Hearing is the most important sense

Ask an expert

Helen Keller

"I am just as deaf as I am blind. The problems of deafness are deeper and more complex, if not more important than those of blindness. Deafness is a much worse misfortune."

"Blindness separates us from things but deafness separates us from people."

The American Medical Association reports that hearing loss leads to:

depression
sadness
worry
anxiety
reduced social activity
emotional turmoil
insecurity
other problems

Hearing loss leads to:

- Alzheimer's disease
  - Mild HL – twice the risk
  - Moderate HL – three times the risk
  - Severe HL – five times the risk

- Johns Hopkins study of 639 seniors published in Archives of Neurology

Hearing loss leads to:

Dementia

Misdiagnosis of dementia

Misdiagnosis of mental deficit

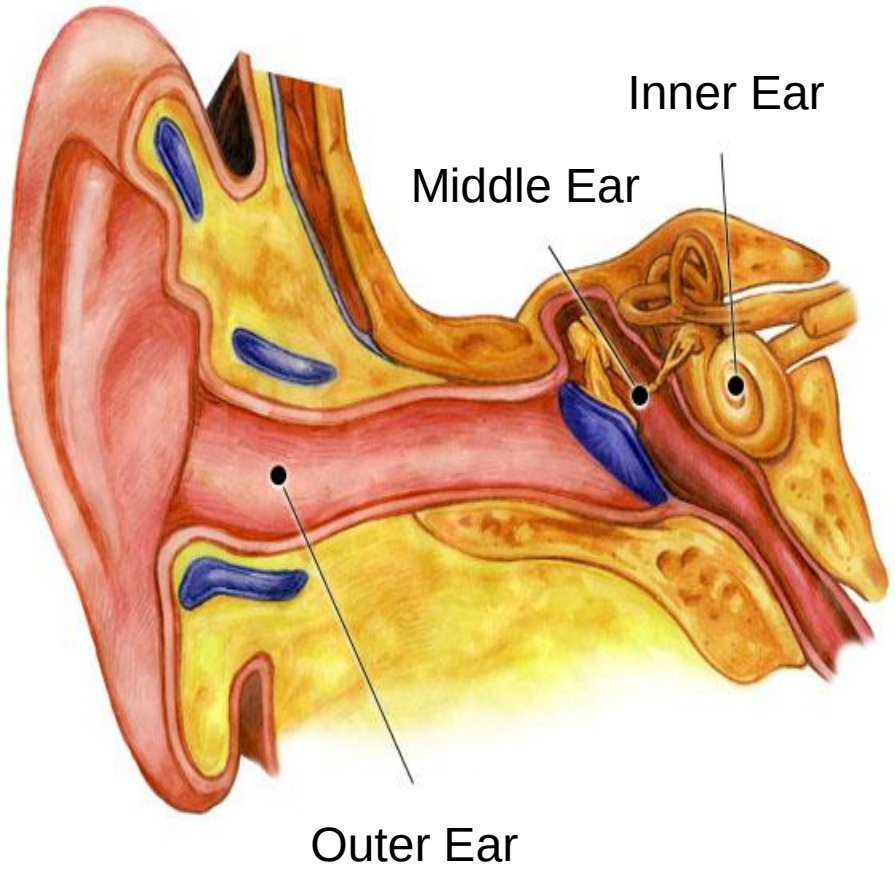
Hearing loss leads to:

- Memory loss even in mild cases
- 15 year study by Brandeis University funded by the National Council on

How we hear

The ear has 4 parts:

