Post Tympanostomy Tube Otorhea

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Incidence of PTTO

- 30% - 50% of patients suffer at least one otorrhea episode while the tube is in place[1,2]
- 10% - 20% of patients suffer from otorrhea within two weeks after tube placement[1]
- 22% of patients reported multiple episodes of acute otorrhea with 9% having 3 or more discrete bouts[3-5]

1. Lee D, et al., *Otolaryngol Head Neck Surg.* In press.
2. Smelt GJ, et al. *J Laryngol Otol* 1984;98:243-245.
3. Mandel EM, et al., *Ann Otol Rhinol Laryngol.* 1994;103:7113-718
4. McLelland CAI. *Arch Otolaryngol* 1980;106:97-99.
5. Herzon FS. *Arch Otolaryngol.* 1980;106:645-647.

Etiology

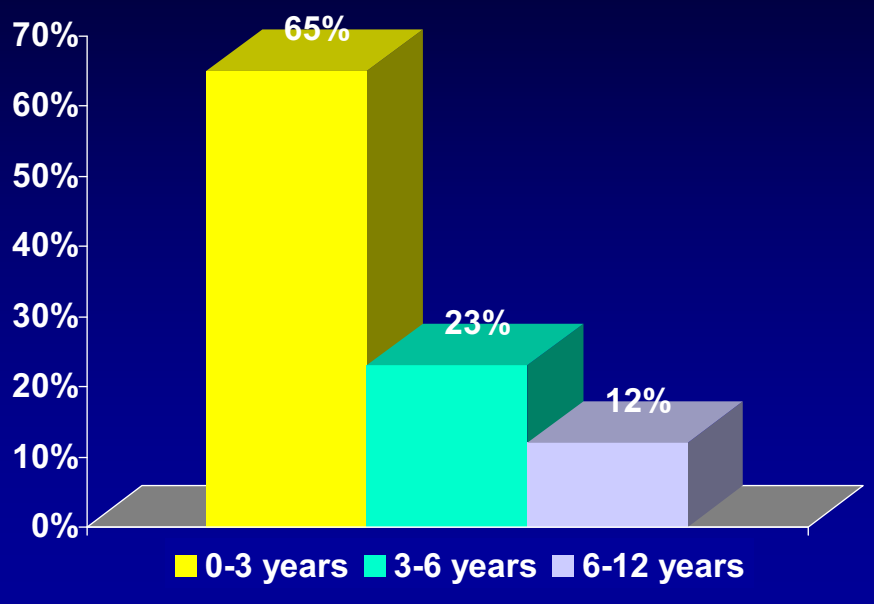
- Positive culture @ insertion
- Recurrent OM was indication
- Rhinitis--viral/AR
- NOT surface swimming!!

Microbiology of AOM with a tympanostomy tube

Subjects & Methods

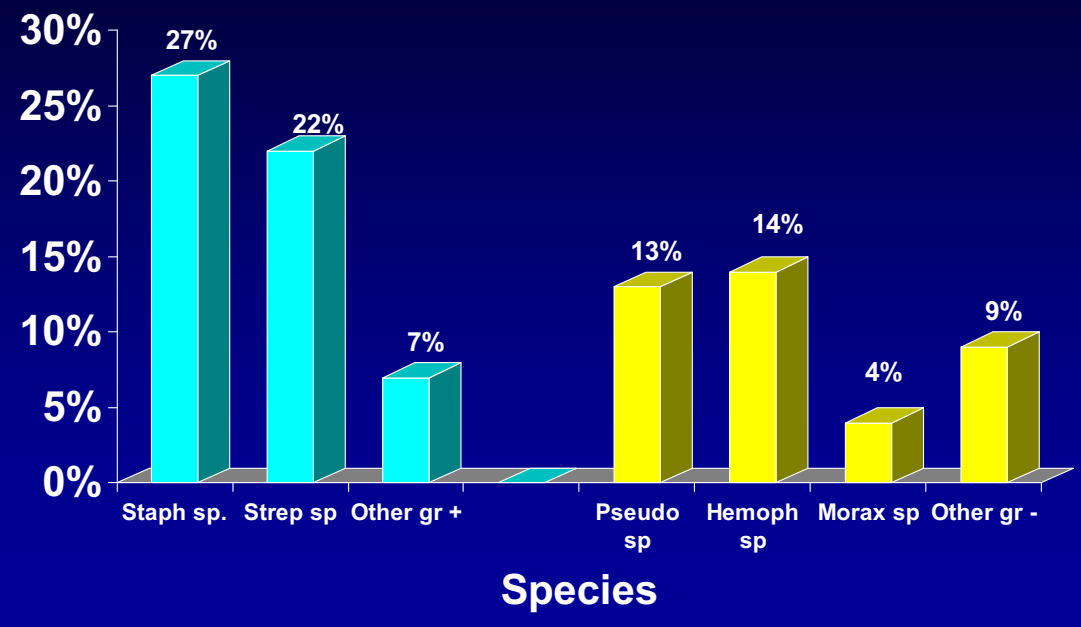
- 1309 isolates from 956 subjects recruited to 3 clinical trials
- Ages: 6 months -12 years
- Duration of drainage < 3weeks
- > 3 weeks from insertion of TT
- Cultures from lumen of TT
- Subspecies ID using phenotypic & DNA based characterization (Ribotyping & 16 S sequencing)

