

**MJF COLLEGE OF VETERINARY AND ANIMAL SCIENCE,
CHOMU, JAIPUR**



DEPARTMENT OF VETERINARY PATHOLOGY



FMD

Foot and Mouth Diseases

- OIE-Listed disease

- Synonym :
 - Aphthous fever
 - Aftosa
 - Enzootic apthiae

- FMD is a highly contagious viral disease of cloven-hoofed species characterized by fever and vesicles and/or ulcer in the mouth and on the muzzle, teats, and feet

- FMD virus belongs to the genus **Aphthovirus** (aphtha = ulcer) in the **Picornaviridae** family
- Seven serotypes
 - **Serotype O** : India, Asia, Africa, Europe, America
 - **Serotype A** : India, Asia, Africa, Europe, America
 - **Serotype C** : India, Asia, Africa, Europe, America
 - **Serotype Asia 1** : India, Asia
 - **Serotype SAT 1** : Africa
 - **Serotype SAT 2** : Africa
 - **Serotype SAT 3** : Africa
- **Infection with any one serotype does not confer immunity against another**
- **Epitheliotropic Virus**

- Domesticated and wild cloven-hoofed animals
- Cattle, pigs, sheep, goats and water buffalo, camel
- Bison, waterbuck, wild boar, elephant, yak, llama and giraffe



Species	Host	Carrier
Sheep Goats	Maintenance	Pharyngeal tissue 4-6 months
Pigs	Amplifier	No
Cattle	Indicator	Pharyngeal tissue 6-24 months

- Contact between susceptible and infected animals
- All secretions and excretions including semen and milk
- Respiratory aerosols
 - Proper temperature and humidity
- Direct contact
 - Vesicular fluid
 - Ingestion of infected animal parts
- Indirect contact via fomites
 - Boots, hands, clothing

- Entry of virus in body → Reach to pharynx and lung → Virus replication → Go in the blood → Viremia → dissemination to surface epithelium → Infect Langerhans cells → Infect squamous epithelium → Replication in stratum spinosum → degeneration, lysis and necrosis of the cells → **Formation of epidermal vesicles (hallmark of the disease)** → coalesce to produce bullae (5-6 cm) → Rapture in 12-14 hours → Ulcer formation → Secondary infection or Regeneration in 2 weeks

- Incubation period: 2 to 14 days
- Fever of up to 106°F (41°C)
- Excessive salivation
- Smacking (opening and closing) of the lips and tongue
- **Vesicles and/or ulcer** on the tongue, dental pad, gums, lips, and on the coronary band and interdigital cleft of the feet, teats and udder
- Young calves, lambs, kids, and piglets died without showing any vesicles



- **Single or multiple, fluid-filled vesicles or bullae or ulcer from 2 mm to 10 cm in diameter**
- **Ulcer** on the tongue, dental pad, gums, lips, and on the coronary band and interdigital cleft of the feet, teats and udder
- **Secondary bacterial infection may be seen**
- **Young calves, lambs, kids, and piglets died with "Tiger heart" myocardial degeneration and necrosis can cause gray or yellow streaking in the myocardium; known as "tiger heart" lesions**





















