



# Otologic Disease

Ear drops, indications and ototoxicity

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# Case



- 5 year old female presents with otorrhea from left ear to my office.
- Patient otherwise well, no systemic complaints.
- Tubes placed 3 months ago for chronic otitis media.
- Seen recently at a walk in clinic and prescribed Amoxil.
- No improvement noted.

# Ideal treatment ?



- This patient should have been started on topical antibiotic drops.
- Ciprodex or Cipro HC with no oral antibiotics in this case.
- The Journal of Otolaryngology, Volume 34, Supplement 2, August 2005

# Use of Otological vs Systemic Antibiotics



- Otological antibiotics

- All cases of uncomplicated AOMT

- Systemic antibiotics

Systemic illness

Complicated otitis media (ie mastoiditis)

Associated strep pharyngitis

Diabetic and immunocompromized patients

Failure of topical therapy

# Ototoxicity



- No reported ototoxicity in animal or human studies with fluoroquinilones
- All other ototopical agents may be ototoxic in humans.
- Peter s. Roland Et al Consensus Panel on Role of potentially ototoxic antibiotics for topical middle ear use. Otolaryngology-Head and Neck Surgery. 2004; 130:S51-S55

# Topics for Review

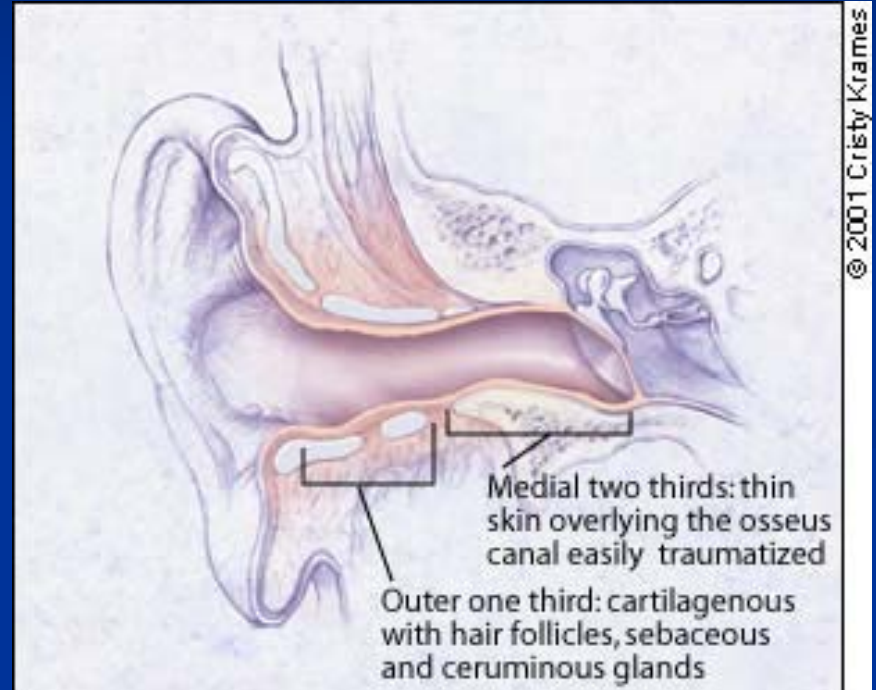


- Anatomy and Physiology
- Cerumen
- Pathology
  - Inflammatory and Infectious
  - Neoplastic
- When and what to do?

# Anatomy



- Only skin lined invagination in the body
- Outer 1/3 soft tissue and cartilage
- Inner 2/3 are boney with thin adherent tissue
- S shaped canal



# Glandular elements



- Sebaceous glands
- Modified apocrine sweat glands
  - Both empty into hair follicle in ear canal