Age breakdown



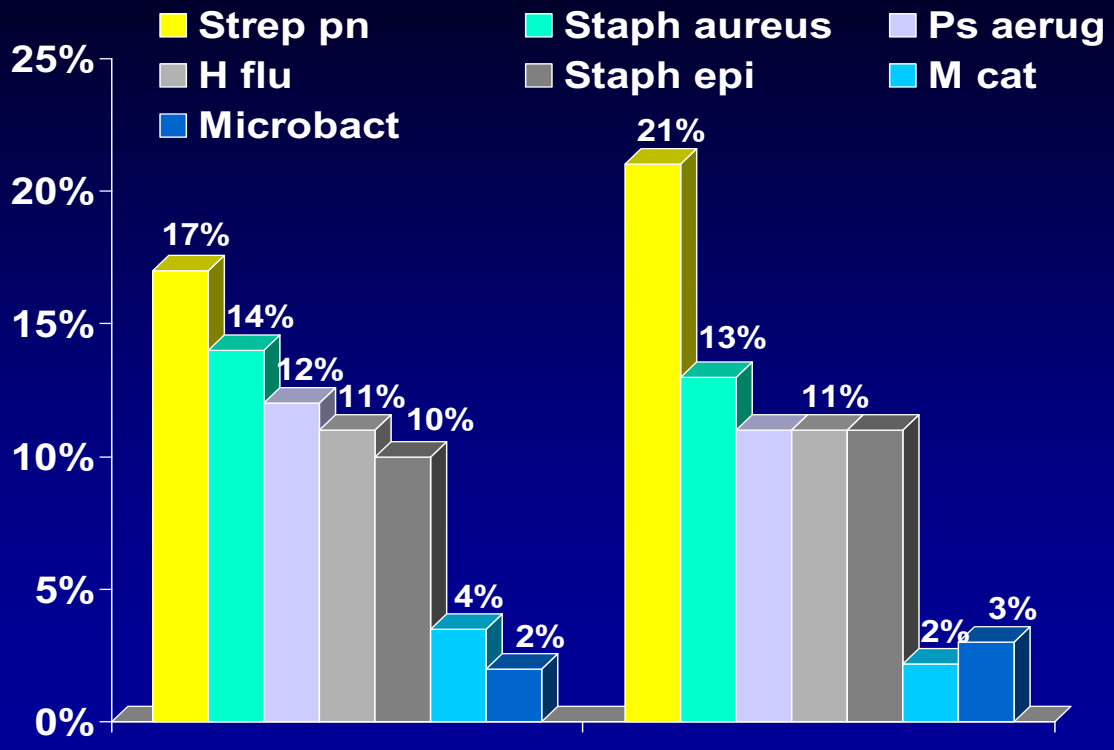
Roland *et al* Laryngoscope 2005

Bacteriologic overview



Roland *et al* Laryngoscope 2005

Most common isolates



Traditional AOM pathogens

Acute Otits Media With Tympanostomy Tubes (AOMT) Caused by *H. influenzae* and *S. pneumoniae* as Function of Subject Age

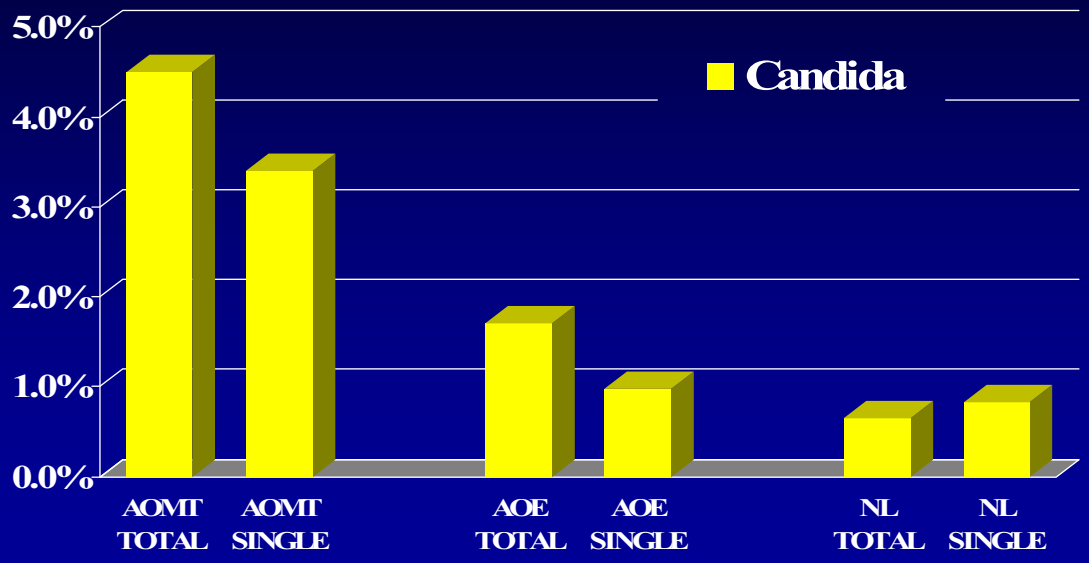
	0-3yrs (n=662)	3-5yrs (n=220)	6-12 yrs (n=114)
Subjects w S pneumonia	26% (161)	11% (25)	8% (9)
Subjects w H influenza	19% (118)	4% (8)	2% (2)
Subjects w M catarrhalis	6% (41)	4% (9)	2% (2)

