Microbial Diseases of the Oral Cavity

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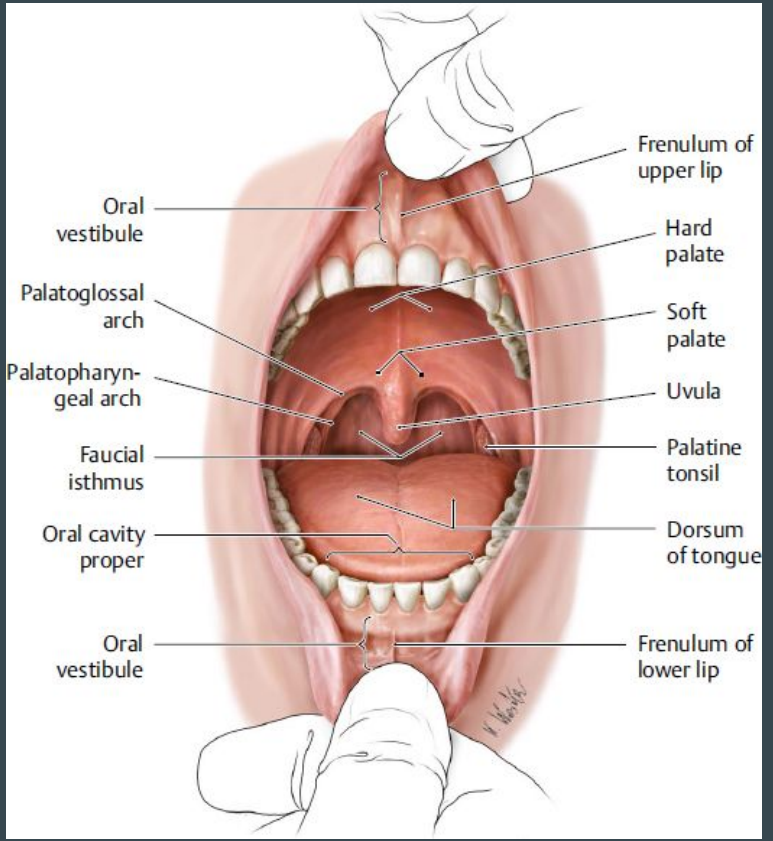
What is the Oral Cavity?

- Also referred to as the mouth forms the rostral opening of the digestive tract and contributes to critical functions including mastication, vocalization and respiration.
- It is divided into a smaller external portion, the vestibule and a larger internal component, the oral cavity proper.

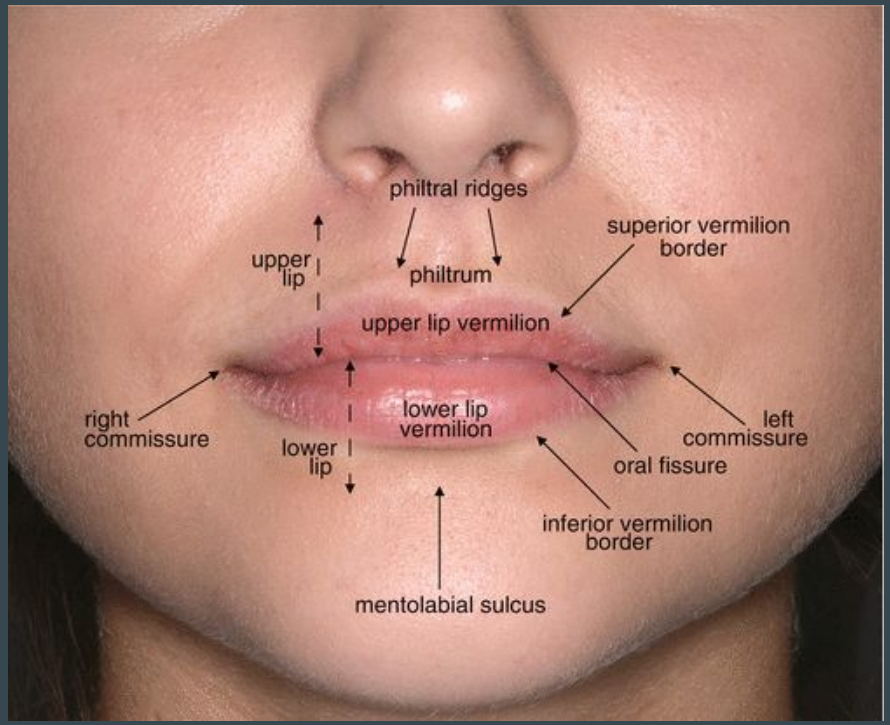
The Vestibule and the Oral Cavity Proper

- The vestibule forms as a cleft between the lips and cheeks externally and teeth internally.
- When teeth are occluded, the vestibule communicates with the oral cavity proper as well with the external environment through the oral fissure.
- The oral cavity proper is the space that includes everything behind the teeth.
    - The roof is formed by the hard palate and soft palate.
    - The floor is formed by the anterior ⅔ of the tongue .



