



Microbiology of Middle Ear Infections

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Objectives

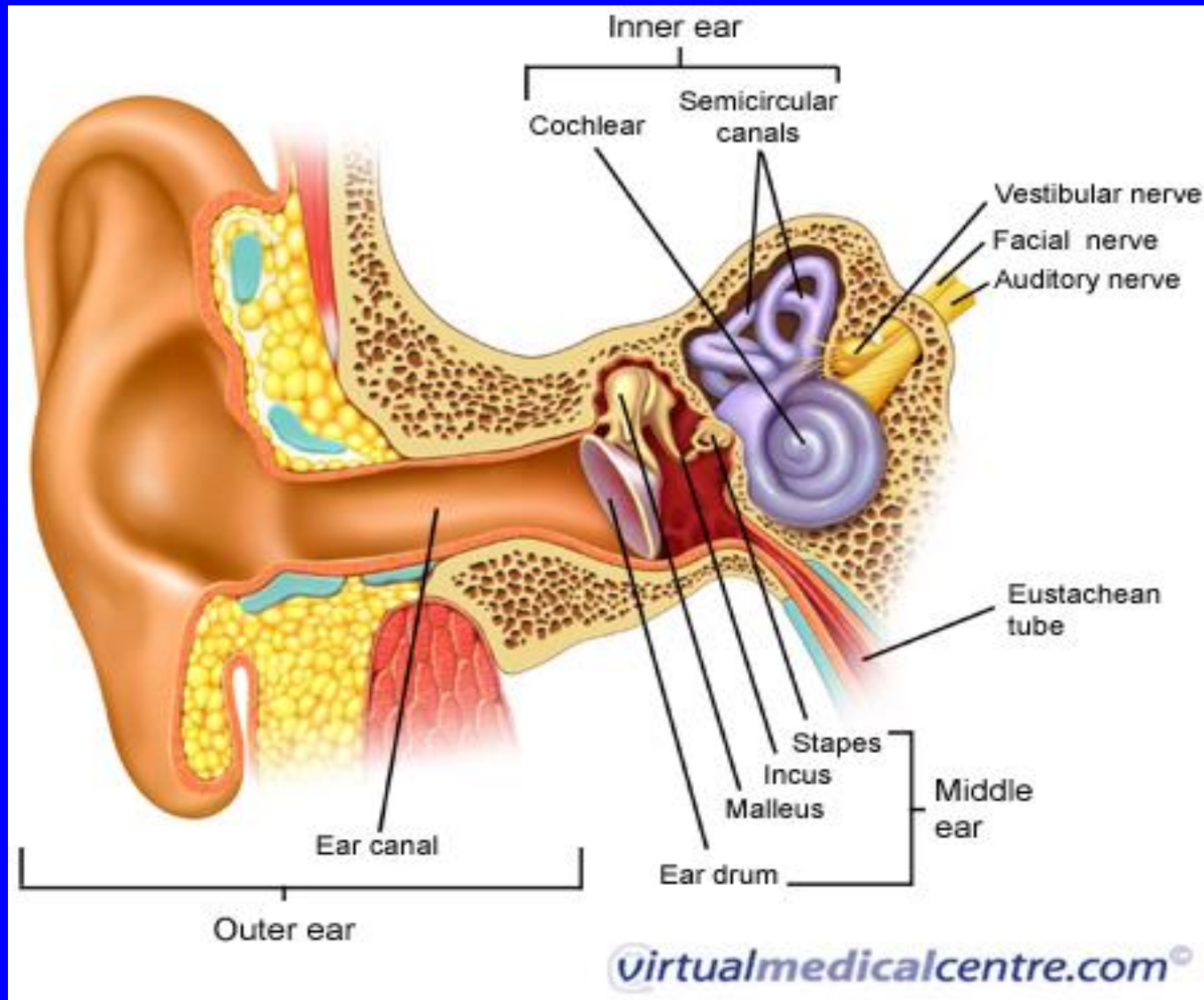
Upon completion of the lecture , students should be able to:

- 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.