- Outer ear
- Middle ear
- Inner ear
- Brain

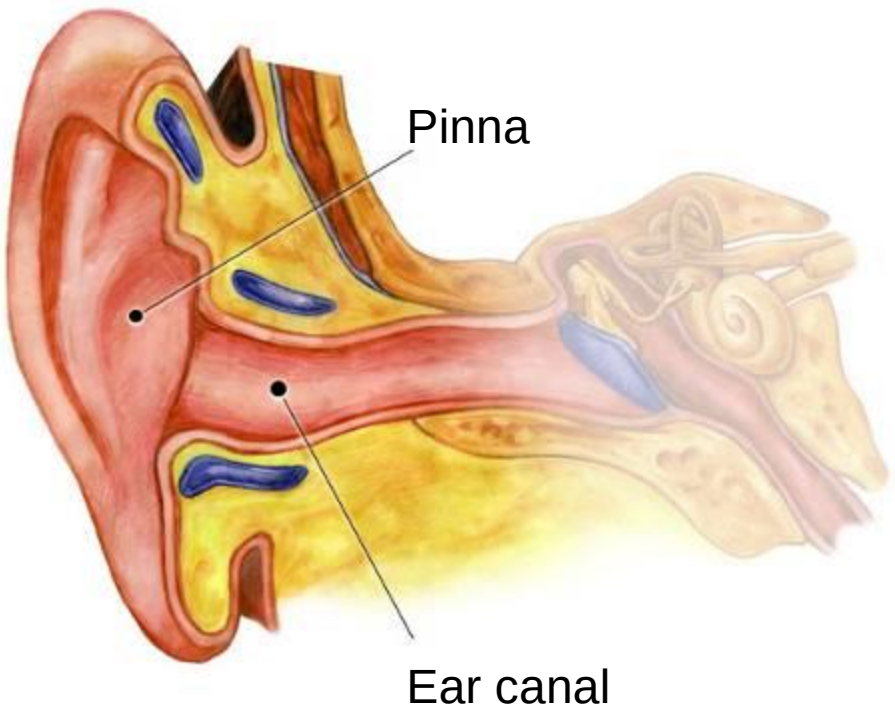


Each part has a special role that allows us to hear.

Outer ear

Sound is:

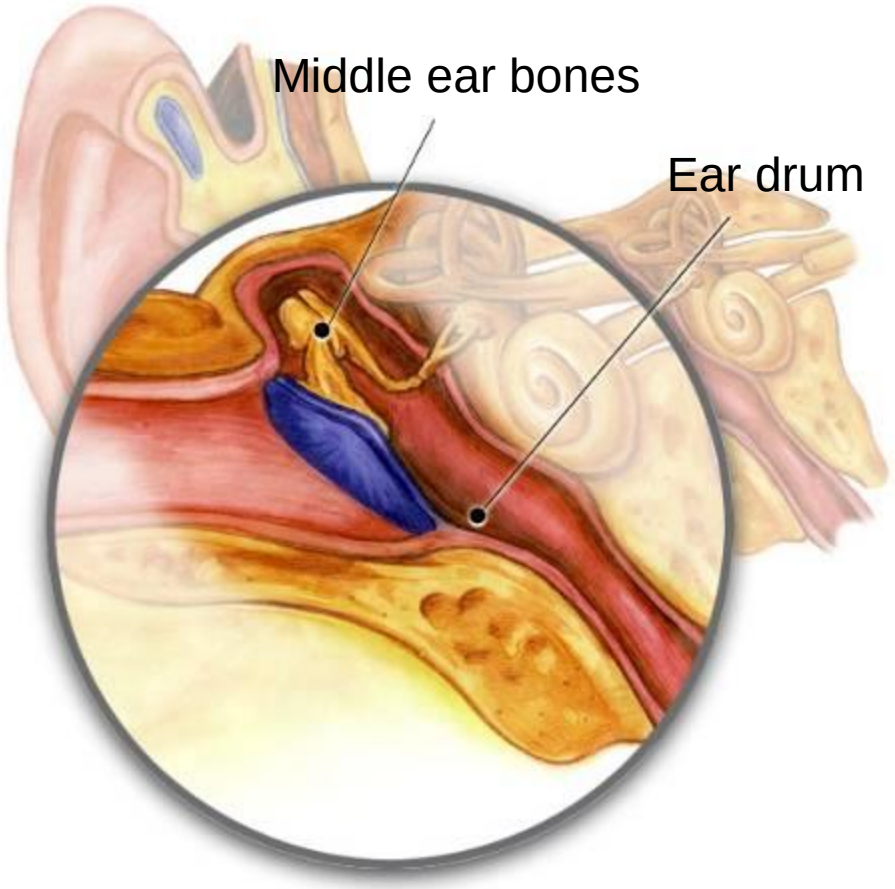
- Picked up by the outer ear
- Sent down to ear canal to the eardrum



