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Infection Control Part I: Why Audiologists Need to Do It

A.U. Bankaitis, Ph.D., Vice President, Oaktree Products, Inc.

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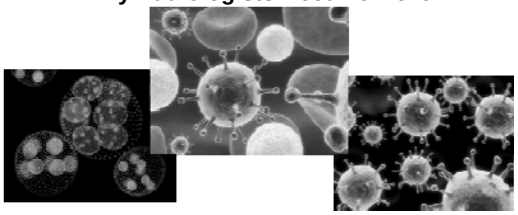
Infection Control I:

Why Audiologists Need To Do It



A.U. Bankaitis, PhD, FAAA
Vice President
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Objectives

- What is infection control?
- Why should you care?
- How to initially prepare?

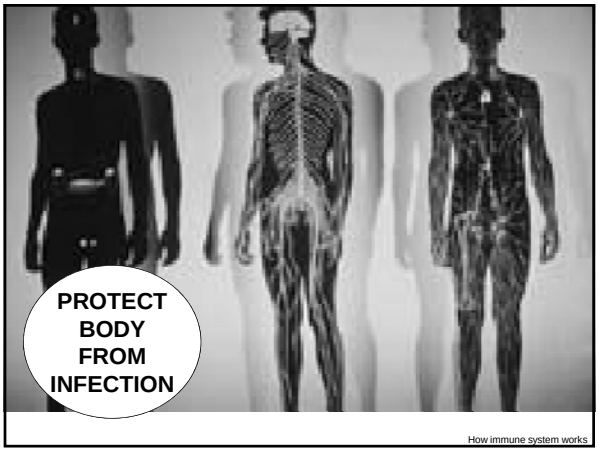
- What is infection control?

'….conscious management of the clinical environment for purposes of minimizing or eliminating the potential spread of disease'

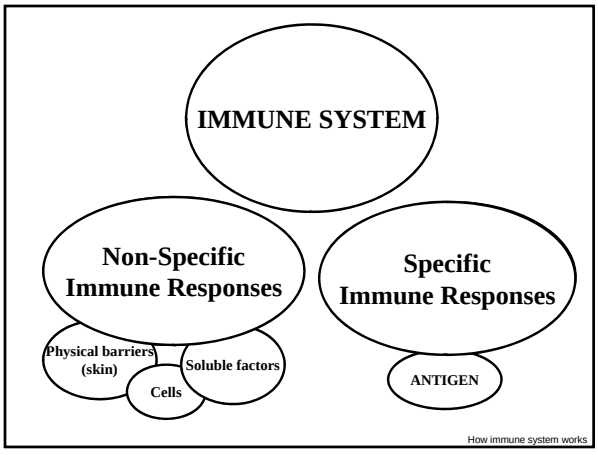
Bankaitis & Kemp, 2003, 2004

- What is infection control?
- Why should you care?
- What should you do?

- How immune system works
- HIV & immune system
- Lessons learned from HIV
- Applications to Audiology



How immune system works



How immune system works

IMMUNE CELL ASSEMBLY

- Bone Marrow
- Thymus
- Lymph Nodes
- Spleen, tonsils, adenoids, appendix, peyer's patches

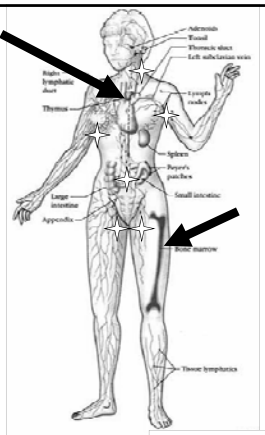


Image from: http://uhaweb.hartford.edu/BUGL/immune.htm#fluids

How immune system works

LYMPHATIC SYSTEM

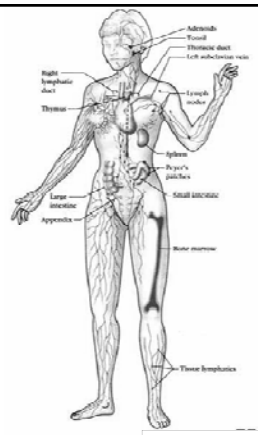


Image from: http://uhaweb.hartford.edu/BUGL/immune.htm#fluids

How immune system works

LYMPHATIC SYSTEM

- Network of vessels
- Channels lymph fluid to lymph nodes
- Directs lymph fluid toward chest
- Empties into bloodstream
- Reabsorbed by body tissues
- Redirected to flow through lymphatic system