Anatomy of the Middle Ear



OM~Classification

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



OM- Epidemiology

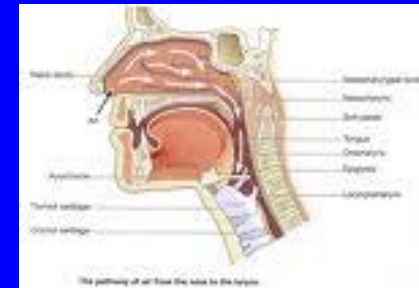


- Most common in infants 6 to 18 months of age (2/3 of cases). Improves with age, why ?
- The Eustachian Tube which vents the middle ear to the nasopharynx , is horizontal in infants, difficult to drain naturally, its surface is cartilage ,and lymphatic tissue lining is an extension of adenoidal tissue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



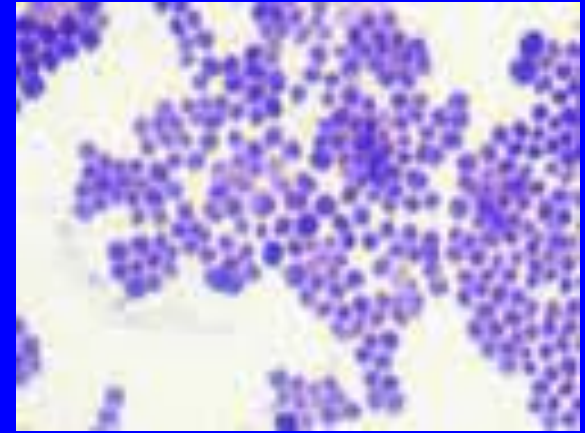
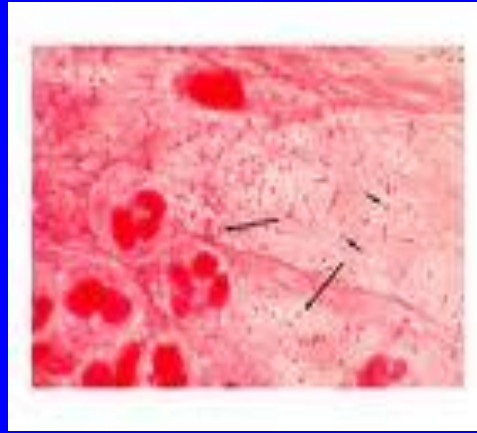
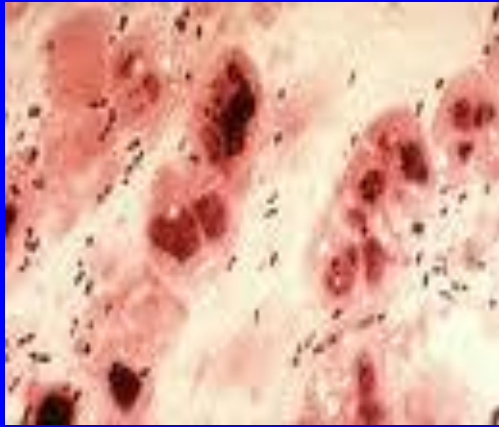
Images of chronic OM