Middle ear

Sound is sent down the canal to the eardrum

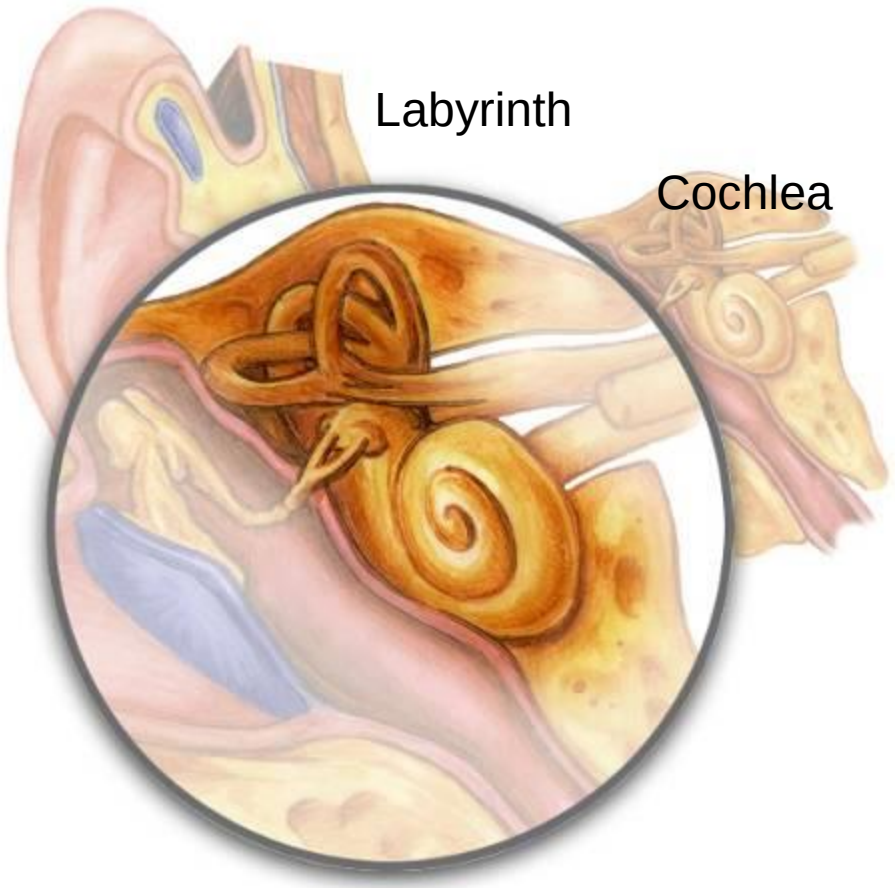
- Sound vibrations cause the eardrum to rock back and forth
- Three tiny bones in the middle ear send the sound vibrations to the inner ear



Inner ear

The inner ear contains 30,000 tiny nerve “hair “ cells

- Vibrations cause these hair cells to move
- Hair cells send signals to the brain through the auditory nerve

