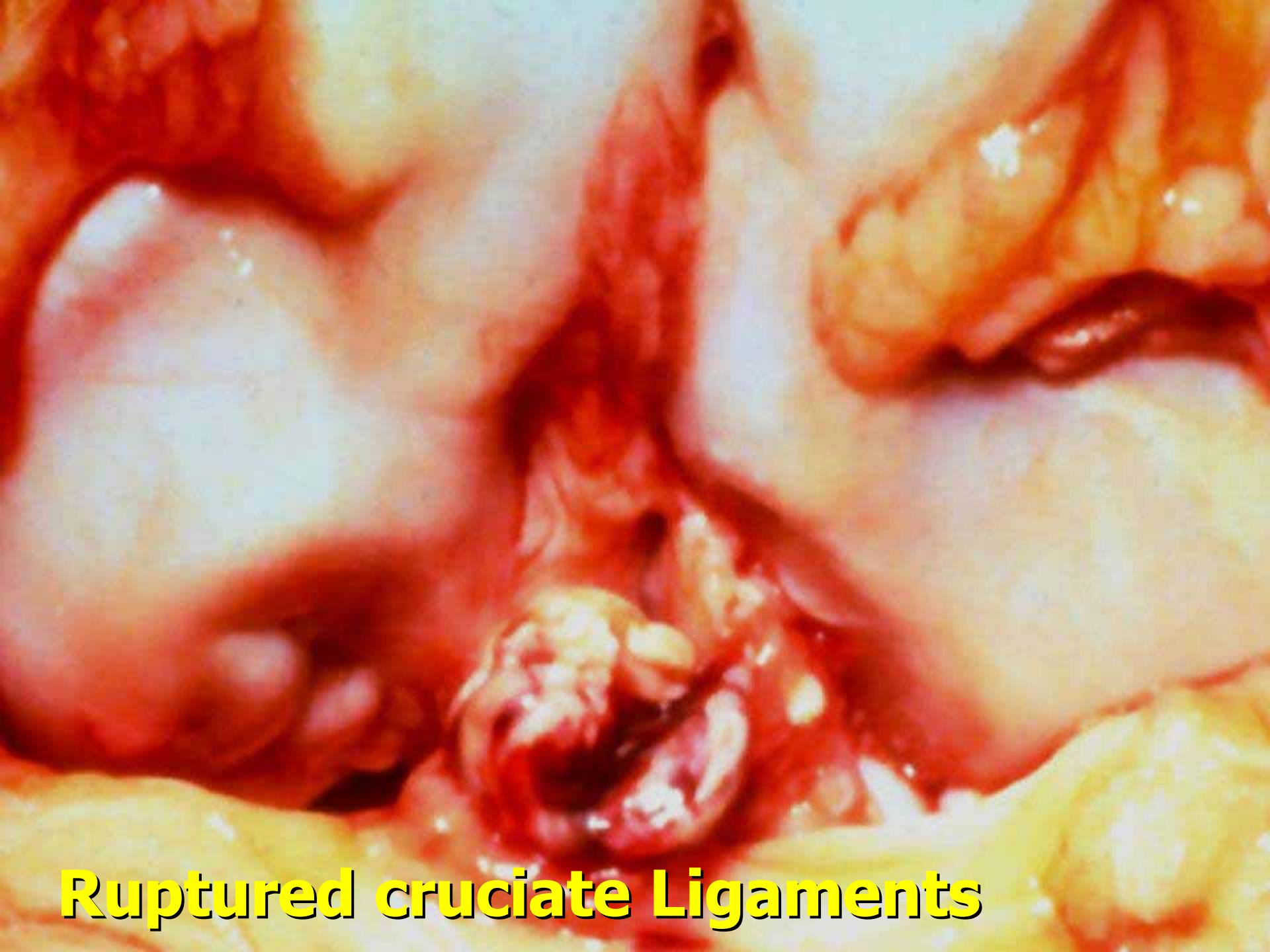
**Arcanobacterium pyogenes**

A close-up photograph of two peach halves. The left half shows significant internal damage, with a large, dark brown, irregularly shaped area where the flesh has been removed or is severely discolored. The right half shows a smaller, more localized area of damage, with a dark brown, roughly circular spot. Both halves have a yellowish-orange skin with some red mottling. The background is a solid teal color.

