



MICROBIOLOGY OF MIDDLE EAR INFECTIONS

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Objectives

Upon completion of the lecture , students should be able to:

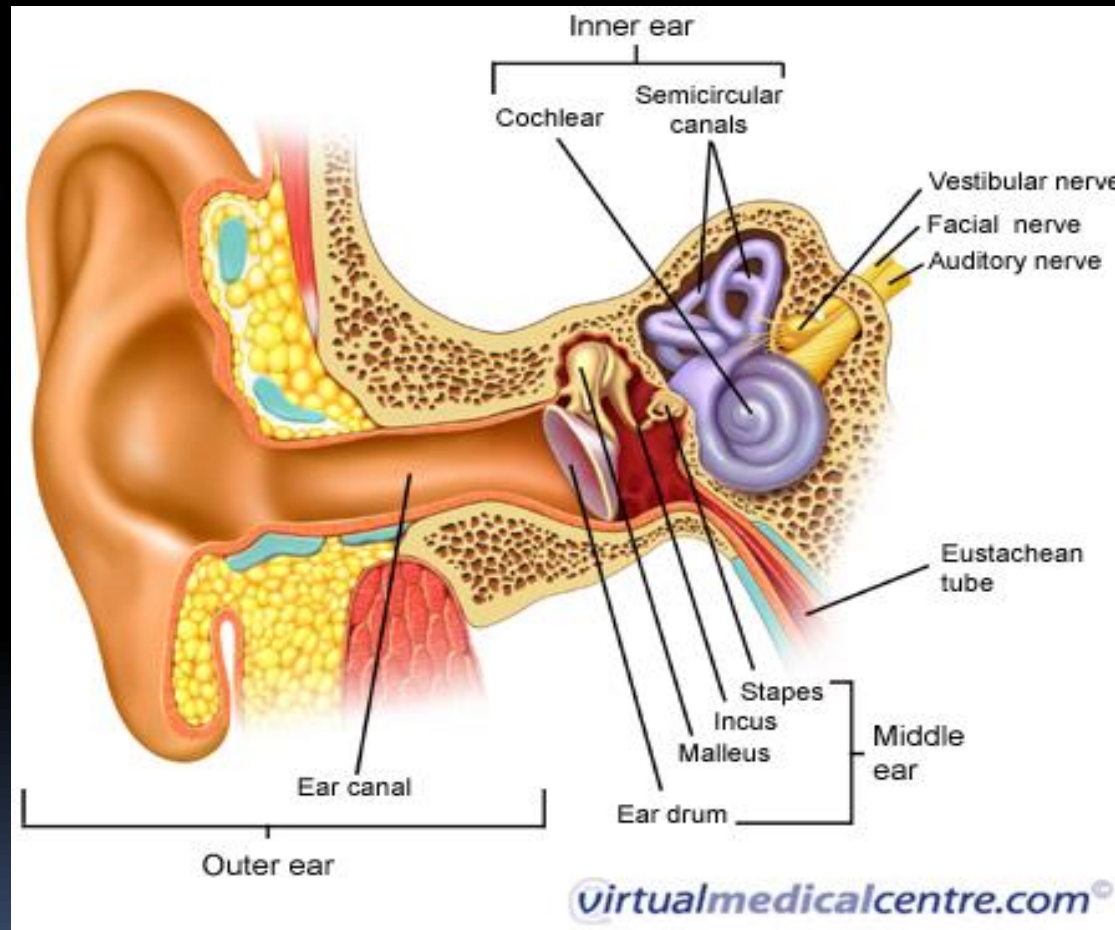
- Define middle ear infection
- Know the classification of otitis media (OM).
- Know the epidemiology of OM
- Know the pathogenesis & risk factors of OM.
- List the clinical features of OM.
- Know the diagnostic approaches of OM.
- Know the management of OM.
- Recall common complications of OM.



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.
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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 the lymphatic tissue lining is an extension of adenoidal tissue from the back of the nose.
- Accompanied by viral upper respiratory infection (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 the middle ear.
- Colonization and infection result.

OM- Other risk factors

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



OM-Microbiology-Bacterial Causes

- **Acute OM**

- < 3 months of age

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

- > 3 months of age

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



OM-Microbiology-cont.

Chronic OM

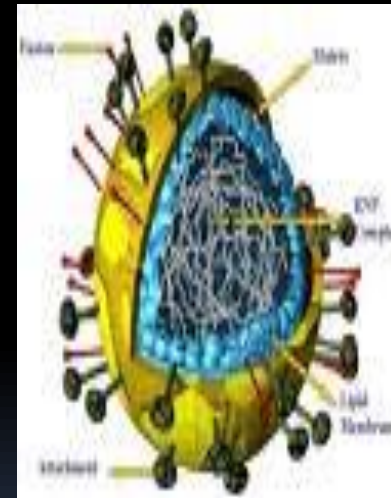
- **Mixed flora in 40% of cases**
- *P.aeruginosa, H.influenzae, S.aureus, Proteus species, K.pneumoniae, Moraxella catarrhalis*, anaerobic bacteria.