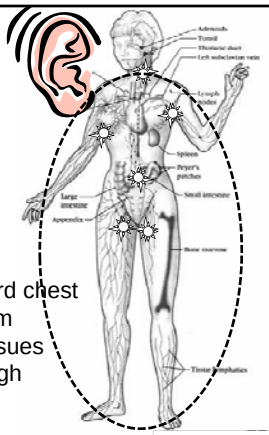


Image from: http://uhaweb.hartford.edu/BUGL/immune.htm#fluids

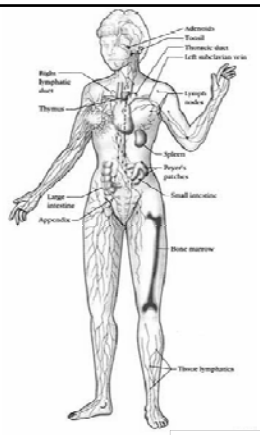
How immune system works

LYMPHOCYTES

Execute & manage all activities of the adaptive immune system

B-Cell

T-Cell



How immune system works

B-Cell

Lymphocytes

- Maturation process occurs within bone marrow
- Identify antigen
- Triggered to produce antigen-specific antibody proteins
- Antibody destroys antigen

ANTIGEN

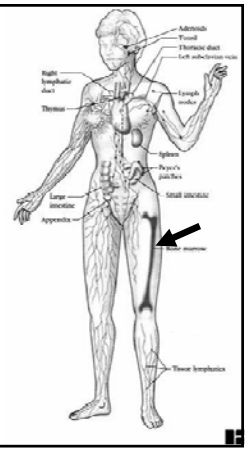
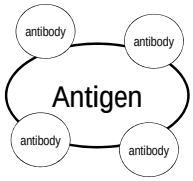


Image from: http://uhaweb.hartford.edu/BUGL/immune.htm#fluids

Humoral Immunity

Activation Signal

B-Cell



Bodily fluid = HUMOR

T-Cell

Lymphocytes

- Maturation process initiated within bone marrow
- Completed in thymus
- Several categories
- Detects antigen
- Destroys antigen

CD-4 T-Cell

Antigen

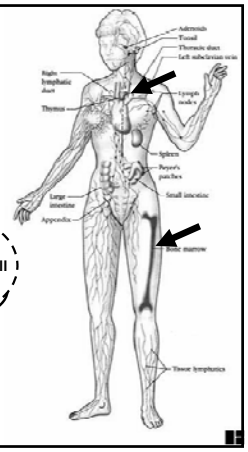
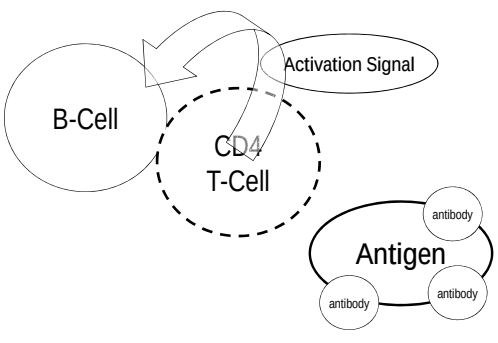


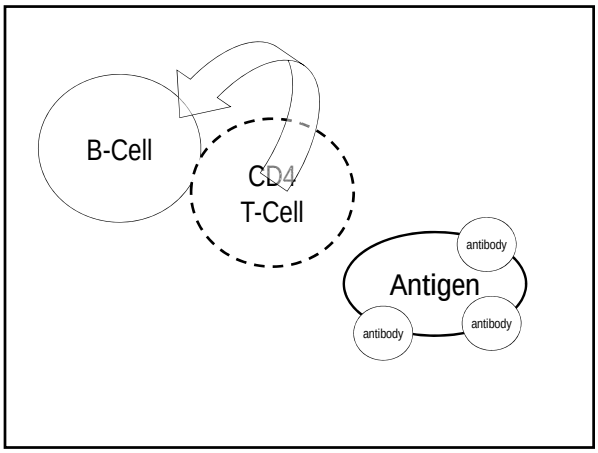
Image from: http://uhaweb.hartford.edu/BUGL/immune.htm#fluids