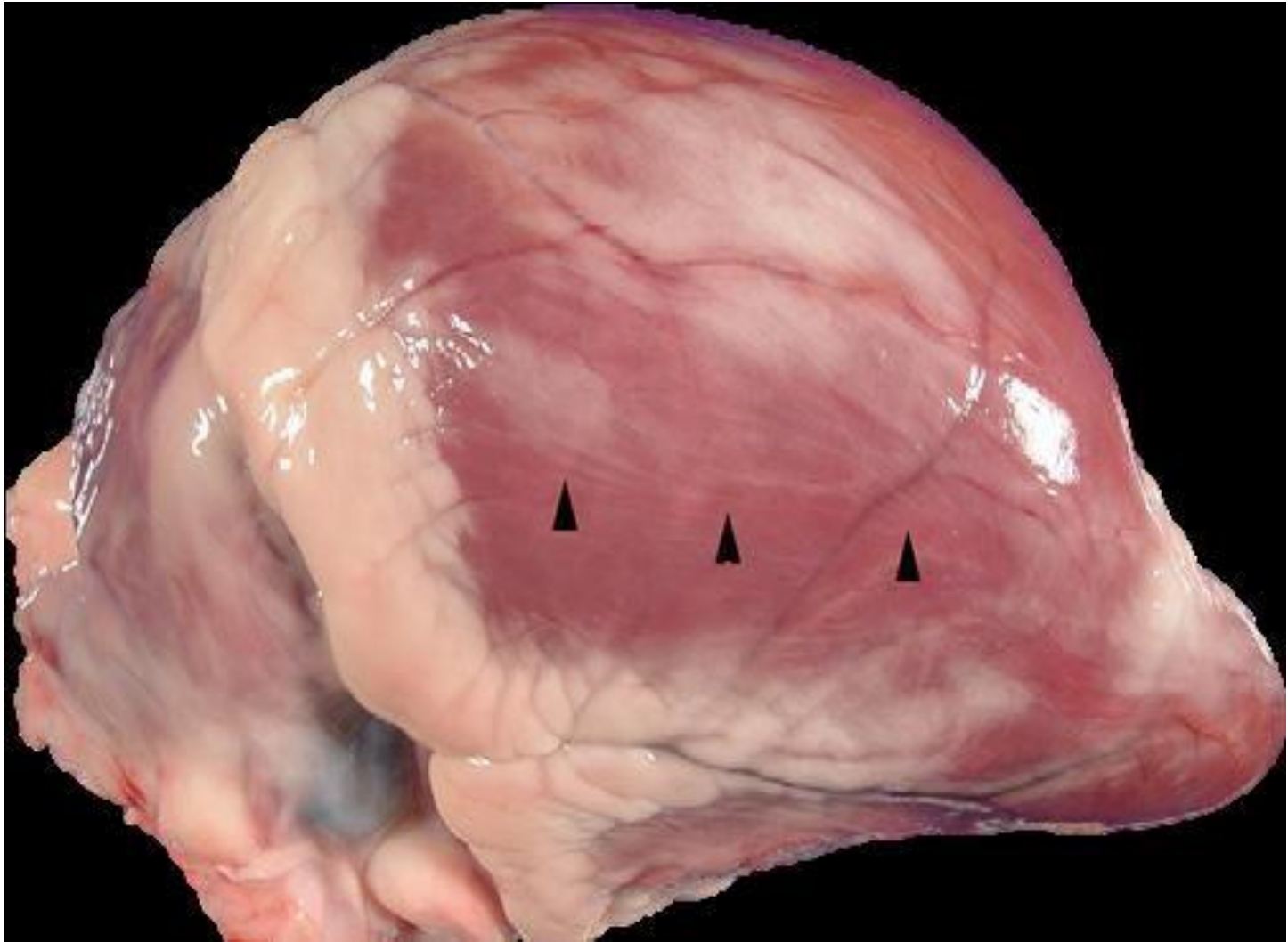




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- **Early stages** – Balloon degeneration of cells in the middle of the stratum spinosum
- **Latter stage:** Necrosis, edema fluid containing bits of fibrin accumulates between the cells and separates them.
- **Neutrophils infiltration**
- **Liquefactive necrosis and accumulation of serum and leukocytes produce vesicles**
- **Ulcer, erosion or suppurative inflammation**
- **Heart: Myocardial necrosis**

- Mastitis
- Panting - lack of heat tolerance
- Diabetes mellitus – Due to Pancrease inflammation
- Enteritis
- Dyspnea
- Anaemia
- Overgrowth of hair
- Endocrine disturbances – Repeat breeding
- Lameness