Fungal organisms

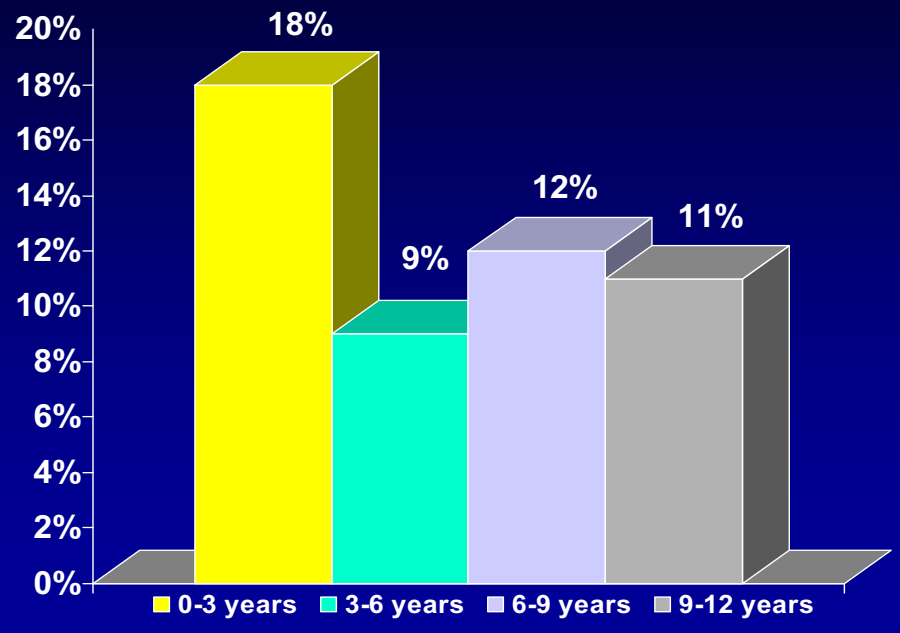
	AOMT		
Candida sp	**5.3%** N=58		
Aspergillus sp	0.2% N=2		

