



# Microbiology of Middle Ear Infections

**DR. ALI SOMILY, MD**

# Objectives

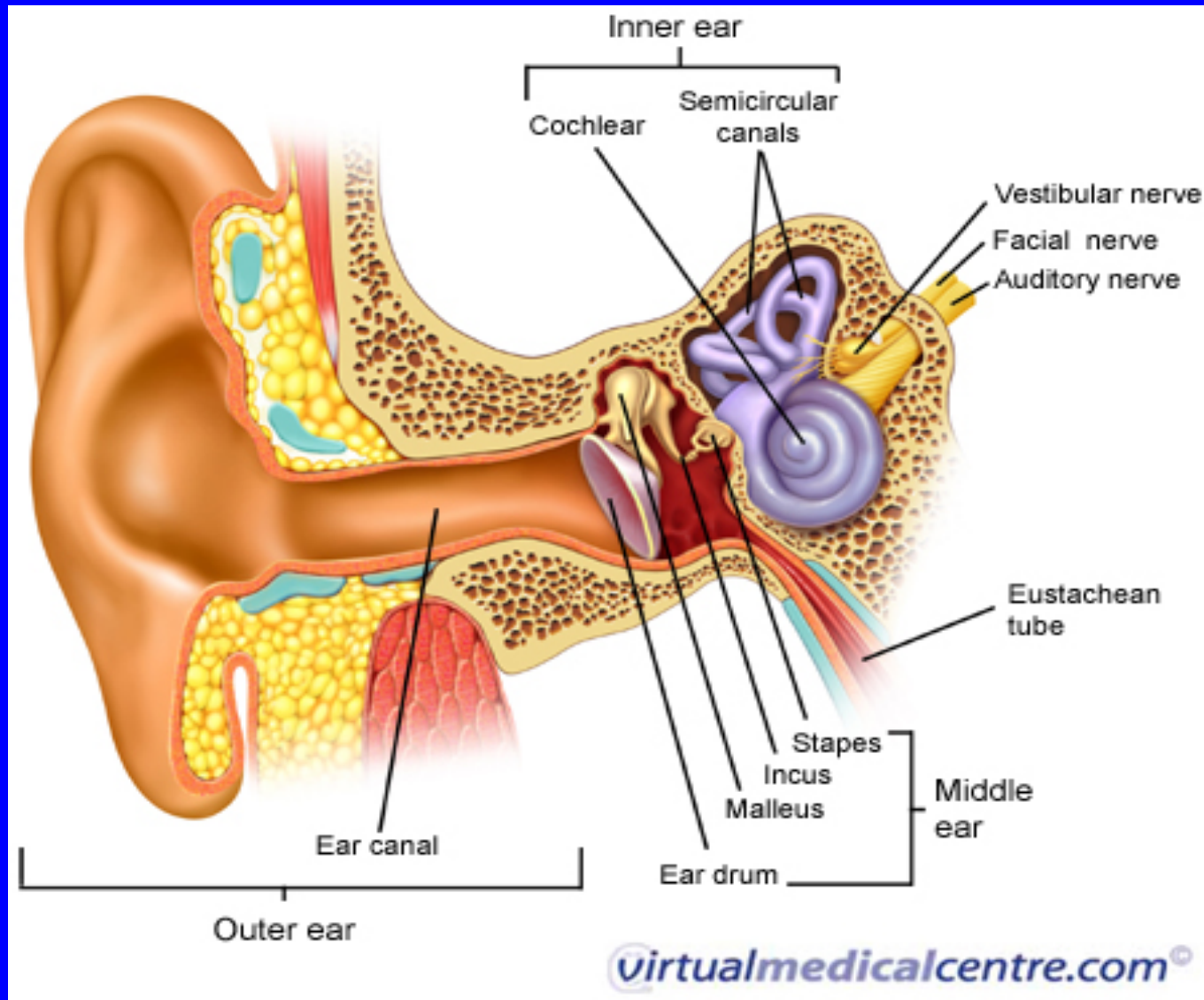
Upon completion of the lecture , students should be able to:

- 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

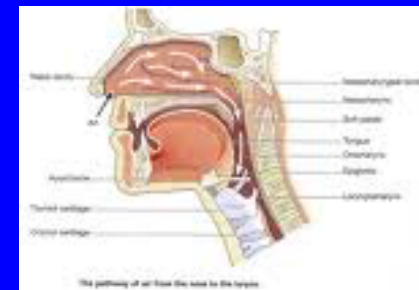


- Most common in infants 6 to 18 months of age (2/3 of cases). Improves with age, why ?
- The Eustachian Tube which vents the middle ear to the nasopharynx, is horizontal in infants, difficult to drain naturally, its surface is cartilage, and lymphatic tissue lining is an extension of adenoidal tissue 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 NasoGastric tube or malignancy, immune dysfunction.
- Exposure to pathogens from day care.
- Exposure to smoking.