- Clinical signs
- Laboratory tests
 - Virus isolation
 - Enzyme-linked immunosorbent assay (ELISA)
 - Complement fixation test
 - Reverse transcription polymerase chain reaction (RT-PCR) tests
 - Serological tests
 - Virus neutralization tests

- **Antigenic heterogeneity and instability of virus**
 - Serotypes - >70 distinct strains within these
 - Spontaneously or occasionally develop
 - Immunity to one serotype does not provide any cross-protection to other serotypes
 - Cross-protection against other strains varies with their antigenic similarity
- Effective vaccine required high proportion of animals vaccinated two or more time per year
 - Any gaps in coverage leads to outbreaks



R

P
Rinderpest

- OIE-Listed disease
- Synonym :
 - Cattle Plague
- Rinderpest is an acute or subacute highly contagious disease of cattle, characterized by erosive or hemorrhagic lesions of all mucous membrane

- Classical form of rinderpest is one of the most lethal diseases of cattle
- In 1889 – kill 90% of cattle of sub-Saharan Africa
- In 1992, the Food and Agriculture Organization (FAO) of the United Nations began the Global Rinderpest Eradication Programme - vaccination campaigns and surveillance
- Between 2002 and 2011 there were no reported field cases

of rinderpest

- **In 2011 OIE - declaration of global freedom from rinderpest**
- **First animal pathogen eradicated from world**
- **Only one other virus, human smallpox, has ever been completely eliminated from nature**

- Rinderpest virus – **SS RNA**
- **Genus: Morbillivirus**
- **Family: Paramyxoviridae**
- **Only one serotype - effective vaccine**
- Other members of the family include **Peste des Petits Ruminants virus, Measles virus, Canine distemper**
- Relatively **fragile virus**

- Most cloven-hoofed animals (order Artiodactyla) are susceptible to RP
- Mainly **cattle** and **buffaloes**, but also reported in sheep, goat and pigs



- Direct contact
 - Nasal/ocular secretions
 - Feces, urine, saliva, and blood
- Contaminated food or water
- Indirect contact
 - Fomites

- Virus reach to nasopharyngeal mucosa → binds to host CD150 on activated T cells, B cells and dendritic cells of tonsils and regional lymph nodes → Virus replication → Go in the blood → Viremia → dissemination to nasal, oral and alimentary mucosal cells → Virus replication causing focal necrosis, erosion, and fibrinous exudation (diarrhea and dehydration) → Infect lymph nodes and GALT → destructions of lymphocytes → Immunodeficiency → Secondary bacterial infection → Death from severe dehydration and occasionally from secondary infections