Roland *et al* Laryngoscope 2005

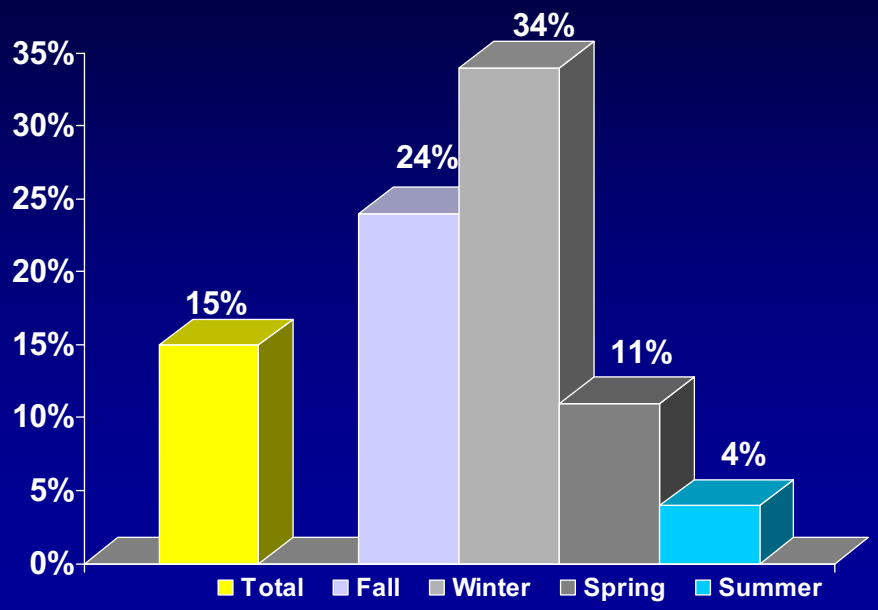
Candida



"No Growth" -- Age

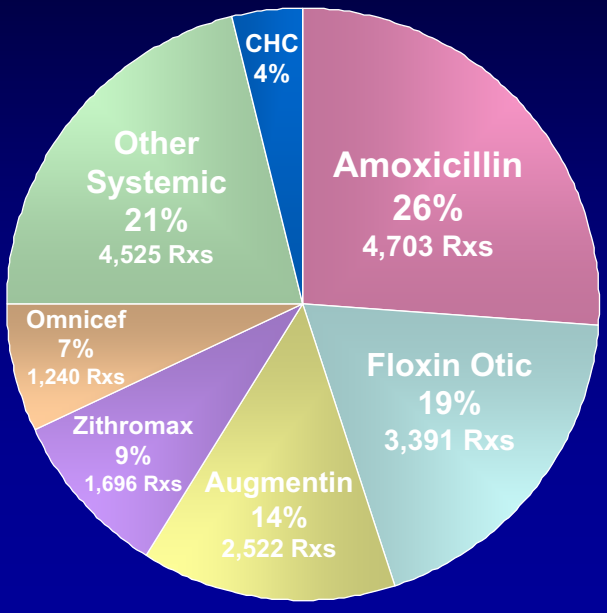


"No Growth" --Season



Current Otic Treatment Issues

Most Commonly Prescribed AOMT Treatments



- 78% of AOMT patients were treated with systemic antibiotics

- -N= 46.056 tube receipients
- -10,328 AOMT Patients
- -18,077 AOMT Rxs

Source: July 2002 - May 2003 Verispan Medical and Prescription data retrospective analysis

AOMT Treatment

- Topical Antibiotic drops
  - Aminoglycoside not recommended
    - Ototoxicty
    - Sensitization
    - efficacy
- Assure delivery
  - Aural toilet
  - irrigation

Why topical instead of systemic as 1st line ??

ADVANTAGES

- Delivery of high concentration
  - Increased efficacy
  - minimize emergence of resistant strains
- Minimal systemic effect
- Low cost
- Alter local micro-environment

Antibiotic Concentrations

- 3-5 GTTS dose of a 0.3% solution is only 90µg - 150mcg but at a concentration of **3000mcg/ml** which exceeds the MIC of any known relevant pathogen.
- Compare with typical ME fluid levels achievable with systemic antibiotics:
  - Amoxicillin (90-100mg/kg/d) 8-10mcg/ml
  - Cefuroxime (Ceftin®) 2-4mcg/ml
  - Ceftriaxone (Rocephin®) 25-30mcg/ml

DISADVANTAGES

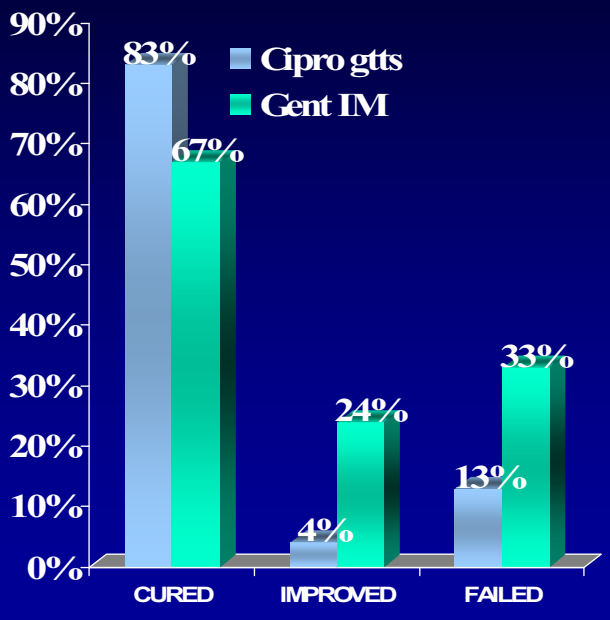
- Local discomfort
  - pH
  - alcohol
  - temperature
- Topical sensitization
- Minimal systemic effect
- *Require direct contact!!*

Topical vs Systemic

- N = 30/30
- 40 pts treated previously with systemics
- eradication rates

	Erad	Persis
Gent	43%	57%
Cipro	85%	17%

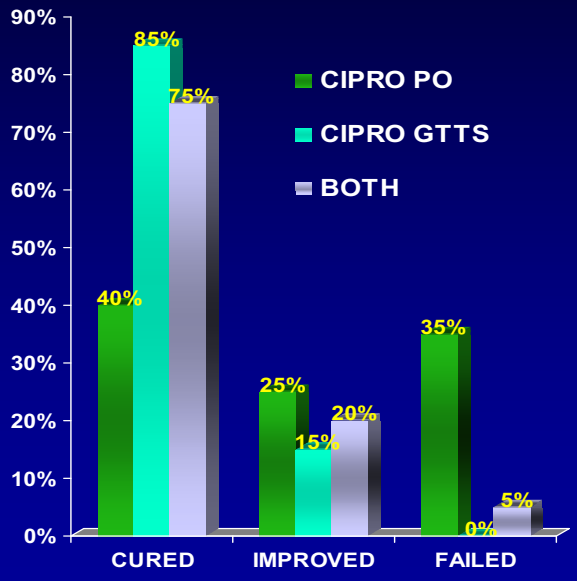
- none of the persistent organisms were resistant to either medicine