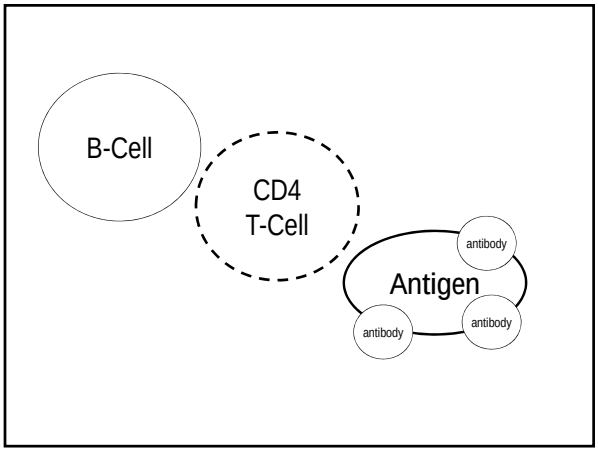
Cell-Mediated Immunity

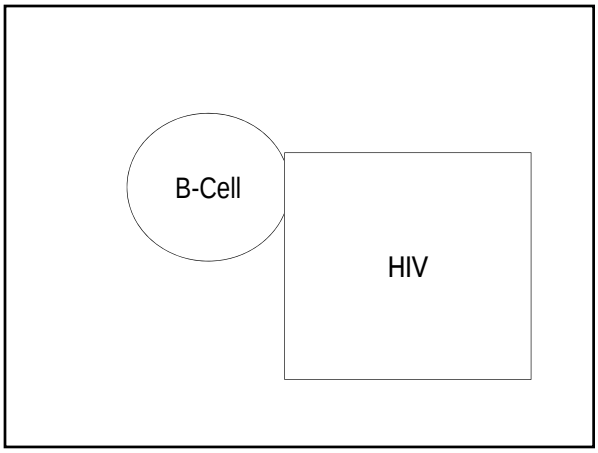
CD4
T-Cell

Antigen




B-Cell
CD4
T-Cell
antibody
Antigen
antibody
antibody


B-Cell
CD4
T-Cell
antibody
Antigen
antibody
antibody


B-Cell
HIV

HIV = catalyst of change

- Concern for cross-contamination
- OSHA enacts regulations
- Provide guidelines on minimizing exposure