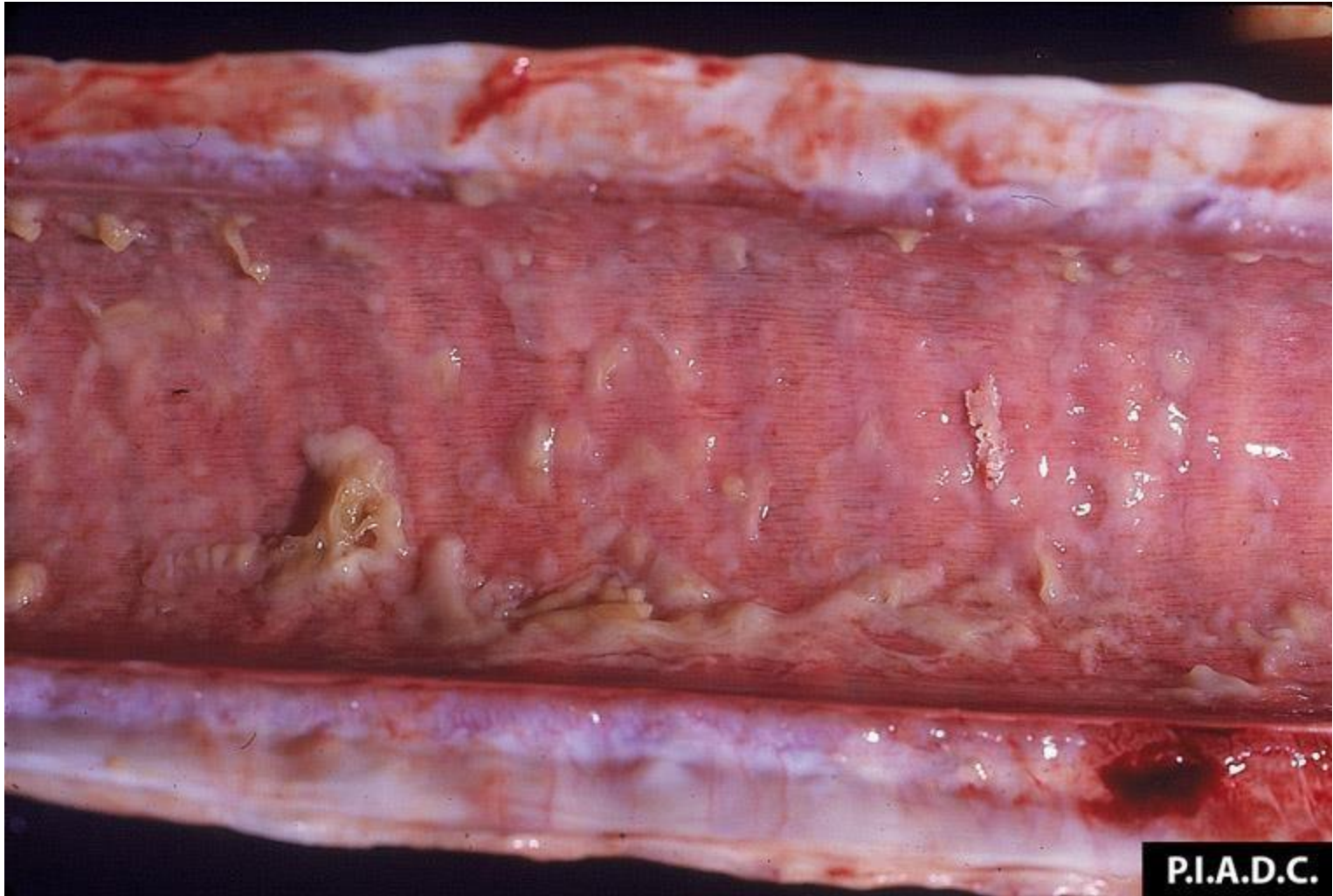
- **Incubation period: 1 to 2 weeks**
- **Prodromal phase** - Lasts approximately 3 day
 - **Acute high fever with anorexia, decreased milk yield, lacrimation**
- **Erosive phases**
 - **Necrotic epithelium of oral cavity visible**
 - **Focal erosions and ulcers of the upper GI and respiratory tracts**
- **Diarrhetic phase** - develops 1–2 days after the onset of mouth lesions - **'Shooting diarrhoea'**
 - **Severe bloody diarrhea, prostration, dehydration, shock, death**
- **Profound leukopenia, hemoconcentration, hypoproteinemia, and hypochloremia**

- Dehydrated, soiled, fetid carcass
- Focal erosions and ulcers of the upper GI and respiratory tracts
- First lesions on inner surface of lower lip, adjacent gum, cheeks, ventral
- ~~Esophagus~~ affects rumen, reticulum
- Erosions, ulcers, edema of abomasum
- Hemorrhagic, necrotic, edematous Peyer's patches
- Hemorrhage and congestion of cecum, colon, rectum (zebra
- ~~Stomach~~ Stomach), swelling and erosion of vulval and vaginal mucosa