Esposito *et al:* Arch Otolaryngol HNS 1992

Topical vs Oral

- N =20/20/20
- TREATMENT:
  - either Cipro PO 250mg BID or
  - Cipro GTTS 250µg/ml BID or
  - both
- Clinical & bacteriological cure rates were statistically significantly higher for the topically treated groups (P < 0.05)



Esposito *et al:* Arch Otolaryngol HNS 1990

Antibiotic Delivery

From otorrhea fluid:

@1/2 - 2 hrs:
- N=17
- Mean: 1,569 mcg/g
- Range: 388-2849

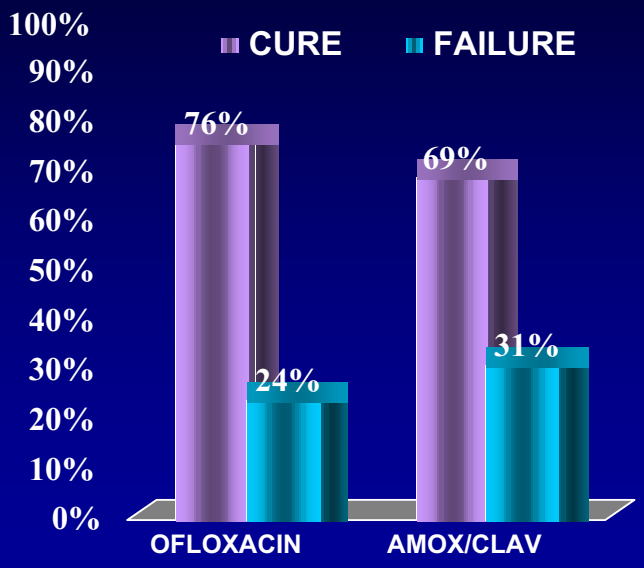
@3-5 hrs:
- N=16
- Mean: 262 mcg/g
- Range: 81-1099

- *Mucosa*
  - N=16 @ ≈1hr
  - Mean: 31.7 mcg/g
  - Range: 0-602

Ohyama et al: Arch Otolaryngol HNS 1999

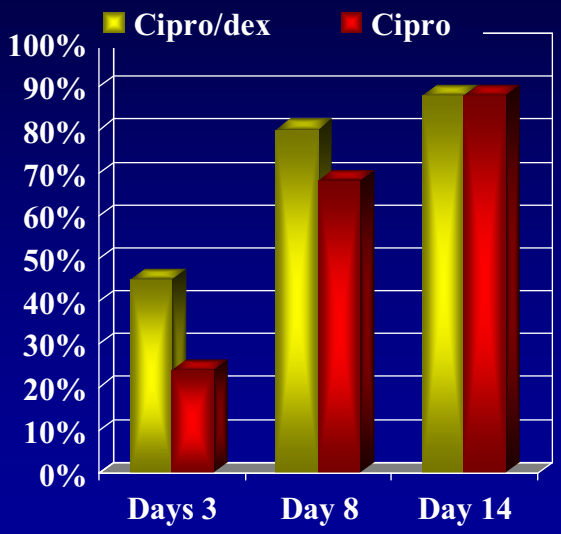
Tube Otorrhea

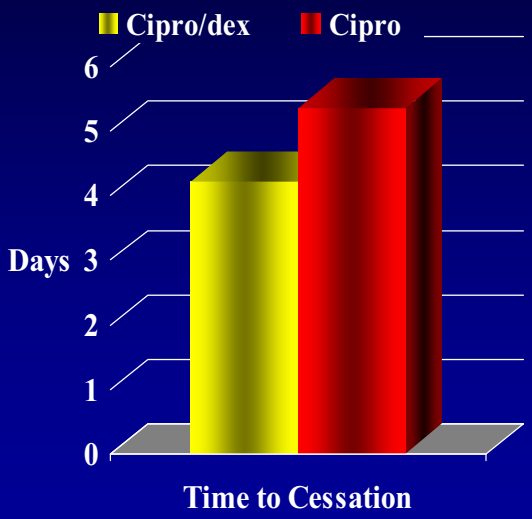
- N=140/146
- 1-12 yrs.
- Patent tube with otorrhea < 3 wks.
- All with P. aerug as sole isolate were excluded!