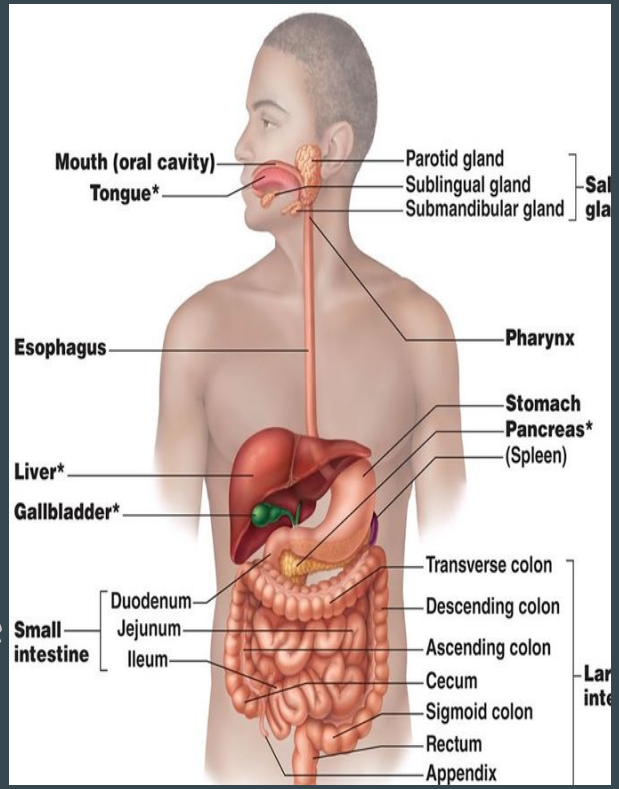
The Fissure and Lips

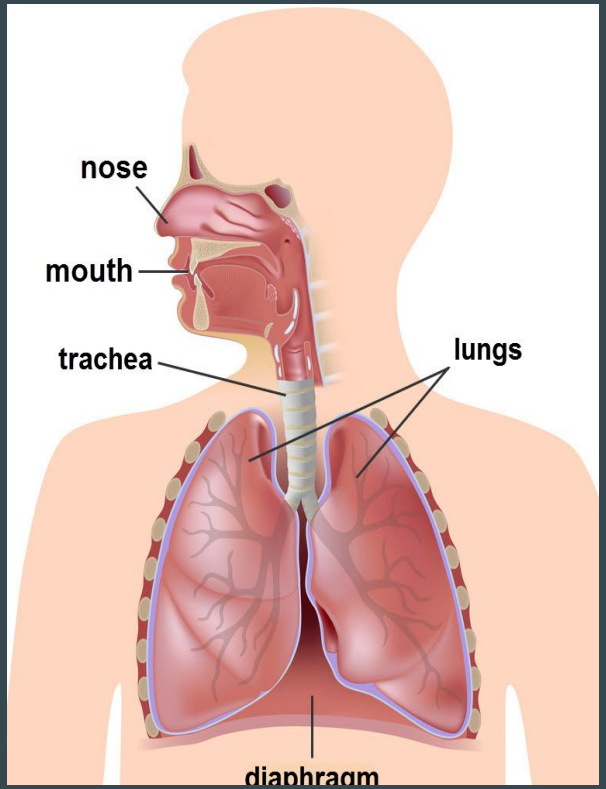
- The fissure is formed by the free borders of the upper and lower lips that join each other in the corners of the mouth or commissures.
- The lips also called labialis are mobile muscle fibrous folds that meet laterally to form the cephalometric point, cheilion.



The Importance of the Oral Cavity

- It is a major gateway to the human body.
- The food we intake goes through our mouth and is masticated and mixed with saliva on its way to the stomach and intestinal tract.
- Additionally, the air we breathe passes through the nose and mouth to the trachea and lungs.





