Microbiology of Middle Ear Infections

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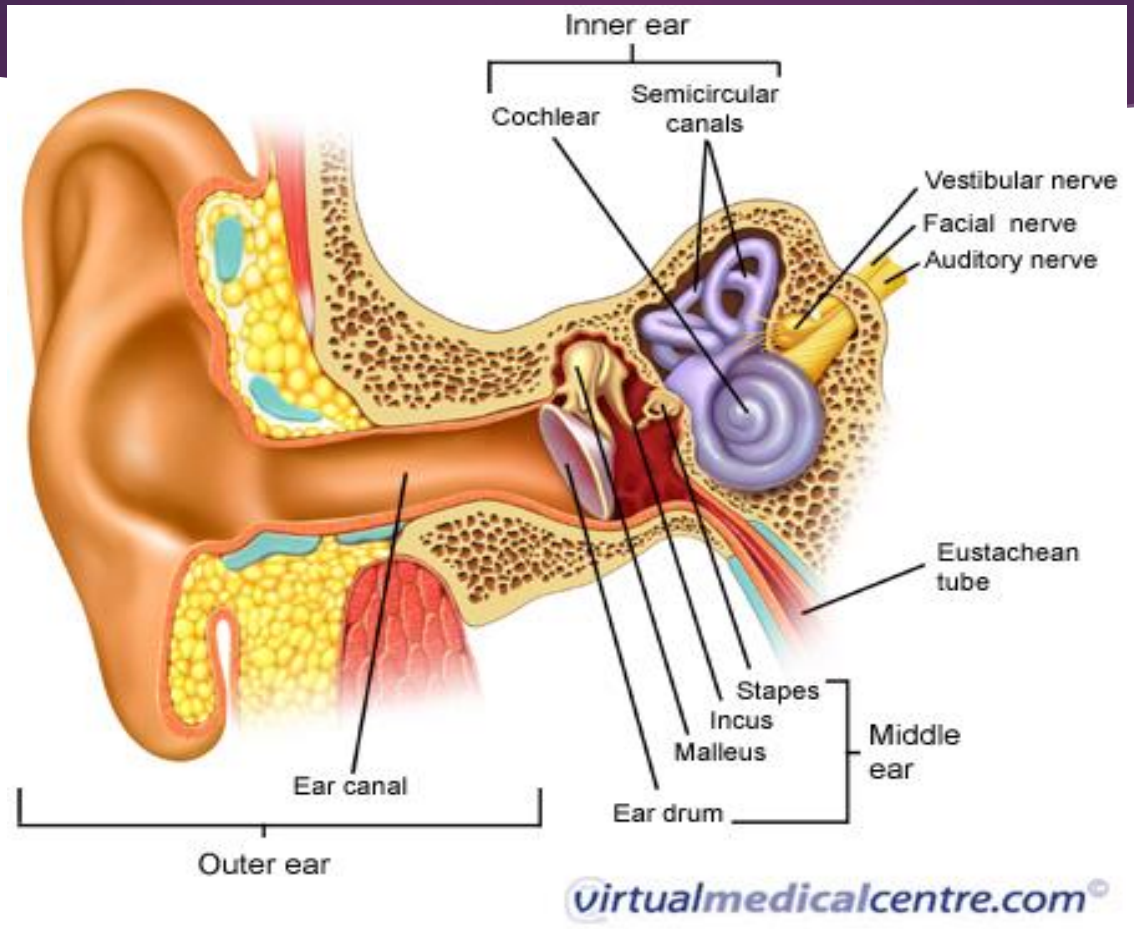
Objectives

- Recognize the definition and classification of otitis media
- Define the epidemiology of otitis media
- identify the pathogenesis and risk factors
- List the major symptoms and signs in the clinical presentation and major etiological agents
- identify the method of diagnosis and management of otitis media

Definitions

- Middle ear is the area between the tympanic membrane and the inner ear including the Eustachian tube.
- Otitis media (OM) is inflammation of the middle ear.

Anatomy of the Middle Ear



OM-Classification

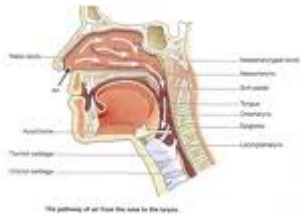
- Acute OM
- Secretory (*Serous*) OM
- Chronic OM

OM- Epidemiology

- Most common in infants 6 to 18 months of age (2/3 of cases). Improves with age, why ?
- The Eustachian Tube which vents the middle ear to the nasopharynx , is horizontal in infants, difficult to drain naturally, its surface is cartilage ,and lymphatic tissue lining is an extension of adenoidal tissue from back of the nose.
- Accompanied with viral URTI