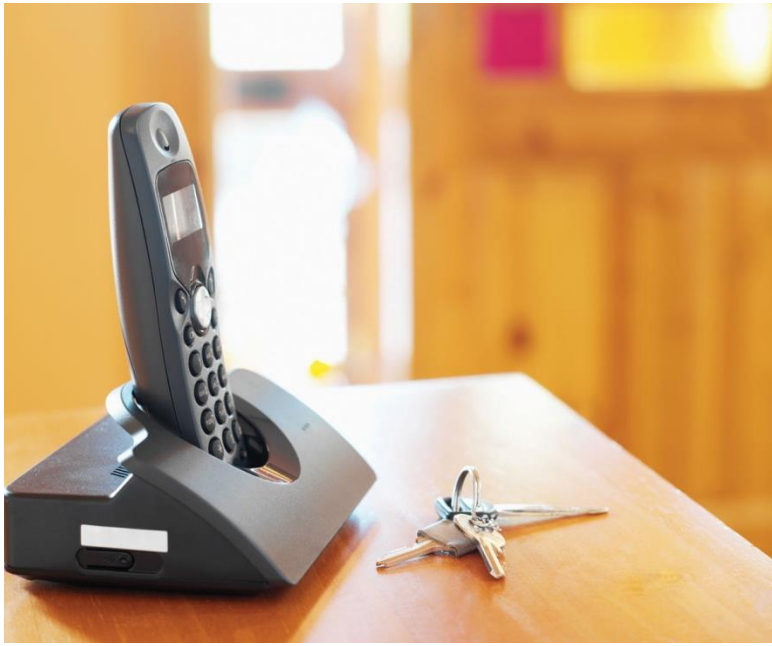


The most important part is the brain

- You hear with your brain, not with your ears.

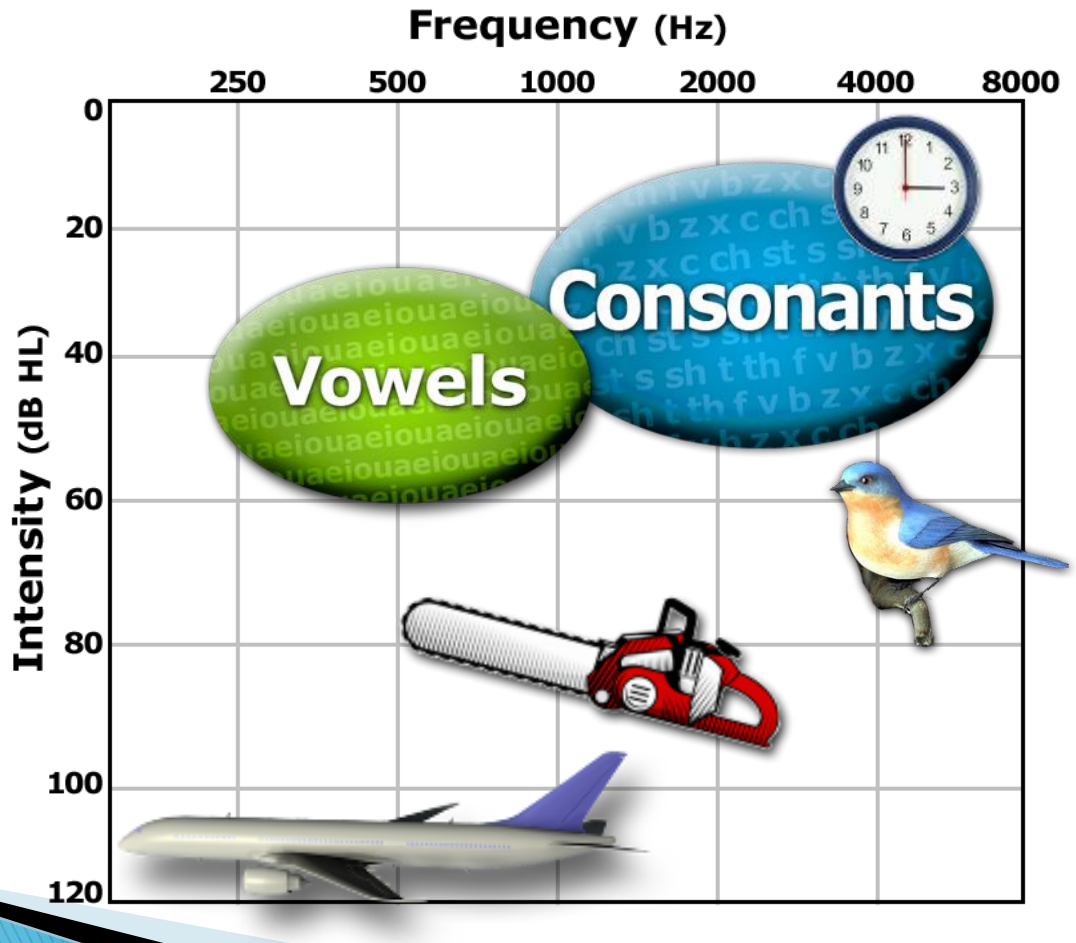
Signs of hearing loss

- People seem to mumble
- Others have to repeat
- Difficulty following conversations in background noise or in groups
- Children and women's voices are more difficult to hear
- Turn up TV or radio louder
- Cannot hear high pitched sounds such as birds, crickets and bells