Lessons Learned from HIV

H

Indeed we serve HIV patient population

V

OTOTOXICITY

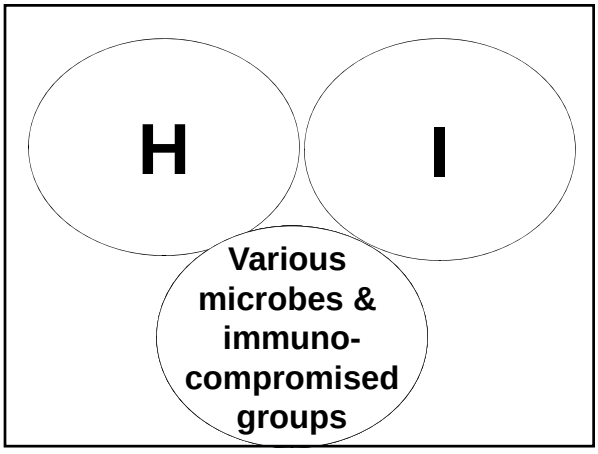
OPPORTUNISTIC INFECTIONS

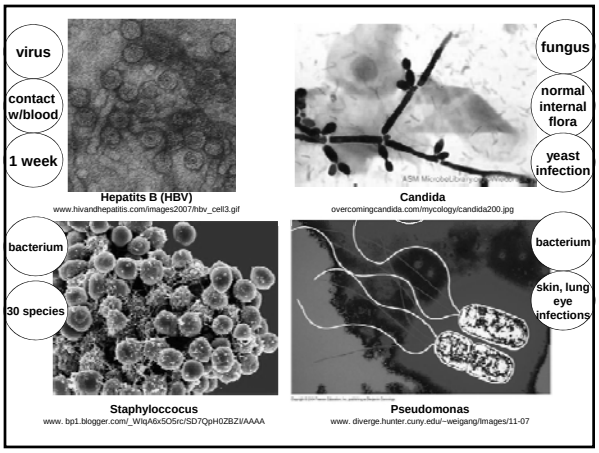
INDIRECT EFFECTS OF HIV

Indirect Effects

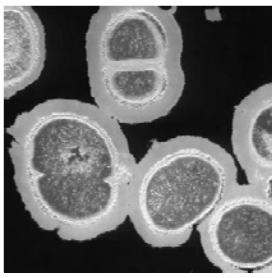
OPPORTUNISTIC INFECTION	HEARING LOSS
Candidiasis	
Pneumocystic/Streptococcal Pneumonia	SNHL from Bacterial Meningitis Conductive Hearing Loss from OM
Cytomegalovirus	SNHL
Cryptococcus infection	SNHL from Bacterial Meningitis
Toxoplasmosis	SNHL
Mycobacterium infection	Conductive HL from OM
Syphilis	SNHL
Staphylococcus aureus	Conductive HL from OM
Karposi's sarcome	SNHL
Herpes zoster	SHNL

Bankaitis, 1996





Methicillin-resistant Staphylococcus aureus (MRSA)



- Serves as IC reminder!
- Genetic mutation of staph
- Resistant to certain antibiotics
  - methicillin
  - penicillin
  - amoxicillin
- Not just nosocomial infection
- Transmission via direct or indirect contact

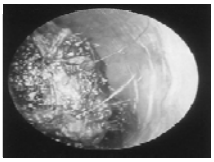
Why Should We Care?

Federal mandate

- OSHA federal regulatory body responsible for overseeing implementation of safety procedures in the work place
- Guidelines on how to reduce exposure to infectious agents
- Scope of practice dictates OSHA's jurisdiction
- Obligated to uphold federally mandated infection control standards

Why should we care?

- Federal mandate
- Contact with bodily fluids



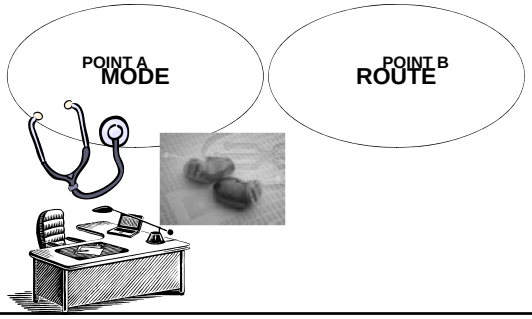
Images courtesy of Jean Courtois, M.D., Odense University Hospital, Denmark

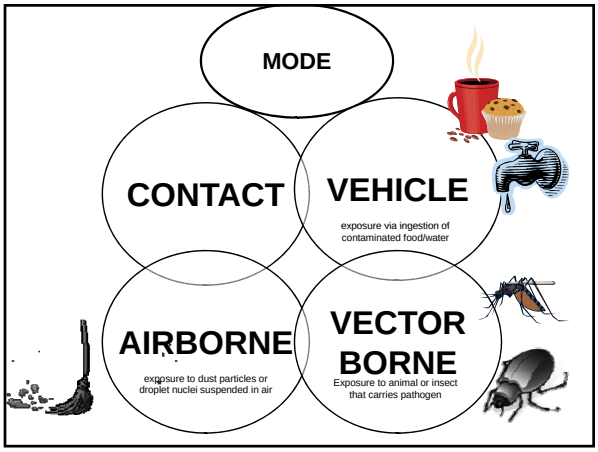
• Why Should We Care?

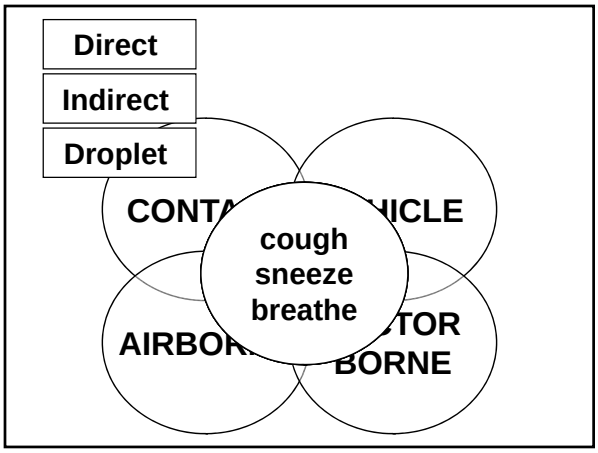
- Federal mandate
- Contact with bodily fluids
- Multiple Contact with Multiple objects & patients