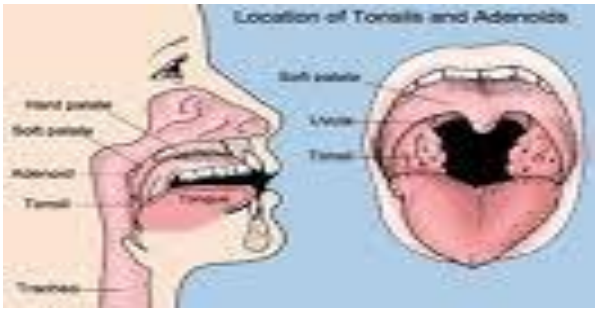
OM-Pathogenesis and Risk Factors

- URTI or allergic condition cause edema or inflammation of the tube.
- Functions of the tube (*ventilation, protection and clearance*) disturbed.
- Oxygen lost leading to negative pressure
- Pathogens enter from nasopharynx into middle ear.
- Colonization and infection result.



OM- Other risk factors

- Anatomic abnormalities
- Medical conditions such as Cleft palate ,obstruction due to adenoid or NG tube or malignancy, immune dysfunction.
- Exposure to pathogens from day care.
- Exposure to smoking.

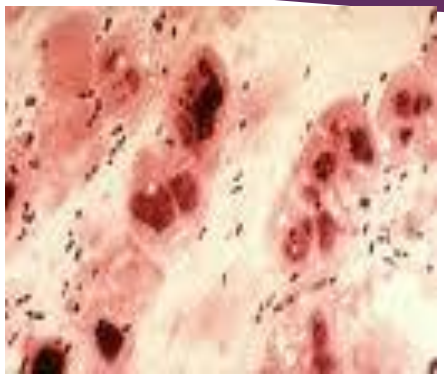


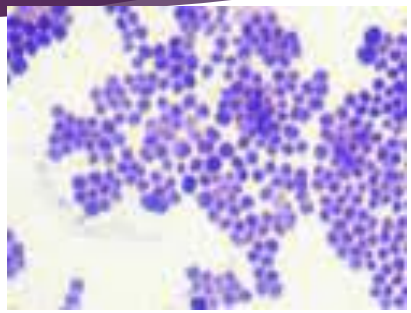
Images of acute OM

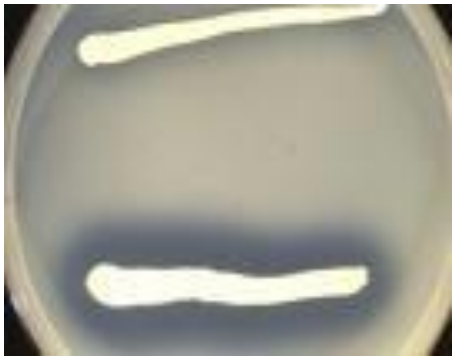
Images of chronic OM

Images of serous OM

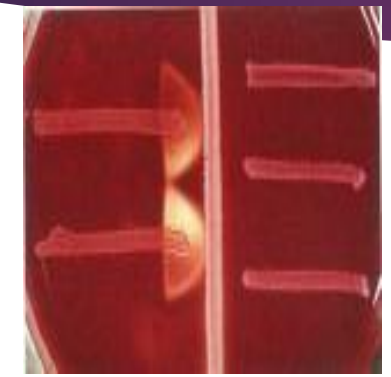
Microbiology of OM

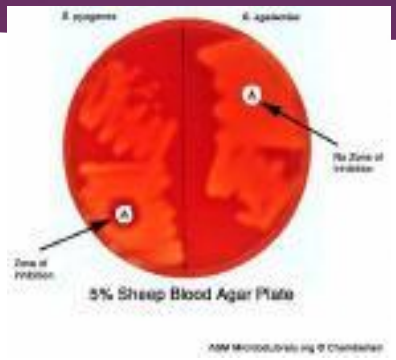


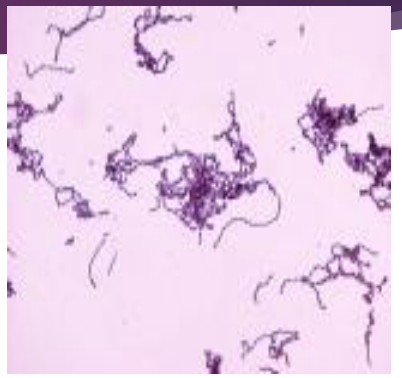


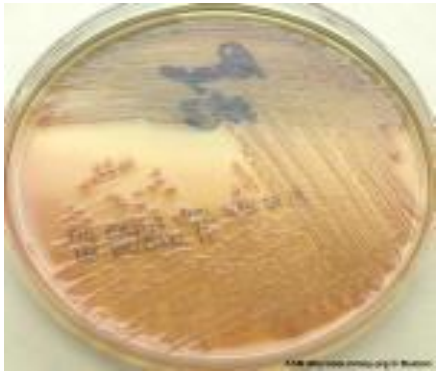


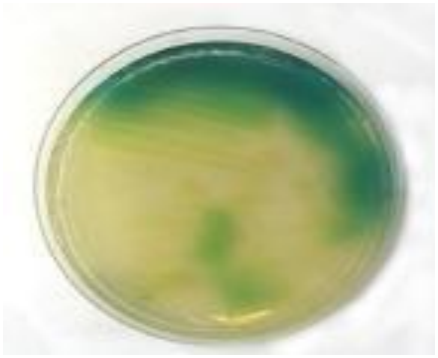
Microbiology of OM-continue

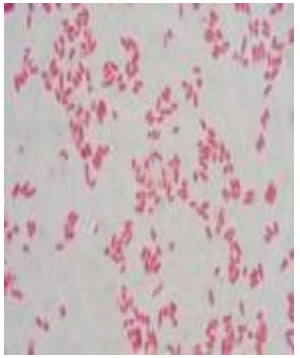












OM-Microbiology-Bacterial Causes

- **Acute OM**

  < 3months of age

  > 3 months of age

- *S.pneumoniae*,(40%) group *B Streptococcus*, *H.influenzae* (*non typable*) ,Gram negative bacteria and *P.aeruginosa*

- *S.pneumoniae*, *H.influenzae* ,others eg, *S.pyogenes*, *Moraxella catarrhalis*, *S.aureus*

OM-Microbiology-cont.

Chronic OM

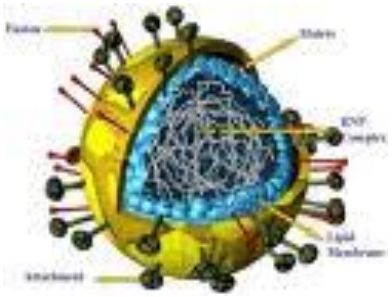
- Mixed flora in 40% of cases
- *P.aeruginosa*, *H.influenzae*, *S.aureus*, *Proteus* species, *K.pneumoniae*, *Moraxella catarrhalis*, anaerobic bacteria.

Serous OM

- Same as chronic OM, but
- Most of the effusions are sterile
- Few acute inflammatory cells

OM-Viral causes

- RSV -74% of viral isolates
- Rhinovirus