Goldblatt *et al. Int J Pediatr Otorhinolaryngol 46(1998)*

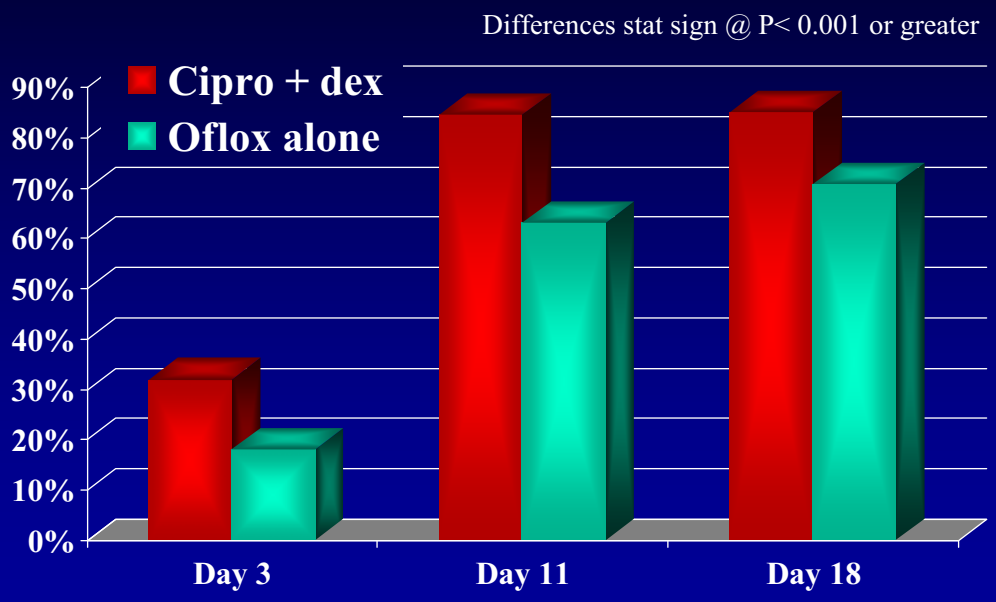
Steroids





Roland *et al* Laryngoscope Dec 2003

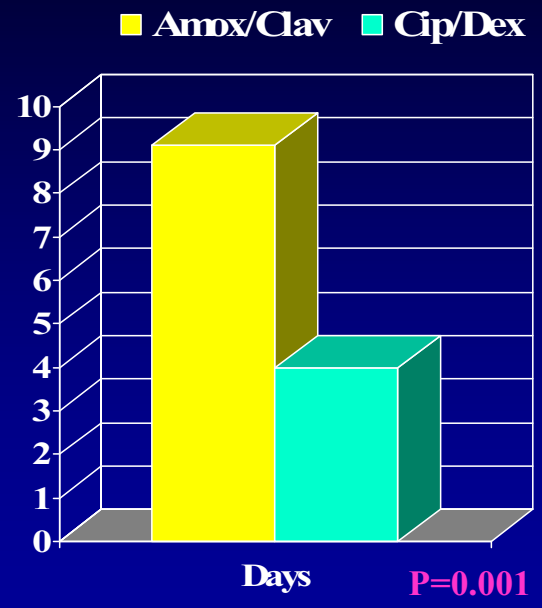
Time to Cessation of Otorrhea

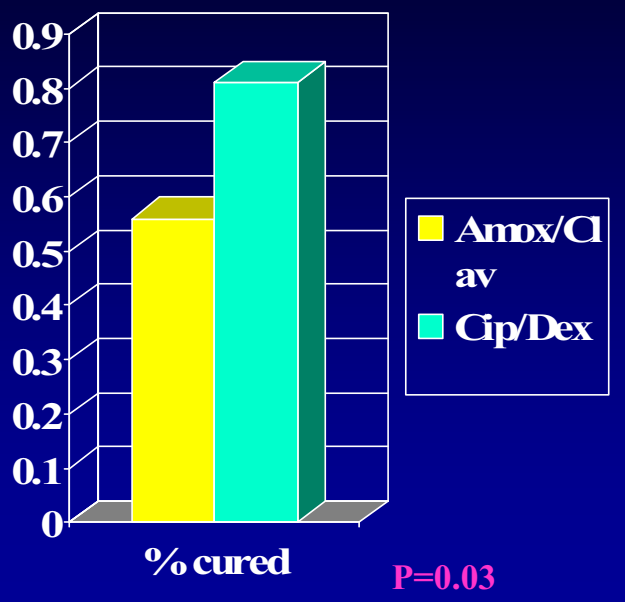


Absence of Otorrhea

Roland *et al* Pediatrics Jan 2004

Topical vs Amox/Clav





N=80 Ave age 1.88 yrs

Dohar *et al* Pediatrics *2006*

Why Do We Fail ?

Persistent Otorrhea

Subspecies identification using genetic analysis (ribotyping) of organisms cultured from failures demonstrated:

- 34/800 children had persistent otorrhea
- 17/34 were persistent infection
- 17/34 were re-infection

Roland et al Pediatrics 2004

Failure of delivery

- Administration
  - Wrong route
  - Compliance
  - Technique
    - Tragal pump
- Anatomic
  - mucopus
  - Granulation tissue
  - Mucosal edema
  - Sequestered nidus