Serous OM

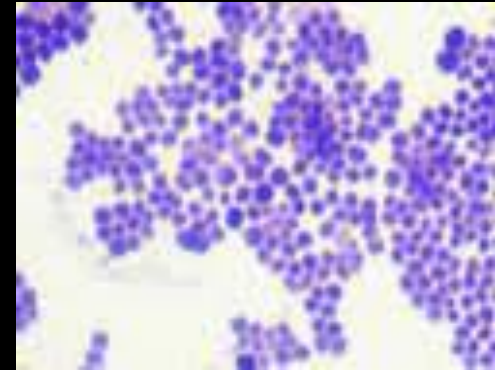
- Same as chronic OM, but **most of the effusions are sterile**
- Few acute inflammatory cells

OM-Viral causes

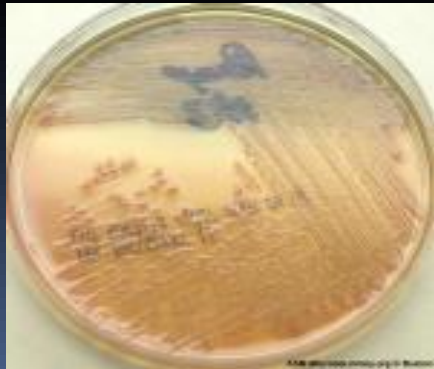
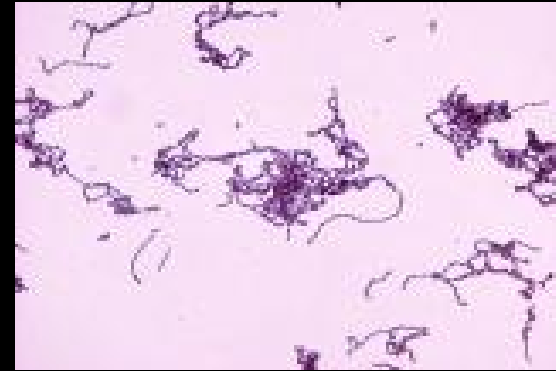
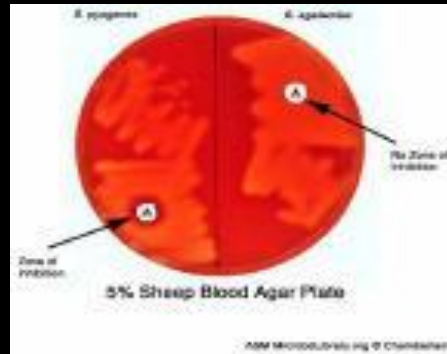
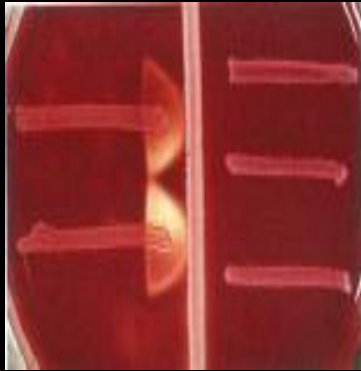
- RSV(Respiratory Synsechial Virus) -74%
- Rhinovirus
- Parainfluenza virus
- Influenza virus



Microbiology of OM



Microbiology of OM-continue



Clinical presentation

- **Acute OM**

Mostly Bacterial ,often a complication of viral URTI. **Pain often severe and continuous** in bacteria causes.

First 1-2 days:

Fever (39 C), irritability, earache , muffled nose.

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



3-8 days:

Pus and ear **exudative** discharge released *spontaneously* then pain and fever begin to decrease.

2-4 weeks :

Healing phase, discharge dries up and hearing becomes normal.

Images of acute OM



Serous OM (OM with effusion)

- 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.
- Over weeks to months, middle ear fluid become very thick and glue like(*glue ear*)
- Tends to be chronic , with non –purulent secretions.
- Cause conductive hearing impairment.

Images of serous OM



Chronic OM

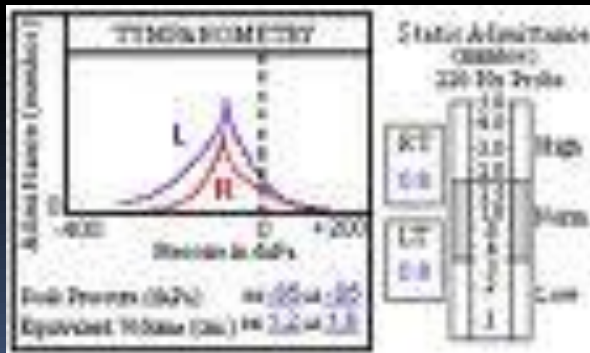
- Usually result from unresolved acute infection due to inadequate treatment **or** host factors that perpetuate the inflammatory process.
- Involves perforation of tympanic membrane and active bacterial infection for long period.
- Pus may drain to the outside (*otorrhea*).
- Result in destruction of middle ear structures and significant risk of permanent hearing loss.

Images of chronic OM



Diagnostic approaches of OM

- Clinical examination
- Tympanometry (detect the 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 cover *S.pneumonia* and *H.influenzae*.
- Drainage of exudate may be required.
- Chronic or serous OM need complex management, possibly surgical.

Complications

Intracranial

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



Extracranial

- Meningitis
- Extradural abscess
- Subdural empyema
- Brain abscess
- others