# Images of acute OM



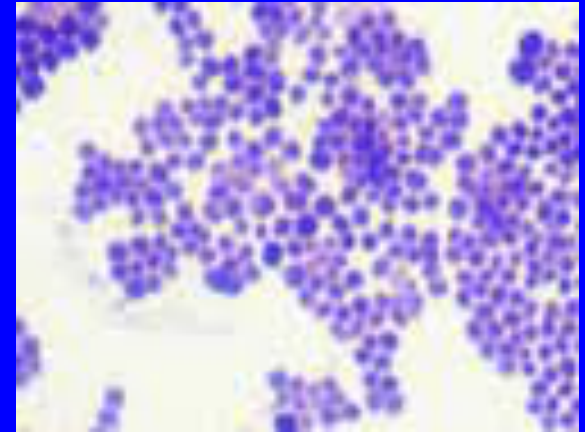
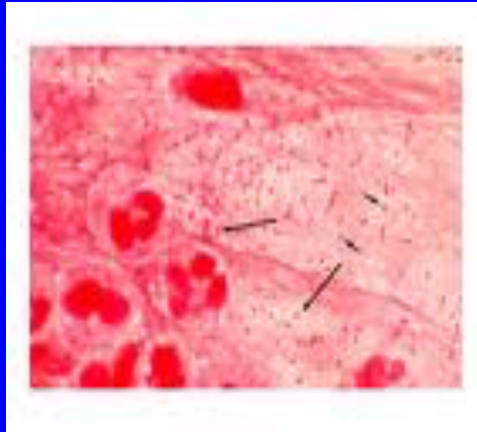
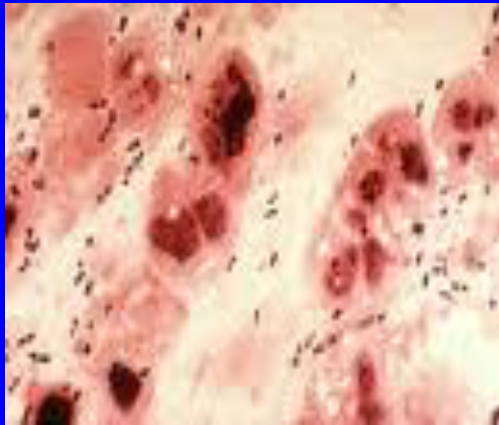
# Images of chronic OM



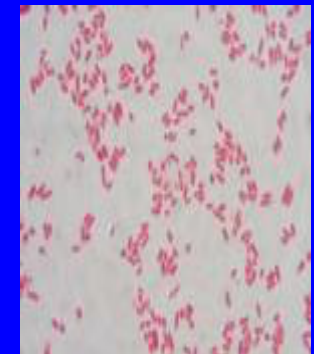
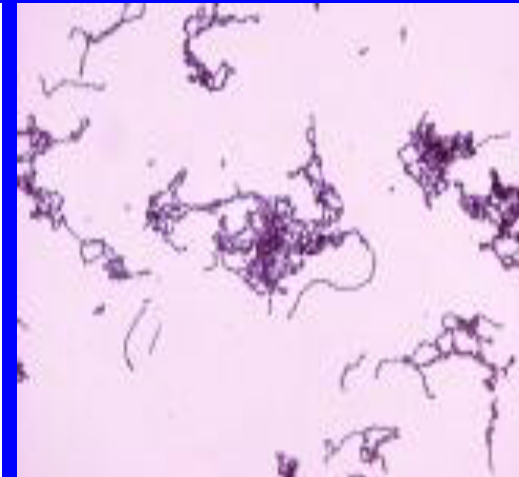
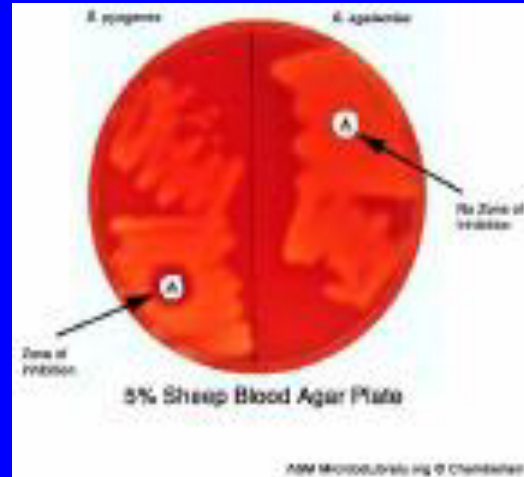
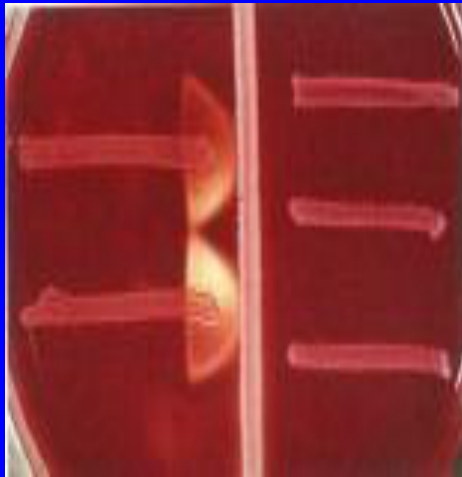
# Images of serous OM