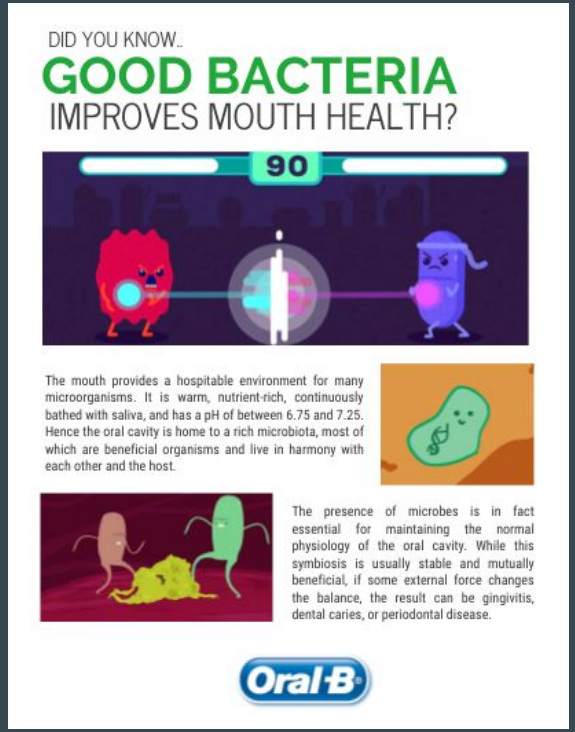
Microorganisms and the Oral Cavity

- Microorganisms inhabiting one region of the oral cavity have a significant probability of spreading on contiguous epithelial surfaces to neighboring sites.
- Microorganisms emanating from the mouth have been shown to cause numerous oral infectious diseases like
  - Tooth decay
  - Periodontitis
  - Alveolar osteitis
  - Tonsillitis
  - Endodontic infections
  - Cancer

- Moreover, scientific evidence is amassing that several systemic diseases such as cardiovascular disease, preterm birth, pneumonia, diabetes and stroke is linked to bacteria within the oral cavity.

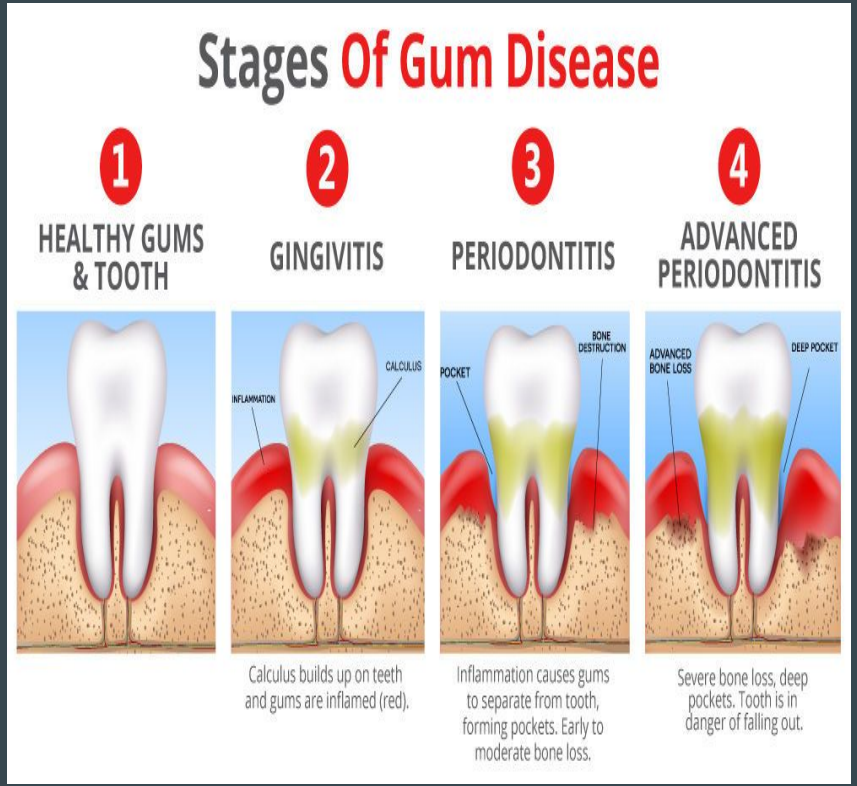
Are the Microorganisms in the Oral Cavity Beneficial?