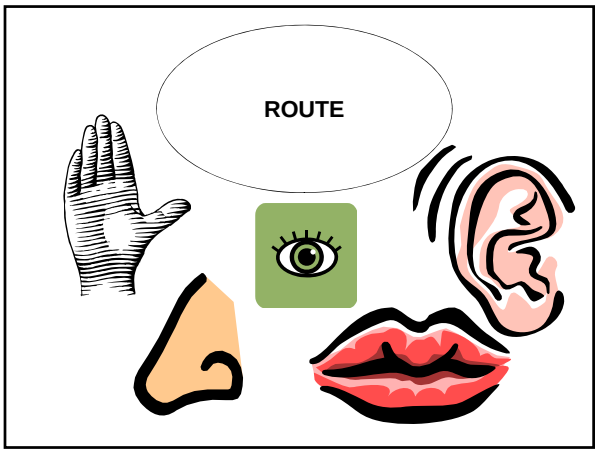
Increases potential for disease transmission!

MULTIPLE CONTACTS:
increased potential for microbial transmission









Why Should We Care?

- Federal mandate
- Contact with bodily fluids
- Multiple Contact with Multiple objects & patients
- **Opportunistic Infections**

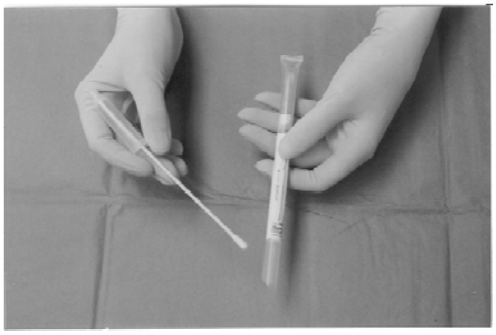
Why Should We Care?

- Hallmark of immunocompromise
- Originate from common place, ubiquitous organisms
- Take the opportunity to infect a body with a disabled immune system

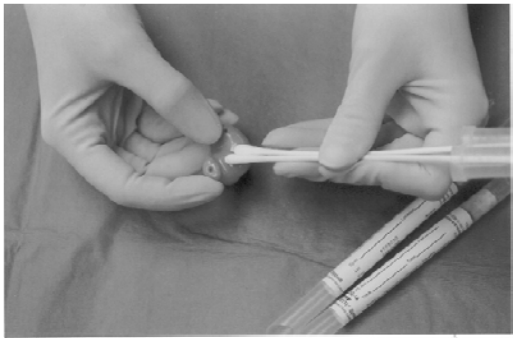
What is growing on your patients' hearing aids?

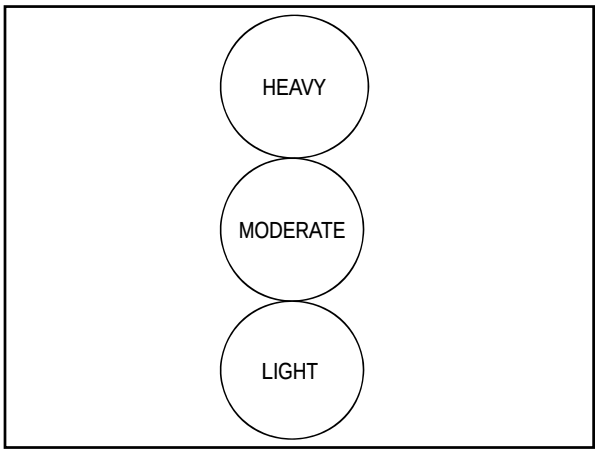
A.U. Bankaitis
The Hearing Journal
June 2002, Volume 55(6)