Aural Toilet

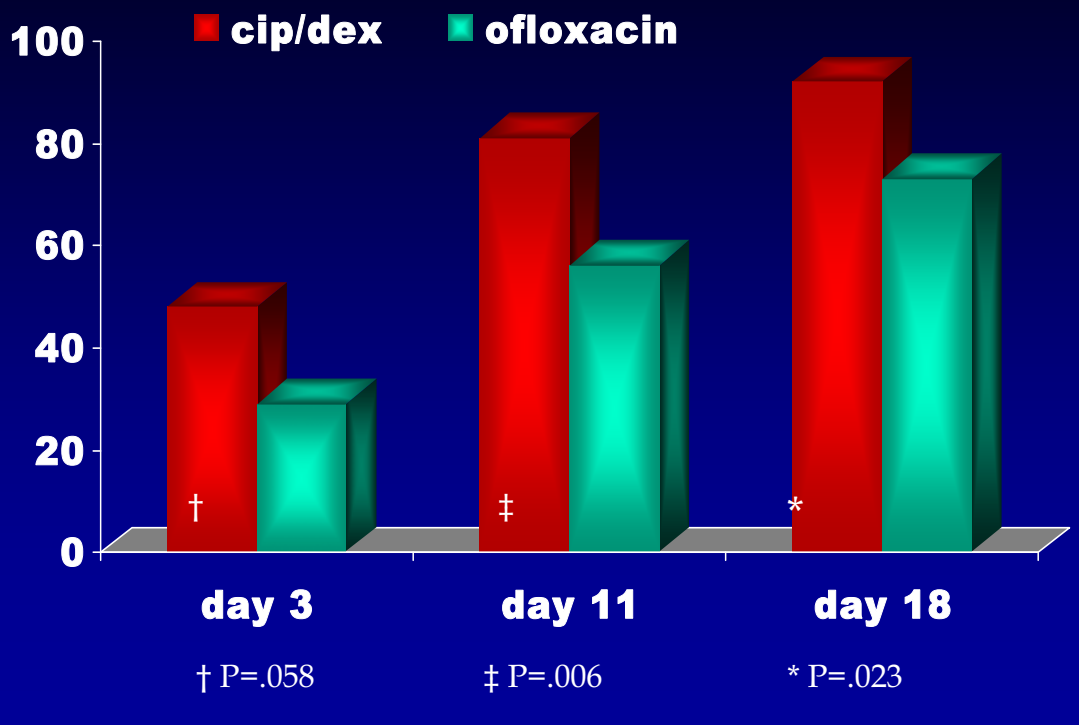
- **Aural Toilet**
  - **Dry mopping**
  - **Home irrigations**
  - **Office suction**

Control of Granulation Tissue

- *Anti-infectives*
- *Steroids*
  - limited "hard" data but opinion is overwhelming
  - more potent steroid preferred
- *Cautery*
  - silver nitrate most common
  - can produce injury

% Free of Granulation Tissue

N = 92



† P=.058 ‡ P=.006 * P=.023

Roland *et al* OTO-HNS March 2004

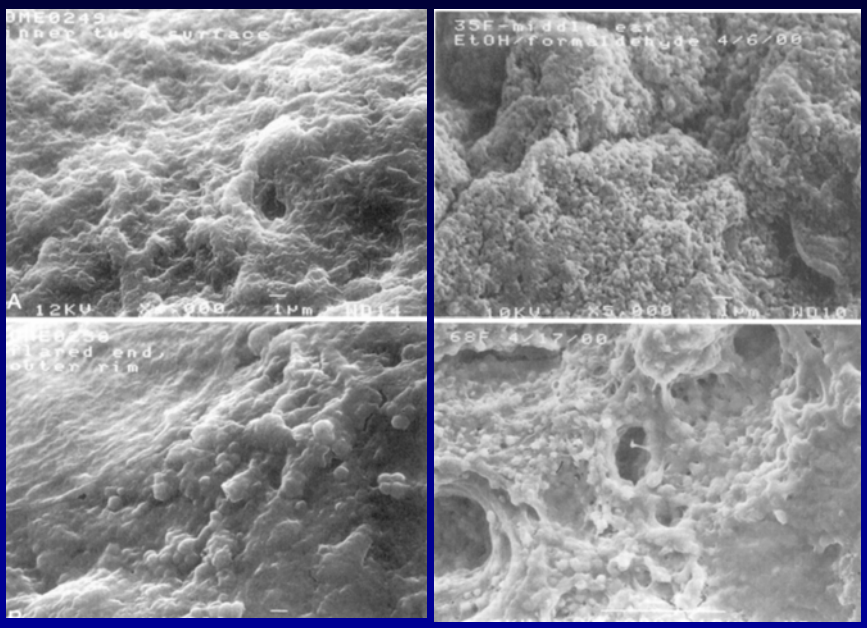
Control of Granulation Tissue

- *Debridement*
  - Office
    - especially polyps in the EAC
    - avoid avulsion, sharp techniques will avoid injury
  - Operative
    - middle ear and mastoid

Re-infection

- From EAC
  - Water ??
- ET reflux
  - Lack of middle ear “pillow”
  - Diease of NP, sinuses, adenoids?
- Immunologic defect

Tympanostomy tube



Tympanostomy tube **Chinchilla ME**

Post JC Laryngoscope 2001

Remove Tube ?

- Topical antibiotics
  - Drops/powders
  - Direct instillation
- ? Systemic antibiotics
  - Oral quinolones
  - IV aminoglycosides
  - IV cephalosporins

Questions?