- Interaction of variable oral microorganisms found within the oral cavity helps the human body against invasion of undesirable stimulation outside.
- However, when there is an imbalance of microbial flora, there is occurrence of diseases such as
  - Dental caries
  - Oral mucosal diseases
  - Systemic diseases: This includes gastrointestinal and nervous systemic diseases.
- For this reason, oral microbes play an important role in the human microbial community and human health (Goa., et. al., 2018).



The Oral Microbiota and an Oral Disease

- The oral microbiota is associated to numerous oral disease and the major infectious pathologies of the buccal tissue are polymicrobial in nature.
- An oral disease that can occur in the mouth is periodontal disease.
  - Periodontal disease is a form of chronic inflammation that affects more than 80% of human adults.
  - It is a polymicrobial attack that leads to the destruction of the periodontal ligaments and supporting marrow that surrounds the teeth.

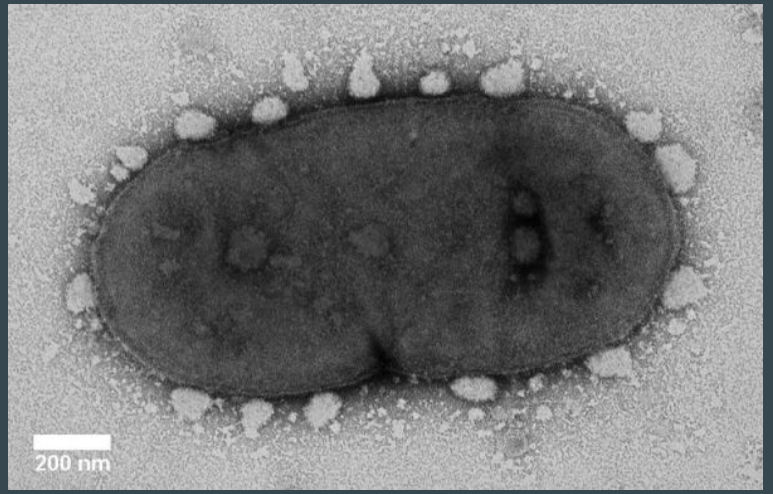


Main Microbial Pathogenic Agents involved in Oral diseases and Systemic Diseases

- *Porphyromonas gingivalis*
- *Tannerella forsythensis*
- *Treponema denticola*
- *Fusobacterium nucleatum*

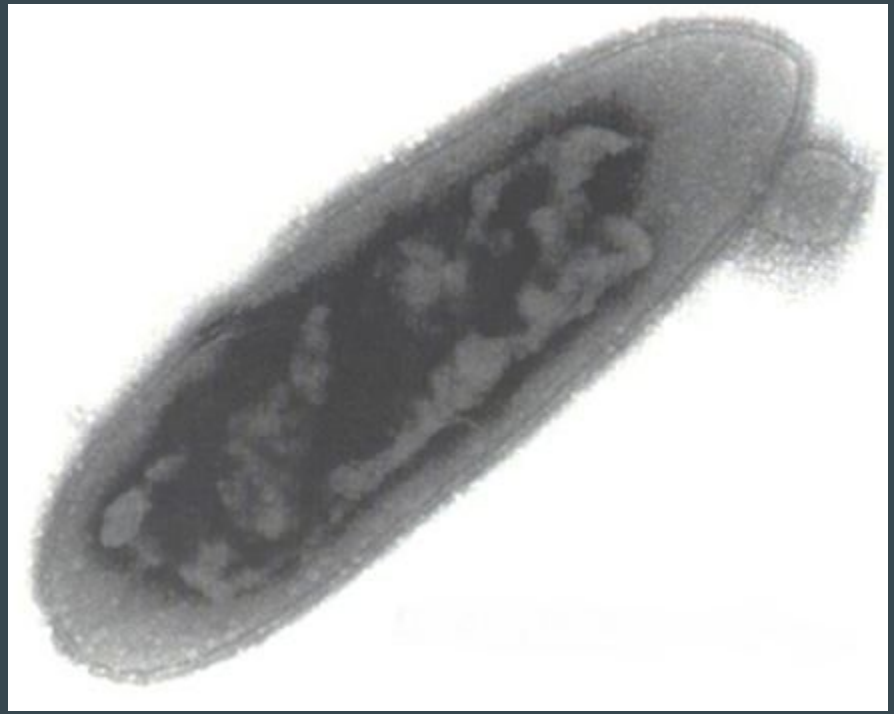
Porphyromonas gingivalis

- Is non-motile, gram-negative, obligately anaerobic rod bacterium that can invade eukaryotic cells via the action of several virulence mechanisms such as adhesion and inhibition of immune cells.
- Major etiologic agent that contributes to chronic periodontitis.
    - Evidence suggests that periodontitis may enhance conditions including cardiovascular diseases and diabetes (How, Song & Chan, 2016).
- It has also been found that it may “exacerbate rheumatoid arthritis” (How et al., 2016)
- Associated with esophagus cancer