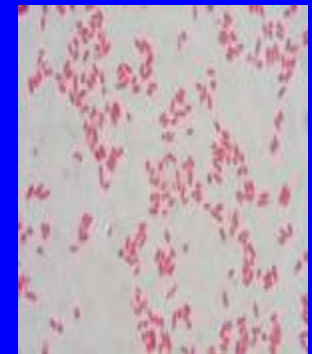
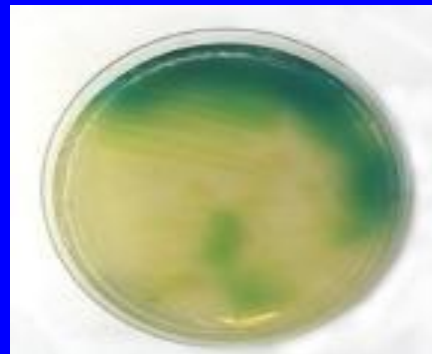
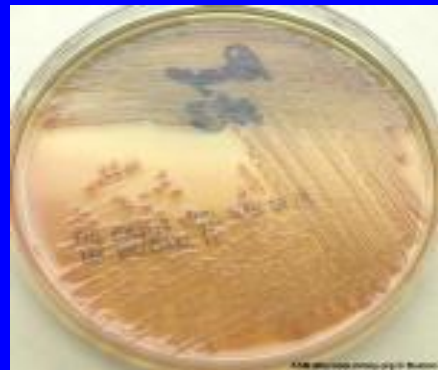
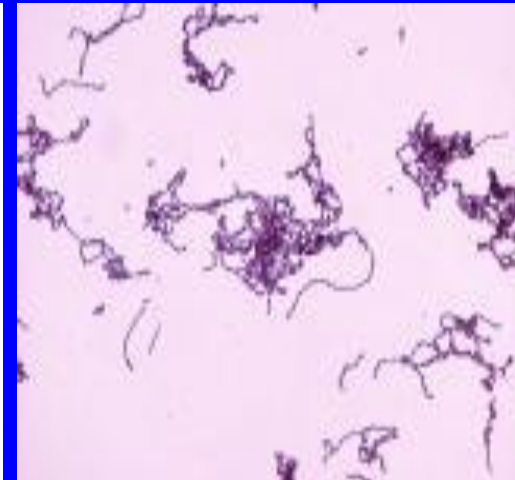
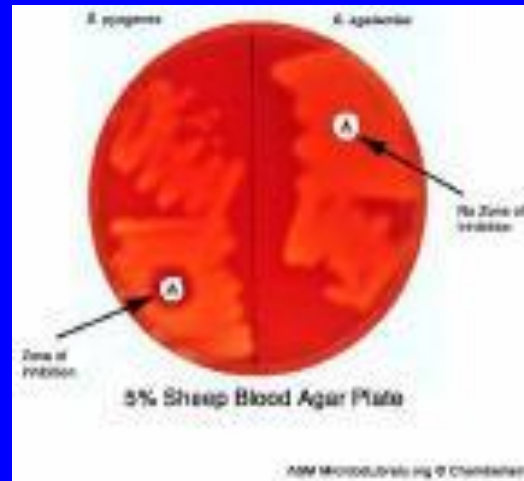
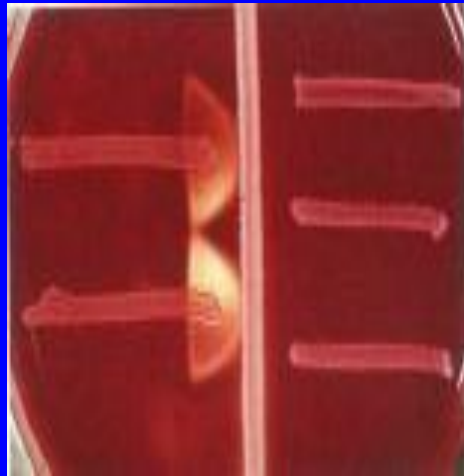
Images of serous OM



Microbiology of OM



Microbiology of OM-continue



OM-Microbiology-Bacterial Causes

- **Acute OM**

- < 3 months of age

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

- > 3 months of age

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

OM-Microbiology-cont.