Specimen Collection



Specimen Collection





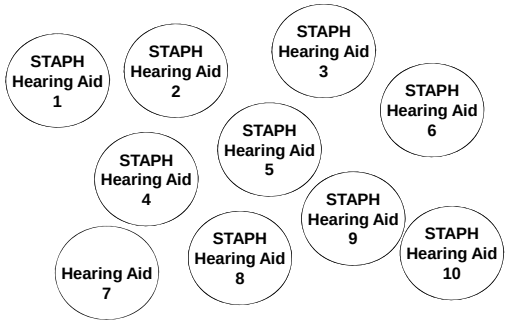
Results

HEARING AID	BACTERIA	FUNGUS
1-ITE	Staph (coag neg)	Aspergillus Flavus
2-CIC	Staph (coag neg) Acinetobacter lwoffi	Aspergillus Flavus
3-ITE	Staph (coag neg) Diptheroids	None
4-ITE	Staph (coag neg)	None
5-ITE	Staph (coag neg) Lactobacilli	None

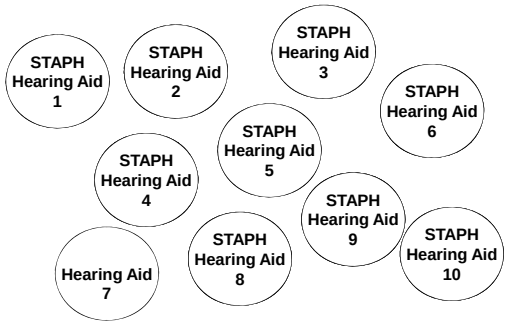
Results

HEARING AID	BACTERIA	FUNGI
6-ITE	Staph Capitis	None
7-CIC	Enterbacter Cloacae Pseudomonas Aeruginosa Enterococci	Candida Parapsilosis
8-CCA	Staph (coag neg) Bacillus Species	Candida Parapsilosis Unspecified Mold
9-CCA	Staph (coag neg) Bacillus Species	None
10-CIC	Staph Aureus Staph (coag neg)	None

Result Synopsis

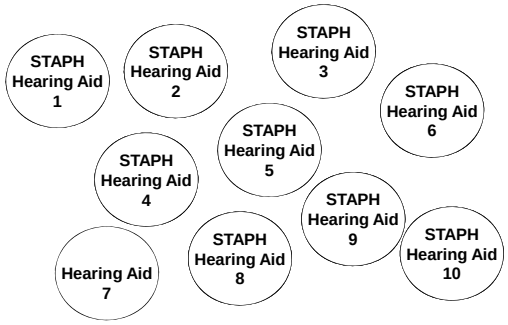


Other Bacteria Too!



Fungal Growth

F



FINDINGS NOT SURPRISING
ARE THESE FINDINGS SURPRISING?

- Finding of light to heavy amounts of microbial growth on hearing aids not surprising
- Normal flora of EAC
  - Coag Neg. Staphylococcus
  - diphtheroids
  - occasional fungal spores

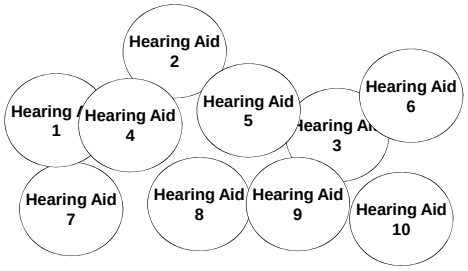
However….

- EAC more prone to microbial infection
- Efficacy of cerumen challenged for hearing instrument wearers
  - EAC is warm, moist environment
  - retains moisture
    - depletes acid ions from canal skin
    - raises surface pH to more neutral or alkaline levels
    - Creates environment more conducive to microbial growth
- Opportunistic Infections

Bankaitis, 2000

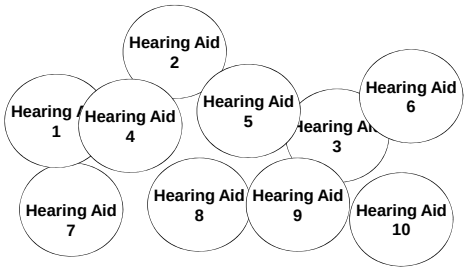
STAPHYLOCOCCUS

- Bacteria is ubiquitous
- Highest rates of nocosomial infection



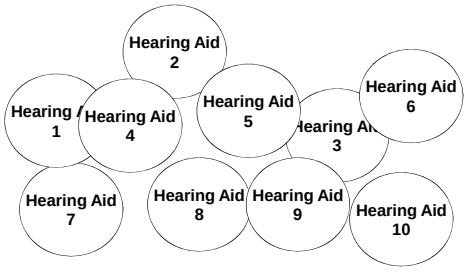
PSEUDOMONAS ARUGINOSA

- Lives in dead matter, highly virulent
- Otitis externa, malignant otitis externa