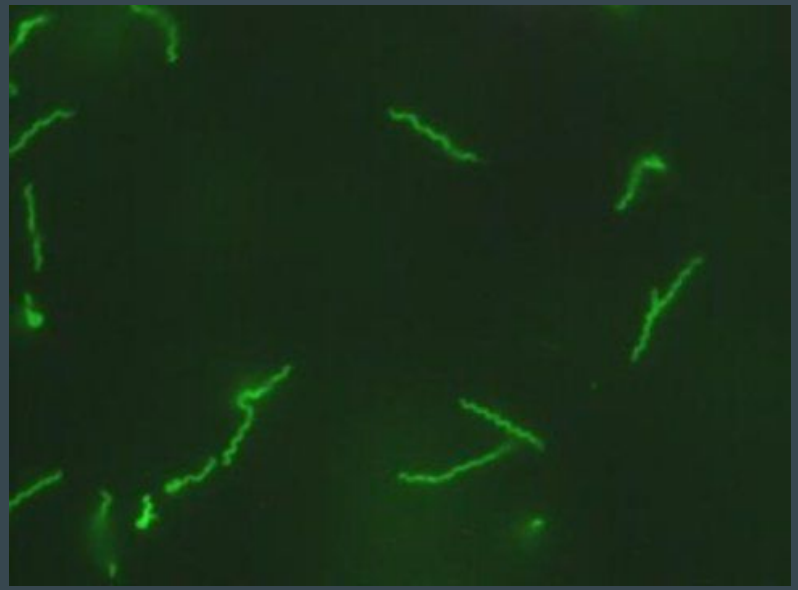
Tannerella forsythensis

- Gram-negative .
- Strictly anaerobic bacterium.
- Frequently found in periodontal pockets. Thus, it can cause periodontal disease.



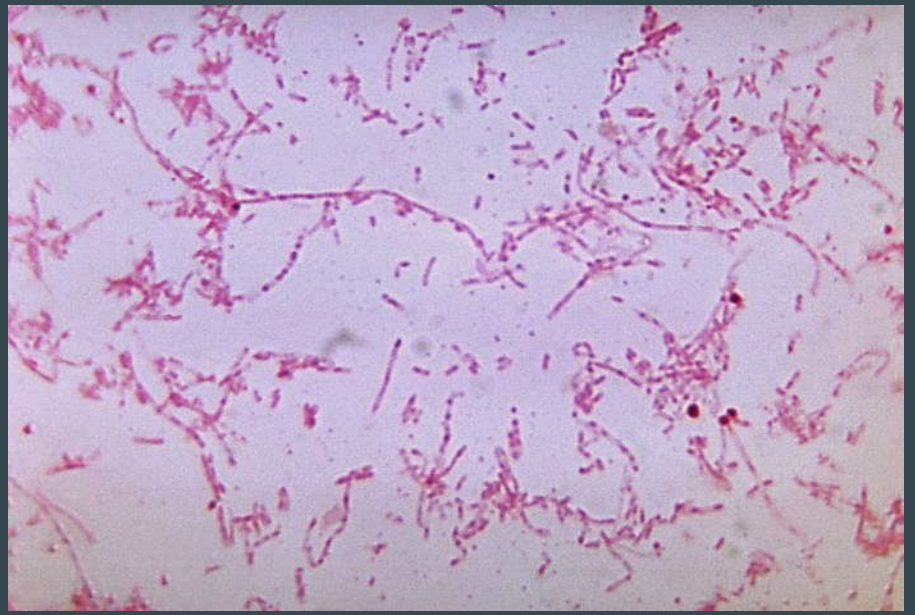
Treponema denticola

- Gram- negative
- Obligate anaerobic
- Motile and highly proteolytic spirochete bacterium
- Found to be closely associated with periodontal disease and has been detected in atherosclerosis
- In addition, has also been associated with chronic periodontitis, acute necrotizing ulcerative gingivitis, endodontic infections and acute dental abscesses.