Chronic OM

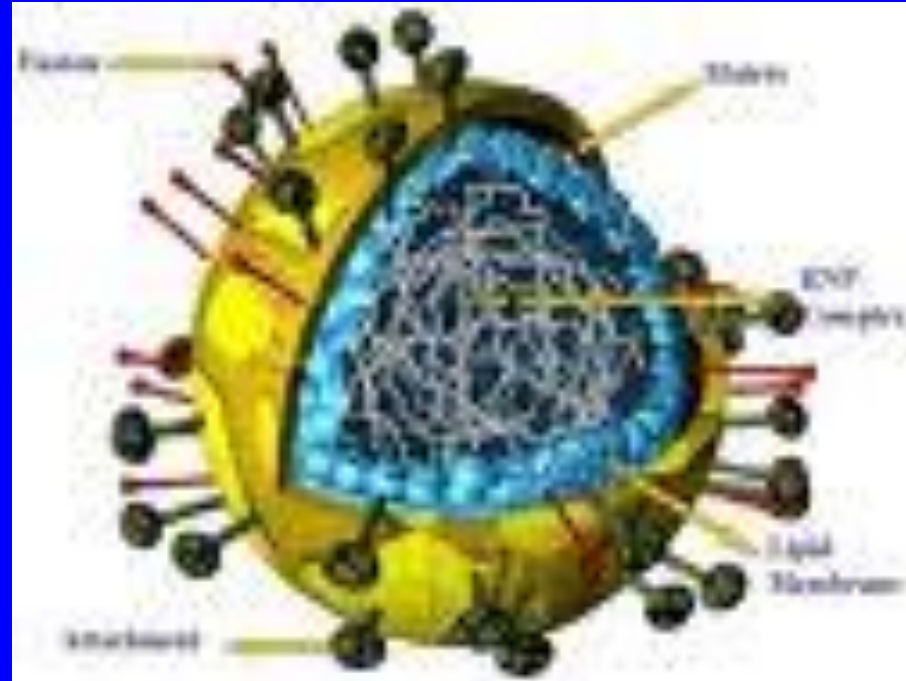
- Mixed flora in 40% of cases
- *P.aeruginosa*, *H.influenzae*, *S.aureus*, *Proteus* species, *K.pneumoniae*, *Moraxella catarrhalis*, anaerobic bacteria.

Serous OM

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

OM~Viral causes

- RSV ~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 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 dries up and hearing becomes normal.

Serious OM

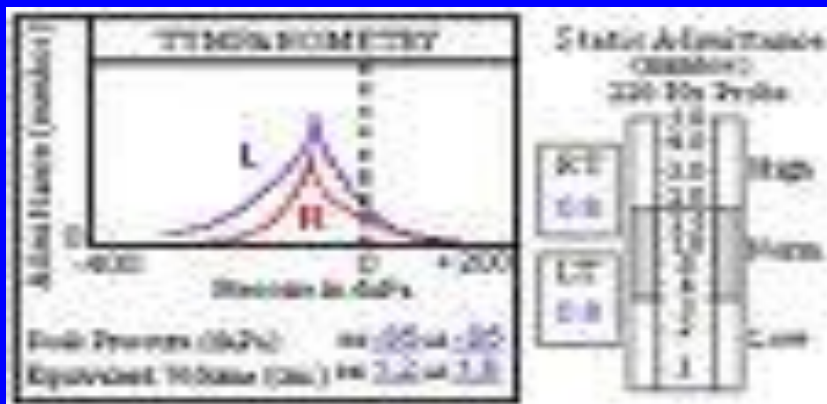
- Collection of fluid within the middle ear as a result of negative pressure produced by altered eustachian tube function.
- Represent a form of chronic OM or allergy-related inflammation
- Tends to be chronic , with non – purulent secretions.
- Cause hearing deficit.

Chronic OM

- Usually result from unresolved acute infection due to inadequate 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 cover *S.pneumonia* and *H.influenzae*.
- Drainage of exudate may be required.
- Chronic or serous OM need complex management, possibly surgical.

Complications

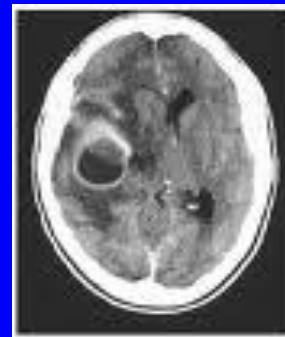
Intratemporal

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



intracranial

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





Reference book

Sherris Medical Microbiology, an Introduction to Infectious Diseases.

Latest edition, Kenneth Ryan and George Ray.
Publisher : McGraw Hill .