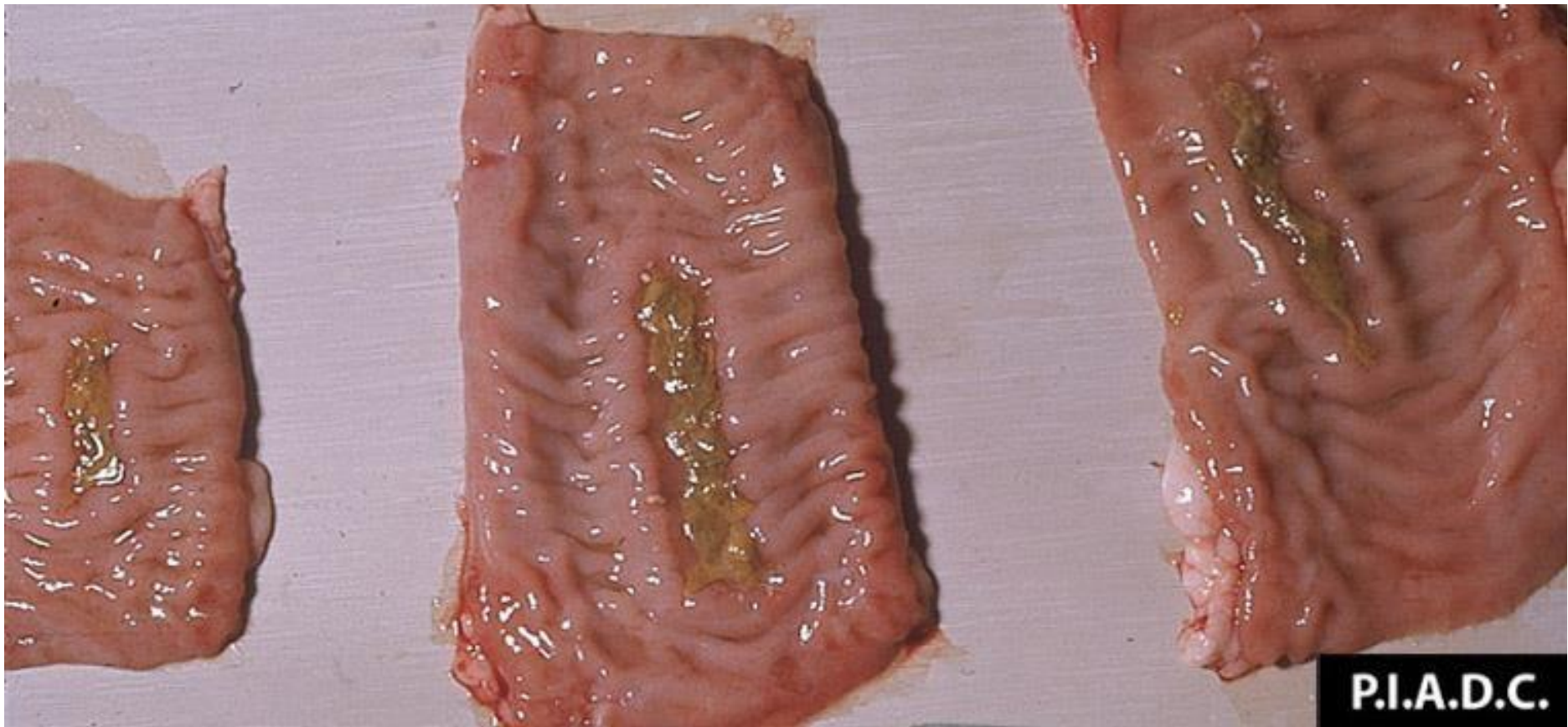
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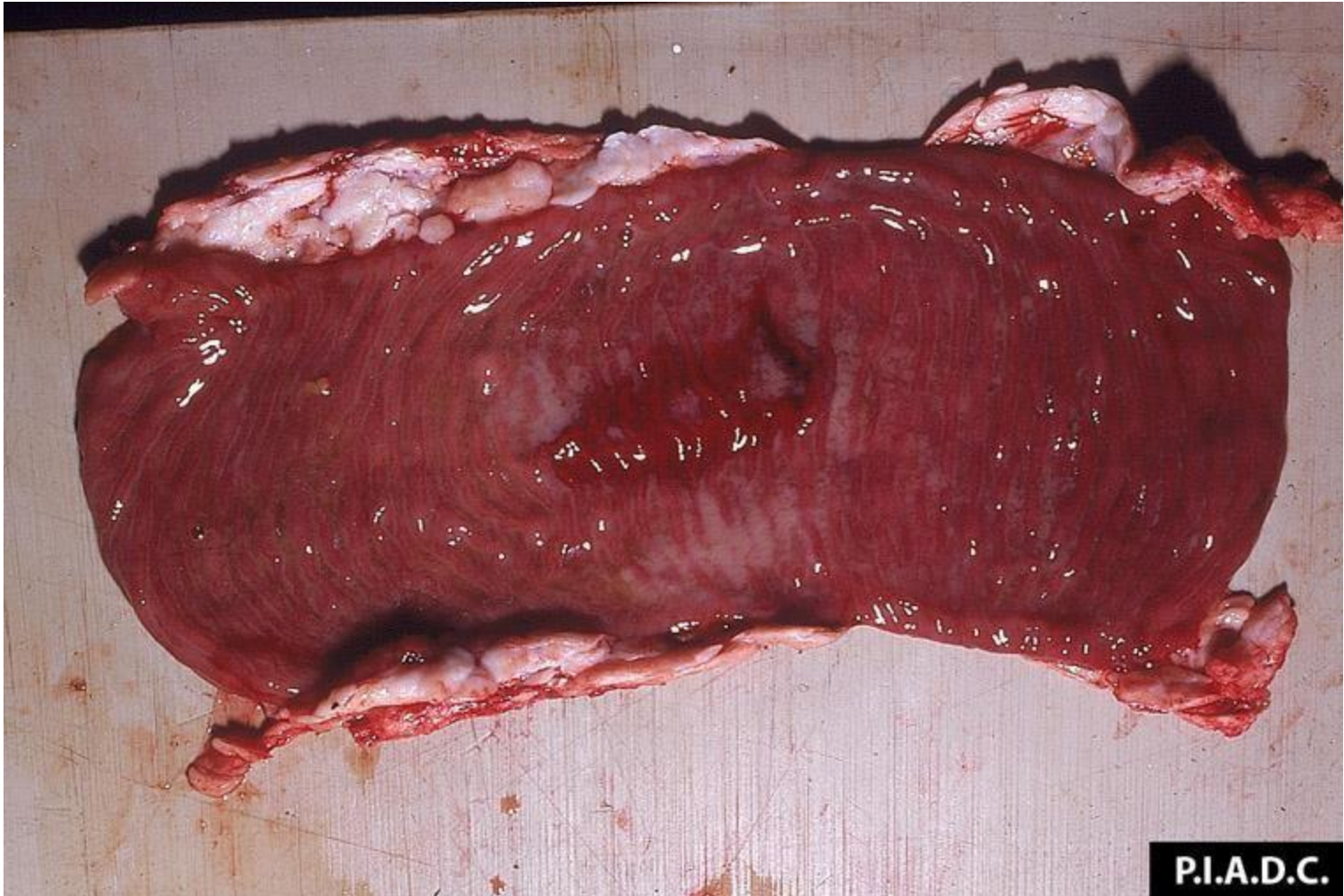


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- Lymphoid necrosis with loss of mature lymphocytes and replacement by plasma cells and macrophages
- Focal mucosal necrosis just above basal layer, extending to the surface
- Necrosis of intestinal crypts with resultant erosions and
- Syncytia; intracytoplasmic and intranuclear eosinophilic inclusion bodies in infected epithelial cells
- Syncytia – Common in Oral mucosa than GIT
- Minimal inflammation

- Clinical signs
- Laboratory tests
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 - Agar gel immunodiffusion (AGID)
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Thank you