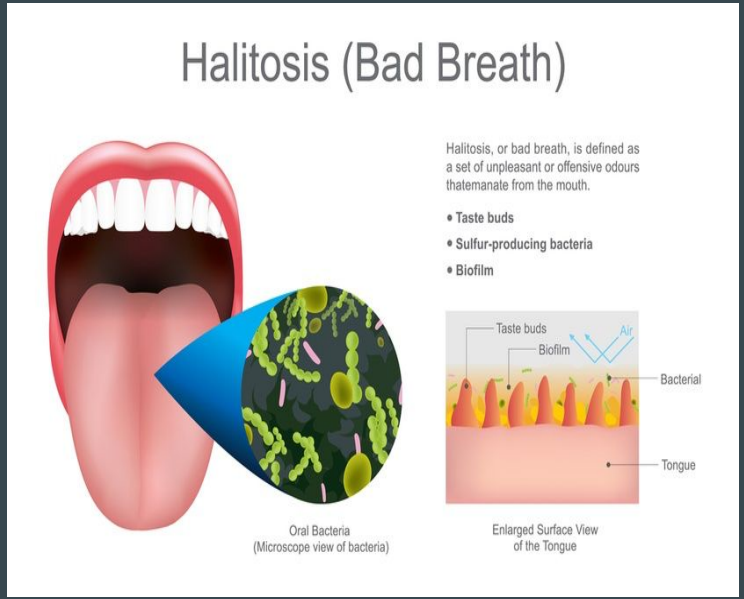
Fusobacterium nucleatum

- Gram-negative
- Anaerobic
- Has the ability to join with other bacteria species in oral cavity.
- Under disease conditions, an abundant of this bacteria is found.
- Causes
  - Periodontal disease
  - Gum disease
  - Halitosis
  - Associated with colon cancer



Oral Disease and Halitosis

- Halitosis = Oral Malodour
- Can affect people of all ages.
- Occurs because of the accumulation of food debris and plaque on the tooth and tongue.
    - Due to poor oral hygiene.
- Most notable is acute necrotizing ulcerative gingivitis.
- No cleaning teeth because of xerostomia can also cause malodour.
- Treated through improving oral hygiene and tooth cleaning.



Candida Albicans and Mouth Thrush

- Oral Thrush = Oral Candidiasis
- Condition where the fungus Candida albicans accumulates on your mouth.
- Normal organism, but can overgrow.
- Cause white lesions on tongue or inner cheeks. May be seen on the roof of mouth, gums, tonsils or back of throat.
- Some symptoms include redness, burning sensation, loss of taste and cottony feeling in mouth.
- More likely to occur in babies and older adults due to reduced immunity

HPV and Oral Cancer

- Difficult to discover
- Can be painless..
- HPV is the leading cause of oropharyngeal canc
  Primarily found in the tonsils, tonsillar crypt an
  base of the tongue.
- HPV said to cause 70% of oropharyngeal cancer
  the U.S.
- More males than females develop oropharyngea
  cancer
- Signs
  - Ulcer or sore not healing in 2-3 weeks..
  - Red, white, or black spot on soft tissue in mouth
  - Swelling or lump in mouth