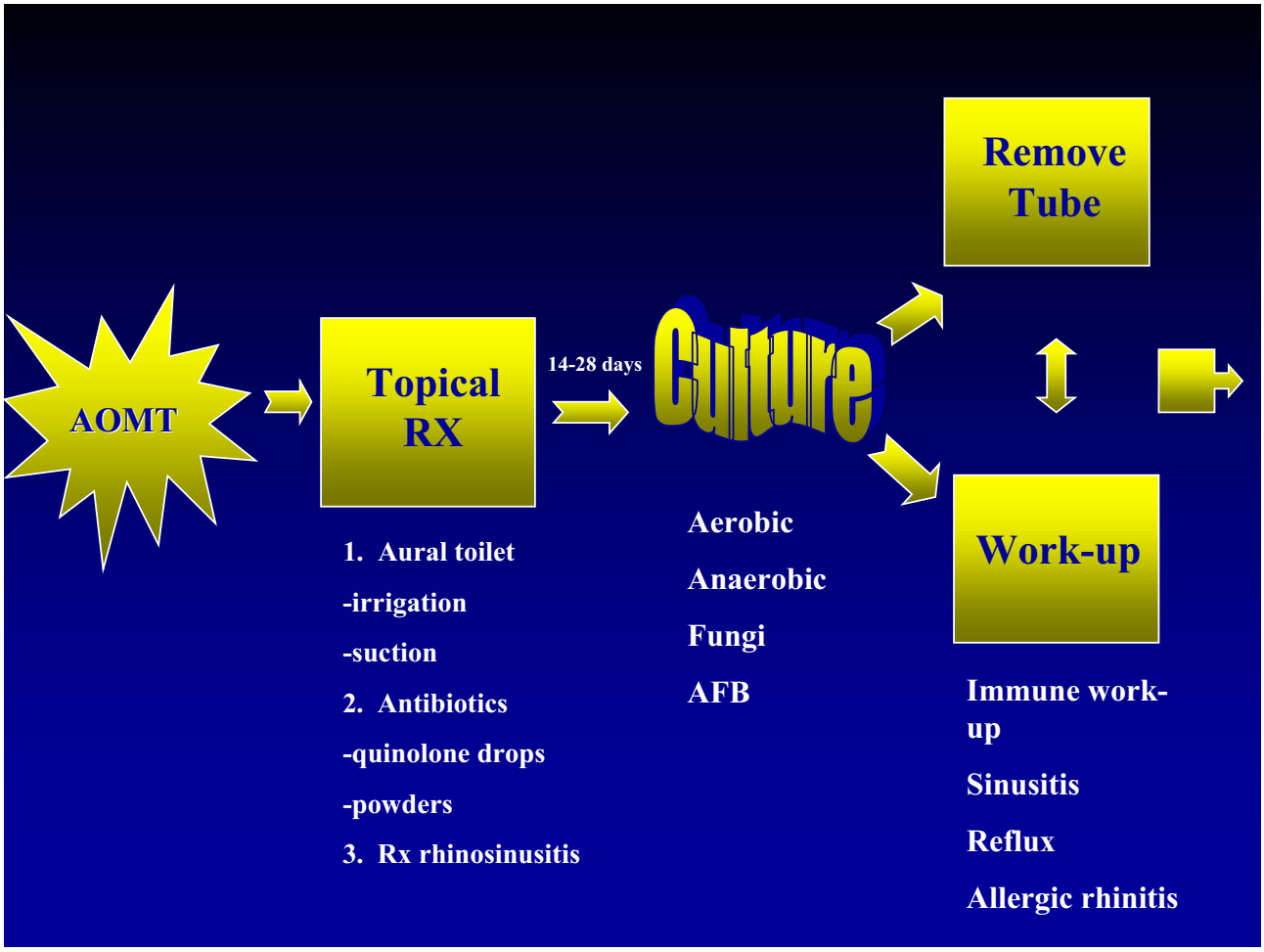
Alters environment

-Concentration of enzymes
  - Can erode mucosa/bone.
- Concentration of metabolic products
- Protection from fluctuations in environment
- Protection from antibiotics
  - Altered metabolism
  - Glycocalyx excludes antibiotics
  - Concentrates protective factors

CDC has recently stated that 65% of all clinical infections are caused by biofilms, including Otitis Media !!

Clinical

- Tympanostomy tubes
  - C. Post, Berry, Biedlingmaier and others have clearly shown that biofilms grow on tubes using SEM and fluorescent techniques
  - Surface characteristics of tube important
  - Post tympanostomy otorrhea one cause of CSOM


AOMT
Topical RX
14-28 days
Culture
Remove Tube
Work-up
1. Aural toilet
-irrigation
-suction
2. Antibiotics
-quinolone drops
-powders
3. Rx rhinosinusitis
Aerobic
Anaerobic
Fungi
AFB
Immune work-up
Sinusitis
Reflux
Allergic rhinitis