- Parainfluenza virus
- Influenza virus



Clinical presentation

- Acute OM

Mostly Bacterial ,often a complication of viral URTI

First 1-2 days:

Fever (39^{o} C), irritability, earache (otalgia)

, muffled nose.

Bulging tympanic membrane ,poor mobility and obstruction by fluid or inflammatory cells on otoscopic examination.

3-8 days:

Pus and ear exudate discharge spontaneously (otorrhea) and pain and fever begin to decrease.

2-4 weeks :

Healing phase, discharge dies up and hearing becomes normal.

Serous OM

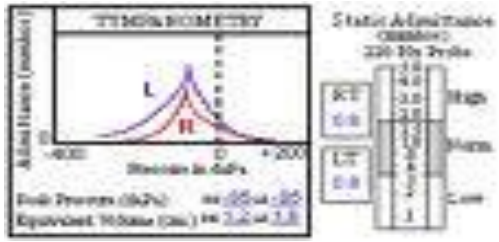
- Collection of fluid within the middle ear as a result of negative pressure produced by altered eustachian tube function.
- Represent a form of chronic OM or allergy-related inflammation
- Tends to be chronic , with non –purulent secretions.
- Cause hearing deficit.

Chronic OM

- Usually result from unresolved acute infection due to in adequate treatment or host factors that perpetuate the inflammatory process.
- Result in destruction of middle ear structures and significant risk of permanent hearing loss.

Diagnostic approaches of OM

- Clinical examination
- Tympanometry (detect presence of fluid)
- Gram stain and culture of aspirated fluid to determine the etiologic agents.



Management of OM

- Acute OM requires antimicrobial therapy & careful follow up.
- Antimicrobial usually empirical depending on the most likely bacterial pathogens, usually to cove *S.pneumonia* and *H.influenzae*.
- Drainage of exudate may be required.
- Chronic or serous OM need complex management, possibly surgical.

Complications

Extracranial

- Hearing loss
- Tympanic membrane perforation
- Mastoiditis
- Cholestatoma
- Labyrinthitis
- others

Intracranial

- Meningitis
- Extradural abscess
- Sudural empyema
- Brain abscess
- others