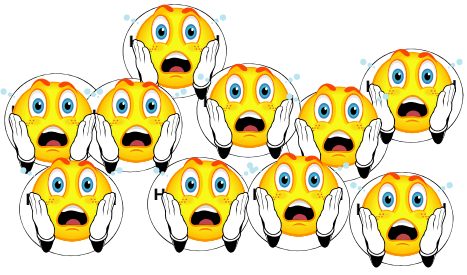
LACTOBACILLUS

- Isolated in large numbers in urine



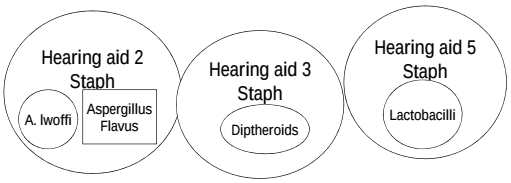
ENTEROBACTER

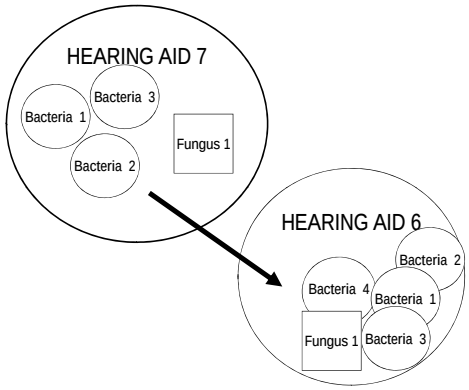
- Found in human feces



The real point

- Each hearing aid reflected a unique bacterial composition





What's STILL growing on your patients' hearing aids?

S. Sturgulewski, A.U. Bankaitis, D. Klodd, & T. Haberkamp
The Hearing Journal
September 2006, Volume 59(9)

How to Initially Prepare for Infection Control Plan Implementation

- **A**ssess scope of service

WHAT SERVICES DO YOU & YOUR STAFF PROVIDE?

Assess Scope of Services

WHAT SERVICES DO YOU & YOUR STAFF PROVIDE?

- Dispense Hearing Instruments
  - Earmold impressions
  - Hearing instrument fittings
  - Hearing instrument modifications
  - Hearing instrument listening checks
  - Electroacoustic/real ear measurements
  - Drop off service
  - Loaner hearing instruments/stock earmolds

Assess Scope of Services

WHAT SERVICES DO YOU & YOUR STAFF PROVIDE?

- Audiological Assessment
  - Otoscopy
  - Air conduction audiometry
  - Speech audiometry
  - Bone conduction audiometry
  - Immittance Audiometry
  - OAEs

Assess Scope of Services

WHAT SERVICES DO YOU & YOUR STAFF PROVIDE?

- Cerumen Removal
  - Mechanical removal
  - Suction
  - Irrigation
  - Cerumen softening agents
  - In the event of a bleeder

Assess scope of service

DEVELOP WORK PRACTICE CONTROLS

- Profession-specific procedures designed to reduce the likelihood of cross-contamination
  - Take list of services you provide
  - Create written procedure
  - Base procedure on Universal (Standard) Precautions

Universal Precautions

- Originally set in 1987 by CDC
- List of recommendations intended to reduce cross-infection
- Protect HCW from exposure to blood-borne pathogens
- Expanded to include all potentially infectious microbes

Standard Precautions

- Appropriate personal barriers (gloves, masks, eye protection, gowns) must be worn when performing procedures that may expose to infectious agents
- Hands must be washed before and after every patient contact and after glove removal
- "Touch" and "splash" surfaces must be pre-cleaned and disinfected
- Critical instruments must be sterilized
- Infectious waste must be disposed of appropriately

Take home messages

- Infection control requires consciously managing the clinical environment
- Important element of best practices for Audiology
- Requires preparation in the form of identifying scope of services prior to developing a written plan

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