# Cerumen

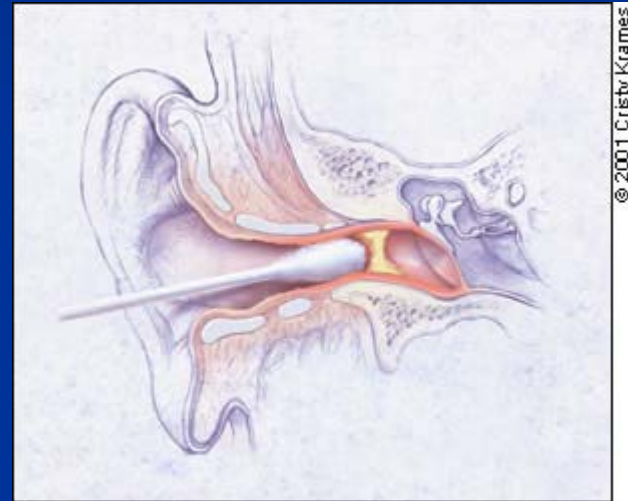


- Mixture of sebaceous, apocrine and epithelial cells
- For lubrication
- Waterproof
- Mechanical protection of the underlying tissue
- Anti-bacterial
  - Contains lysozyme
  - Fatty Acids
  - Maintains canal pH at 6.1

# Cerumen and Hearing loss



- 80% occlusion leads to mild conductive hearing loss increasing to a 30-45dB conductive loss at 100% occlusion of the canal by cerumen



# Excess Cerumen



- Adults: 3-10%
- Geriatric: 34%
- Children 10%

# Cerumen Removal



- Mechanical

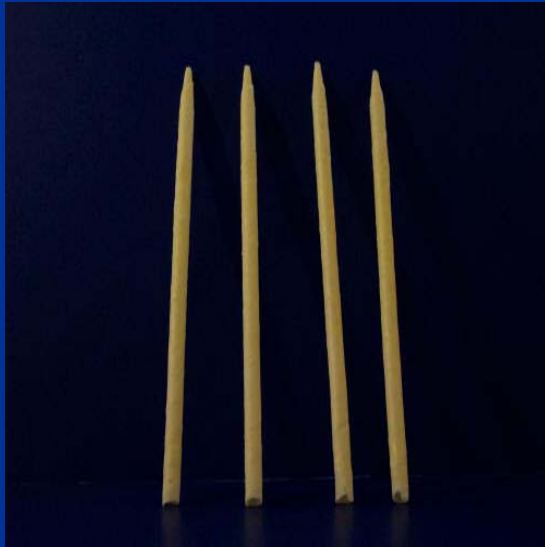
- Irrigation

- Syringe
- Water pic
- Earigate

- Cerumenolytics

- Peroxide based
- Ceruminex
- $\text{NaHCO}_3$
- Colace
- Use of mineral oil

# Ear Candling



# Infections of the external auditory canal



- Fungal
- Bacterial
- Chronic

# Microbiology of Healthy EAC



- Normal Saprophytes

- *Corynebacterium* sp
- Micrococci
- Non pathogenic Staph; ie Staph Alba
- Various Fungi

# Infections of the external auditory canal: Fungal



- Fungal External Otitis
- Uncommon as a primary disease. Fungal organisms do grow on desquamated epithelium or cerumen as saprophytes
- True fungal otitis is either *Aspergillus* or *Candida* species





# Symptoms



- Generally complain of pruritis
- Protracted course
- Hearing loss
- Ototorhea less common

# Treatment of Fungal Otitis



- Mechanical debridement
- Re-acidification of the canal, topical antiseptics: Gentian violet, Mercurochrome
- Very rare to require antifungal antibiotics
- Topical treatment with Ketoconazole, Clotrimazole
- Lococorten drops: Clioquinol and flumethasone
- Powder

# Safety profile: Antimycotic preparations



- Clotrimazole, miconazole and tolnaftate appear safe in the middle ear
- Nystatin appears safe, but carrier leaves a residue around the round window which may be ototoxic
- Gentian Violet is significantly vestibulotoxic and may be ototoxic

■ Lawrence W. C Tom, MD Laryngoscope April 2000

# Acute Bacterial Otitis Externa



- Acute
  - Diffuse “swimmers ear”
  - Furunculosis
  - Nectrotizing
- Malignant otitis externa
- Chronic
  - Hypertrophic sclerosing