Herpes and Oral Herpes Disease

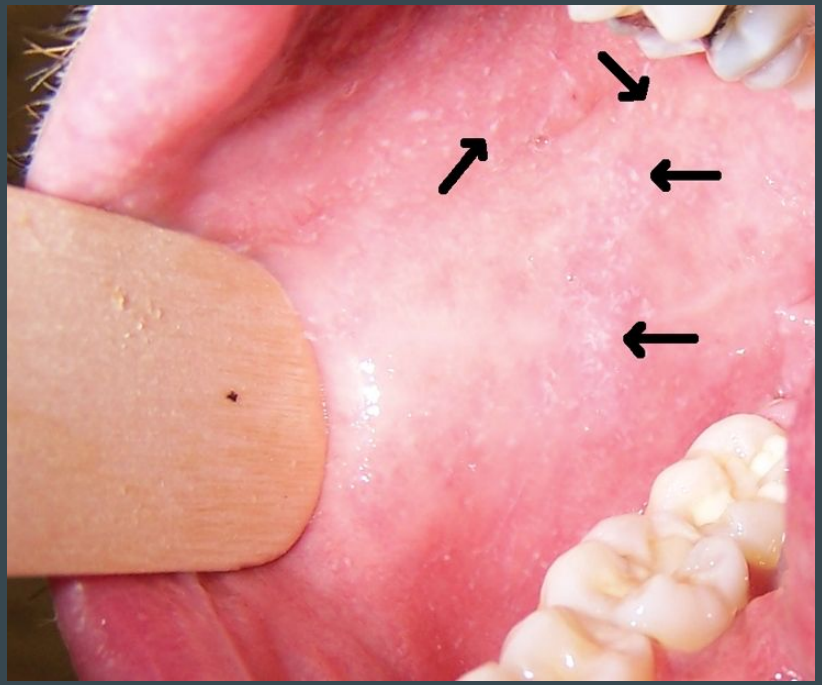
- Infection caused by herpes simplex virus.
- Virus cause painful sores which can be found on the lips, gums, tongue, roof of the mouth and in the cheeks.
- People contract this by touching infected saliva, mucous membranes or skin.
- Herpes simplex is a DNA virus. There are 2 subtypes
  - Type 1 which causes 80% of cases of oral herpes
  - Type 2

Coxsackievirus A16 and Hand Foot & Mouth Disease

- Are RNA viruses that may cause hand, foot, and mouth disease. Can also cause disease of the muscles, lungs and heart.
- Occurs mostly in children
- Causes fever, alaise, skin rash, sore throat and small blister.
- Takes about 10 days for it to resolve, but the coxsackievirus may leave after a couple more weeks.
- No treatment or vaccine for this.
- Is contagious

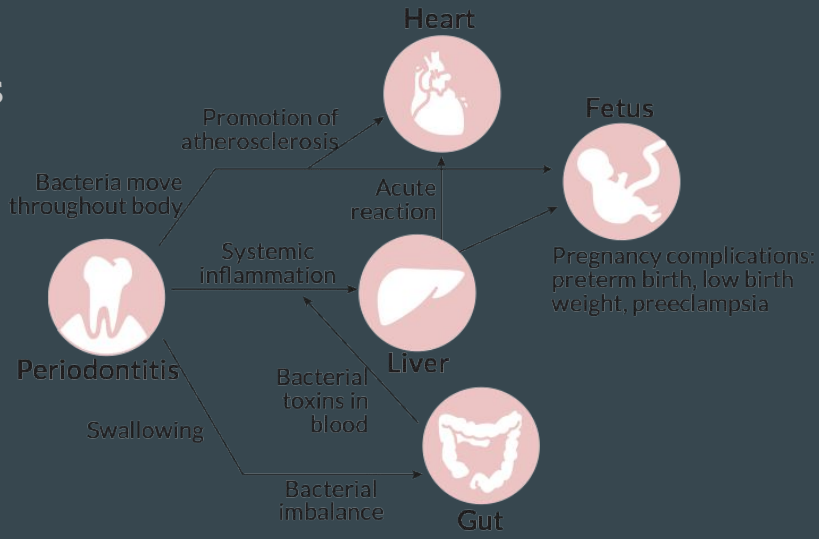
Koplik's Spots with Measles

- Also called Koplik's Sign
- Is an early sign of measles infection. Appear 2-3 days after symptoms begin as tiny white spots inside the mouth.
- Usually found on the inside of the cheek opposite the 1st and 2nd maxillary molars.



Correlation Between Oral Infections and Disease

- Many correlations exist between oral infections and diseases. Among these diseases are rheumatoid arthritis, cardiovascular diseases, pulmonary disease as well as liver abscesses.
- Other illnesses include gastrointestinal cancer, breast cancer, liver cirrhosis and diabetes.
- More recently, links with pregnancy, human immunodeficiency virus (HIV), human papillomaviruses (HPVs) and acquired immune deficiency syndrome (AIDS) have also been reported (Bars et. al., 2016)/



How to Avoid these Oral Infections and Diseases

- Oral management and good hygiene is necessary to reduce the occurrence of oral cavity diseases resulting from an imbalance in the oral microbiota.
- Daily brushing of teeth after meals can reduce the accumulation of plaque.
- Eating of sugary foods can accelerate bacteria growth in the cavity, and therefore a reduction in the intake of sugary foods can help reduce oral cavity related diseases.

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