OCD



OCD



**Ruptured cruciate Ligaments**



**Hygroma**



# Anthrax



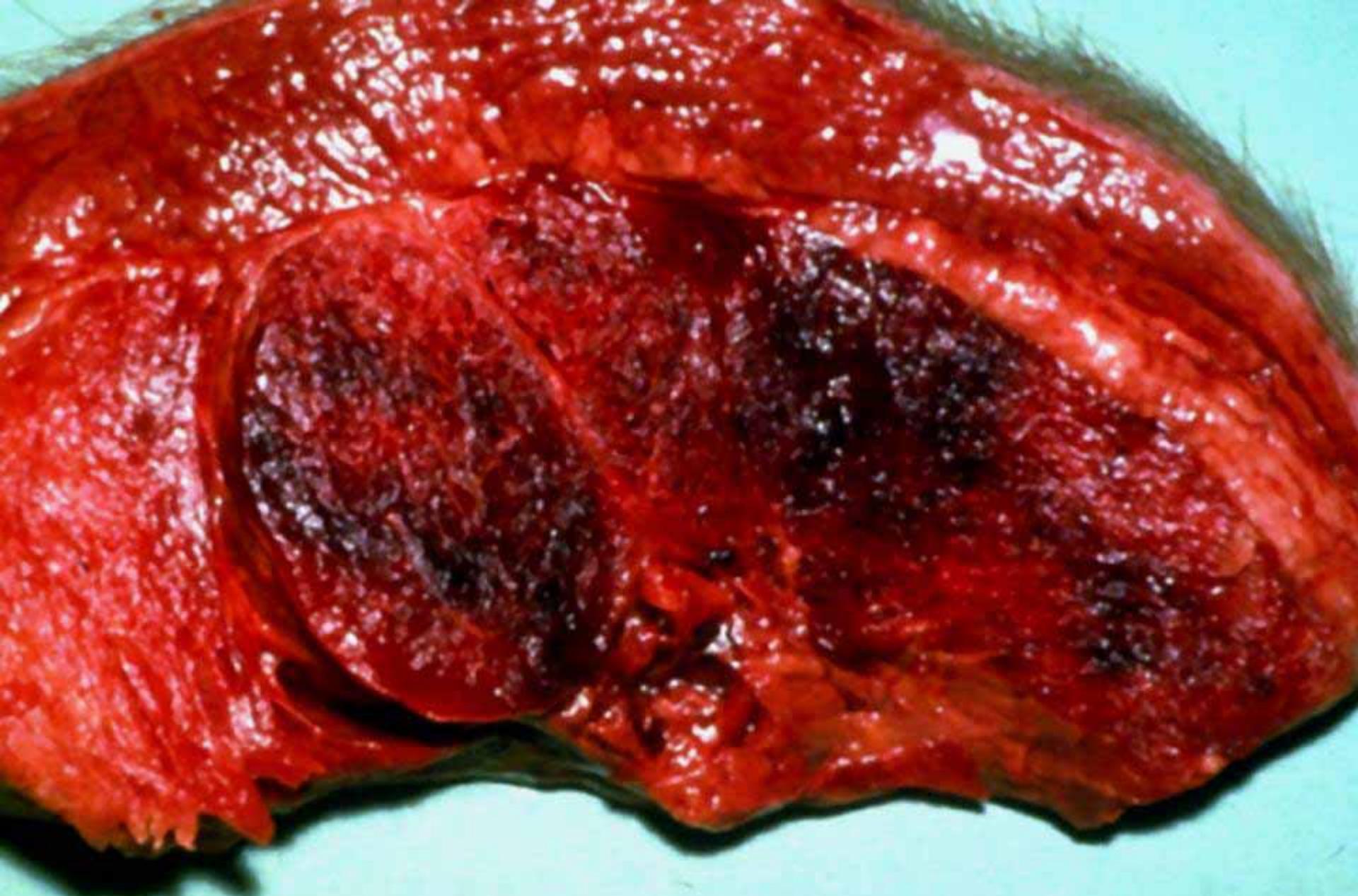
**Clostridium septicum**



**Clostridium septicum**



**Clostridium septicum**



**Clostridium septicum**



**Clostridium septicum**

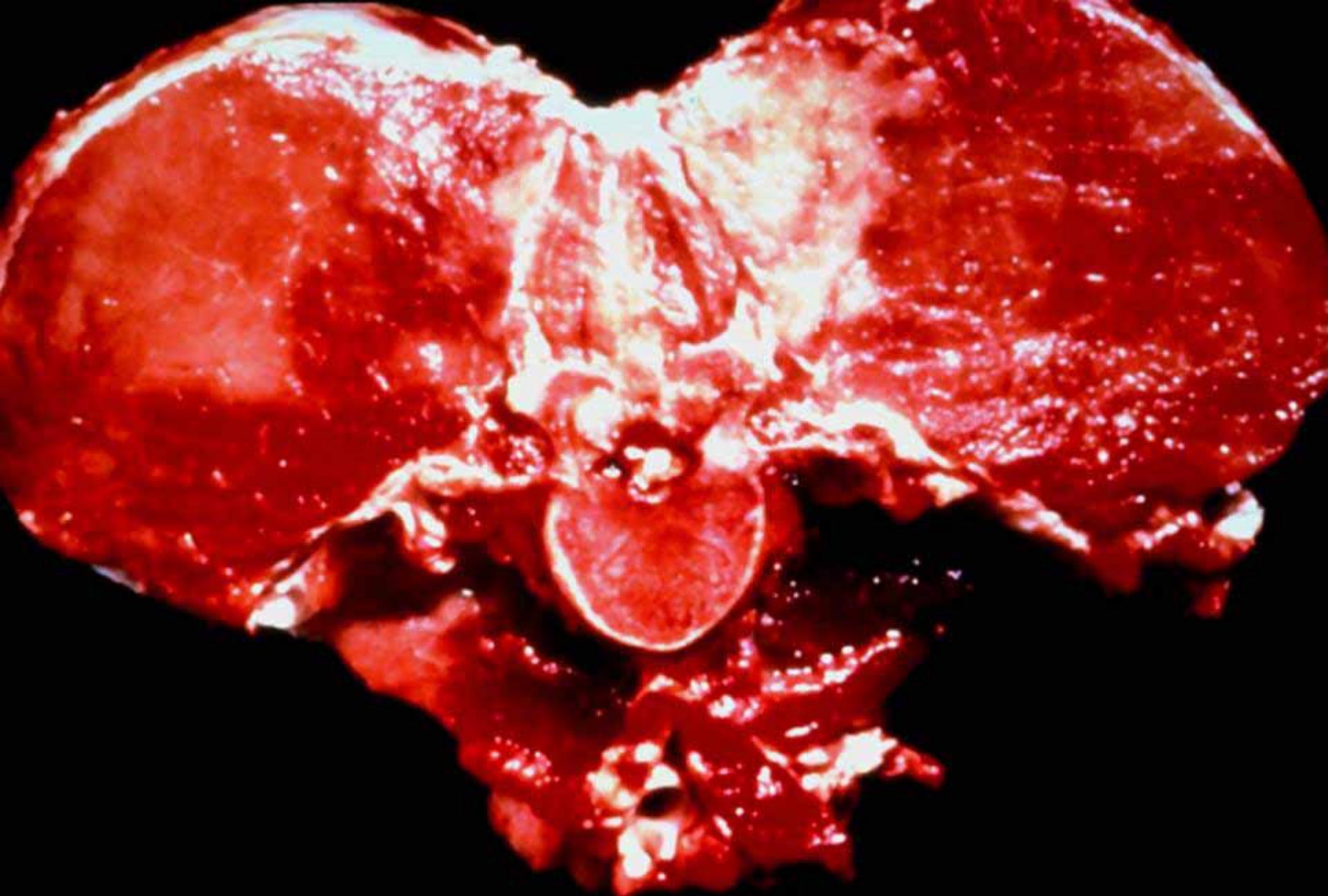
**Muscle**

# **Porcine Stress Syndrome**

- halothane gene (napole gene - Hampshire)
- DNA test
- single (?) recessive gene
- calcium transport deficit
- pig becomes red, splotchy → dies
- hyperthermia, acidosis
- rapid post-mortem autolysis
- associated with extreme muscling



## Porcine Stress Syndrome



# Porcine Stress Syndrome



**Monensin Intoxication**



**Dumbo pig**