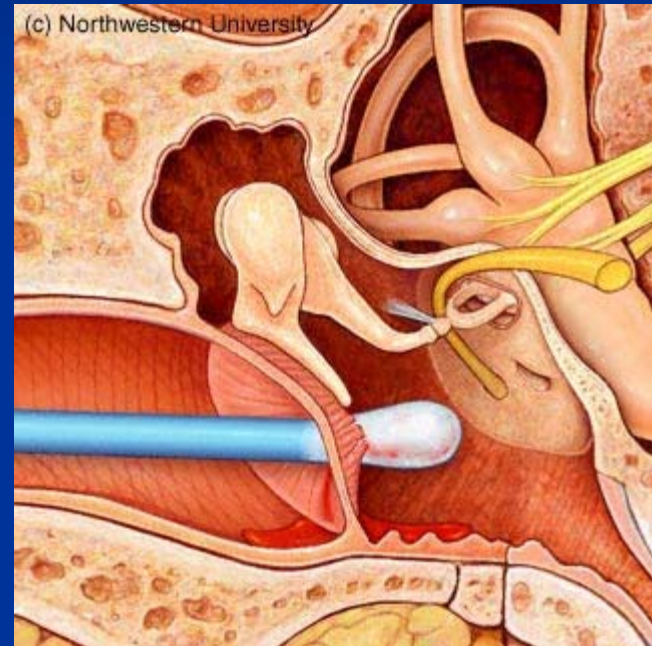


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# AOE: Pathogenesis



- Temperature
- Humidity
- Seasonal
- pH
- Dermatitis
- Trauma



# AOE: Diagnosis

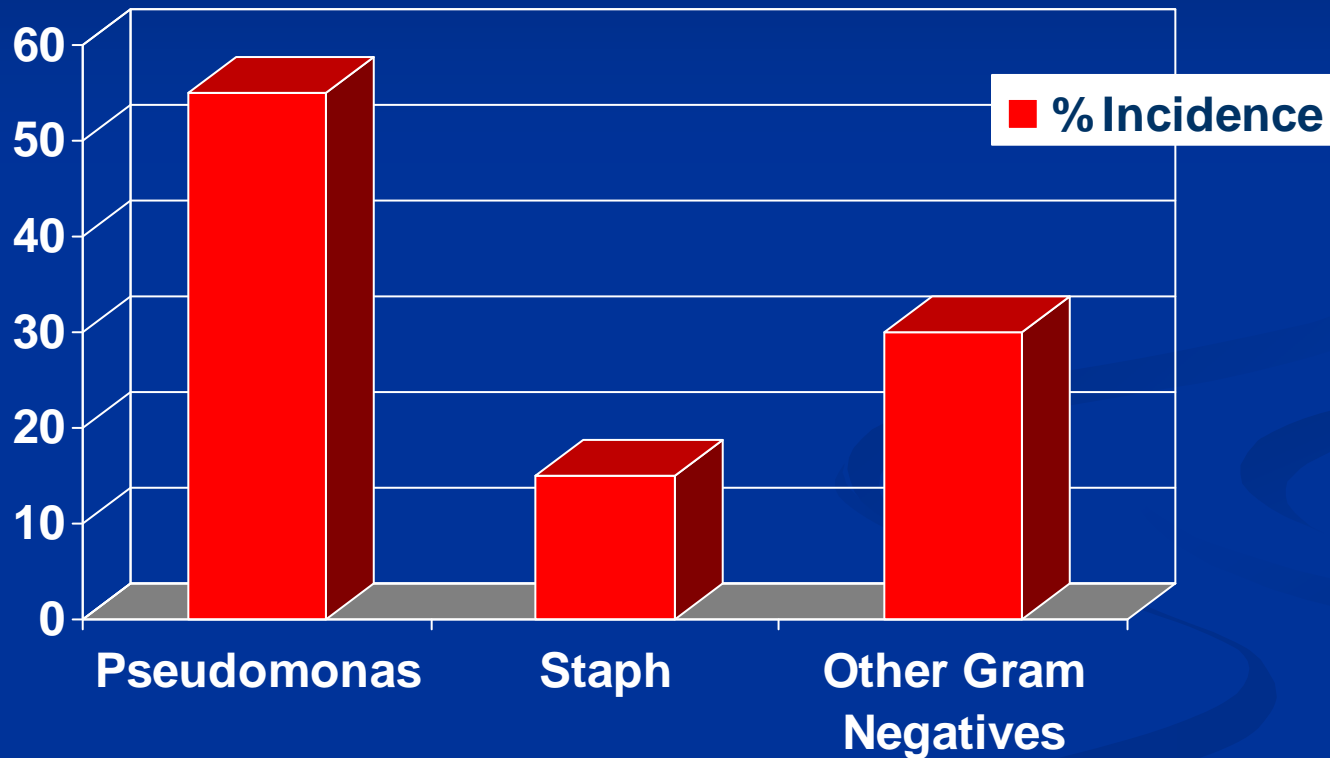


- Swollen canal with narrow lumen
- Erythema may be present
- Exudate often present
- Tenderness is usually pronounced
  - Worse if tragus or auricle are palpated





# Bacteriology of AOE



# AOE Treatment



- Removal of Debris
- Re-Acidification
- Appropriate antibiotics
  - Topical Fluoroquinolones  
Ciprodex (Safe in the middle ear)
  - Aminoglycosides (not if there is a perforation)
- Wick
- Pain Management
- Rarely needs systemic antibiotics.





# Prevention



- Water precautions
- Avoid canal trauma
- Maintain healthy canal pH
  - Diabetic canal pH 7.4 vs normal 6.1



# Ototopical treatment



- Delivers a high concentration of antibiotic
  - Combined with steroid ie Dexamethasone reduced pain and swelling quickly allowing penetration of antibiotic to affected tissues
- Minimal systemic effect
- Very little resistance
  - Includes MRSA.
- Low cost

# Ciprodex



- 3mg/mL of Ciprofloxacin
- 1mg/mL of Dexamethasone
- 0.1mg/mL of Benxalkonium chloride preservative

# Antibiotic concentrations

## CiproDex



- 3-5 drops is a dose of 90-150ug but at a concentration of 3000mcg/ml.
- This exceeds the MIC of any known relevant pathogen
- This includes MRSA

# Middle ear fluid levels with systemic antibiotics



- Amoxil (90-100mg/kg/day)      ■ 8-10 mcg/ml
- Cefuroxime (Ceftin)      ■ 2-4 mcg/ml
