

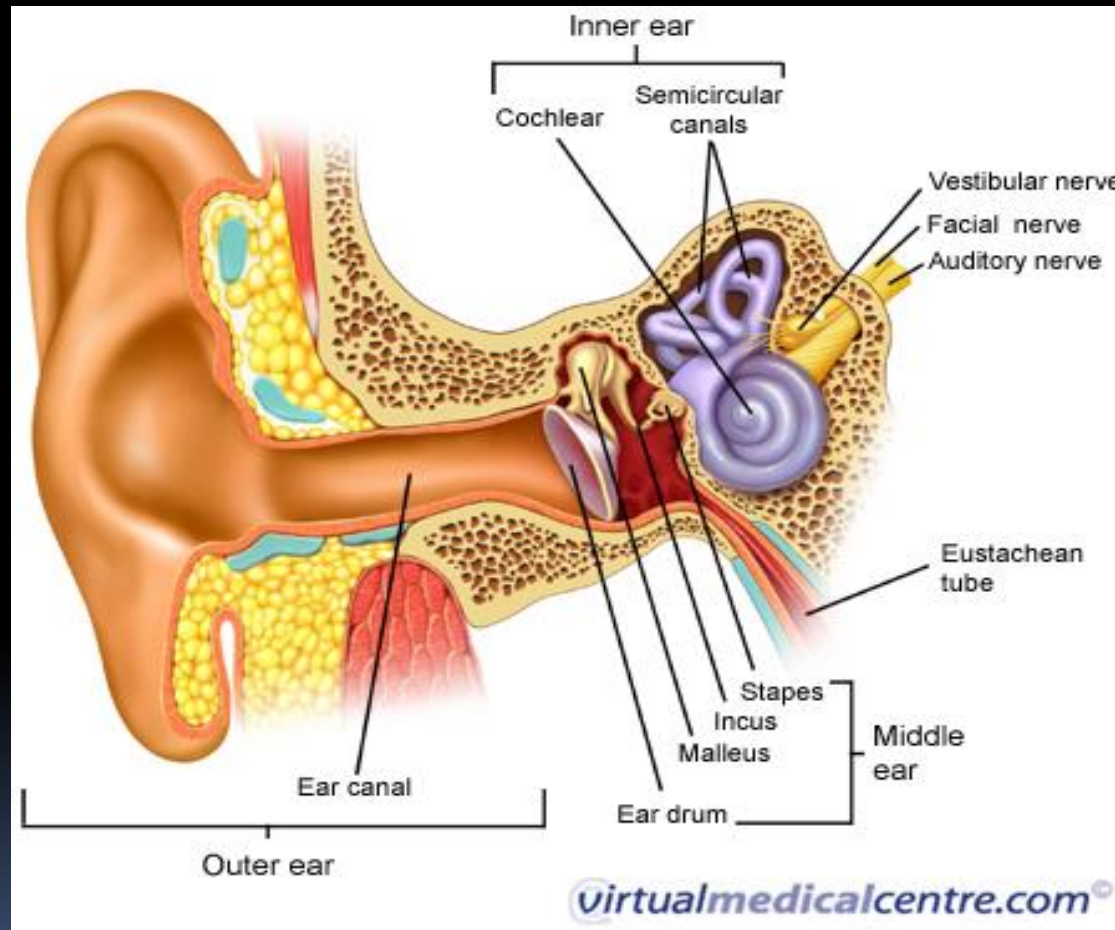


# MICROBIOLOGY OF MIDDLE EAR INFECTIONS

# 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

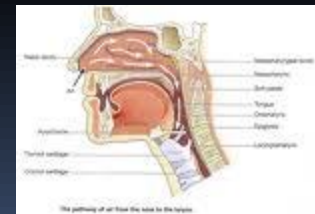


- Most common in infants 6 to 18 months of age (**2/3 of cases**). Improves with age, why ?
- The Eustachian Tube which vents the middle ear to the nasopharynx , is horizontal in infants, difficult to drain naturally, its surface is cartilage ,and lymphatic tissue lining is an extension of adenoidal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





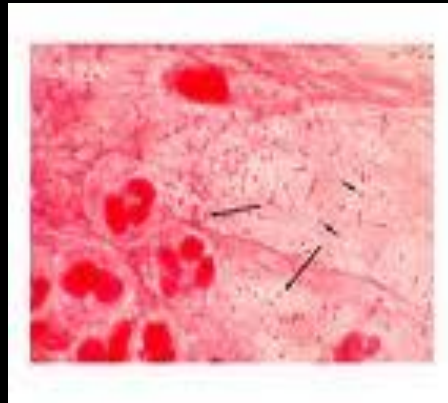
# Images of chronic OM



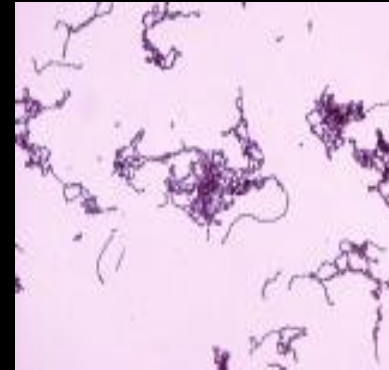
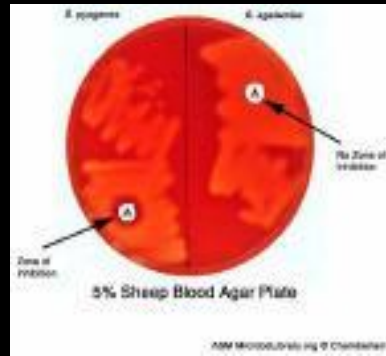
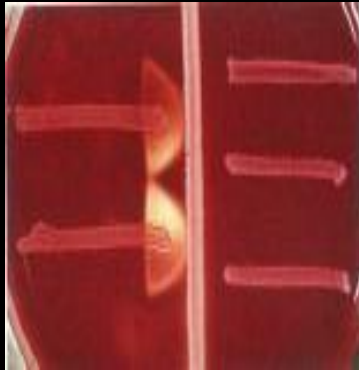
# Images of serous OM



# 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

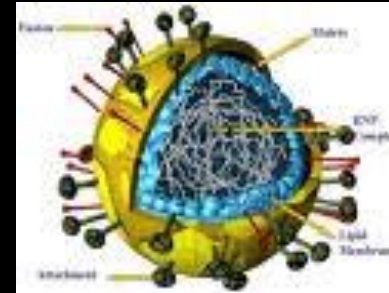
- Mixed flora in 40% of cases
- *P.aeruginosa*, *H.influenzae*, *S.aureus*, *Proteus* species, *K.pneumoniae*, *Moraxella catarrhalis*, anaerobic bacteria.

## 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 , 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 and pain and fever begin to decrease.

**2-4 weeks :**

Healing phase, discharge dies up and hearing becomes normal.



# Serous OM

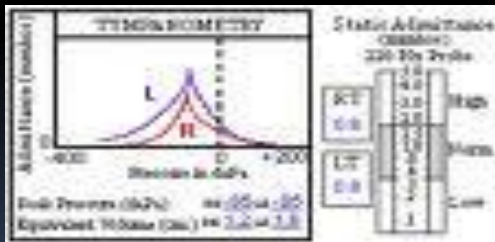
- Collection of fluid within the middle ear as a result of negative pressure produced by altered eustachian tube function.
- Represent a form of chronic OM or allergy-related inflammation
- Tends to be chronic , with non –purulent secretions.
- Cause hearing deficit.

# Chronic OM

- Usually result from unresolved acute infection due to 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

## Intracranial

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



## Intracranial

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