# 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

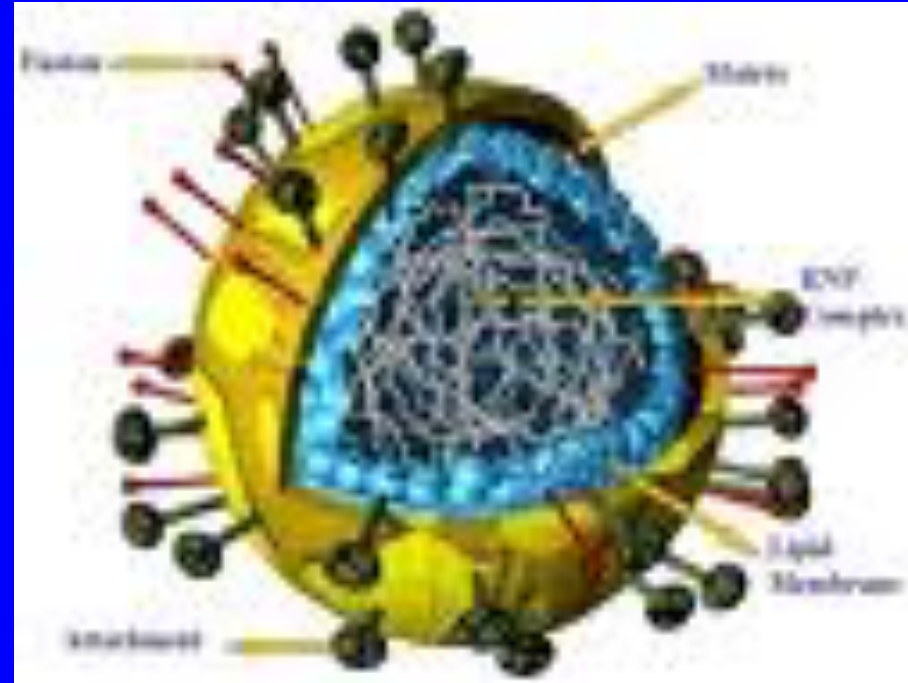
- Mixed flora in 40% of cases
- *P.aeruginosa*,  
*H.influenzae*,  
*S.aureus*, *Proteus*  
species,  
*K.pneumoniae*,  
*Moraxella*  
*catarrhalis*, anaerobic  
bacteria.

## 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.



# 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*.
- Amoxicillin+/- clavulanic acid or cefuroxime for acute
- Drainage of exudate may be required.
- Chronic or serous OM need complex management, possibly surgical.

# Complications

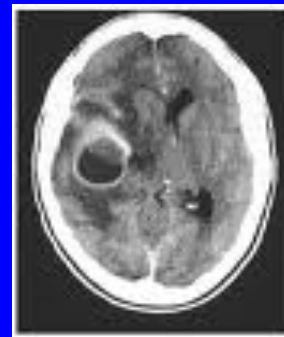
## Intratemporal

- 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 .