- Ceftriaxone (Rocephin)      ■ 25-30 mcg/ml

# Ottopicals: Disadvantages



- Local discomfort (warm up)
  - Ph
  - Alcohol
  - temperature
- Requires direct contact with area involved
- Topical sensitization
- Minimal systemic effect
- Alter micro environment

# Ototopical Choices



- No antibiotic
- Aminoglycoside vs Quinalone
- Single agent vs combined with steroid



# Safety Profile: Topical Antibiotics

- Aminoglycoside antibiotics should not be used where there is a perforated tympanic membrane or an open mastoid cavity due to potential for ototoxicity and vestibulotoxicity

Otolaryngology Head &  
Neck Surgery; Efficacy and  
Safety of Topical Antibiotics  
in the Treatment of Ear  
Disease Consensus Panel  
Update 2004



# Ototoxicity Data



- Neomycin
- Gentamycin
- Streptomycin
- Polymyxin
- Cortisporin
- Propylene glycol
- Hair Cell loss
- Hair Cell loss
- Hair Cell loss
- Hair Cell loss
- Hair Cell loss
- Severe middle ear inflammation with some hearing loss

# Ciprofloxacin



- No evidence of ototoxicity or vestibulotoxicity in animal models
- No reported cases of clinical vestibulotoxicity or ototoxicity

# Summary



- Topical therapy is the first choice for otitis externa, and uncomplicated acute otitis media with tubes
- Ciprodex is safe and highly effective treatment for bacterial otitis externa and otitis media with tubes
- Systemic therapy is not indicated in the majority of cases and should not be initiated as a first line therapy.
- If in doubt about the status of the tympanic membrane: Use Ciprodex.