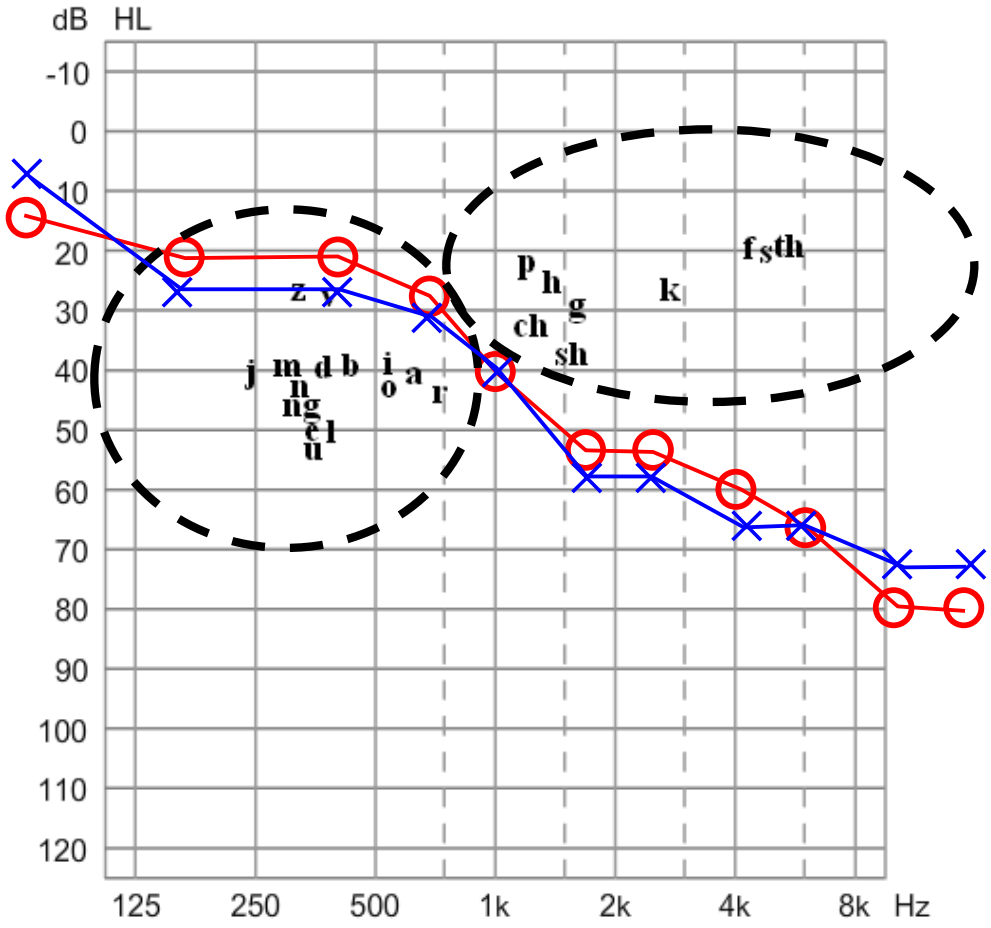
“I hear but I don’t understand.”

Speech looks like this



Sounds occur at different intensity (loudness) & frequency (pitch).

Sounds of speech



“I hear but don’t understand”

Most people with hearing loss have difficulty with high pitched sounds like “s” “sh” “f” and “t”.

- “oooo”, “ahhhh”, “oh”, “ay”
- “see” “she” “fee” “tee”

all sound alike

“I can hear but I can’t understand” because important sounds are missing.

A quick hearing test that anyone can do

- Repeat these words:
  - 1. speech
  - 2. path
  - 3. fifth
  - 4. cease
  - 5. fast

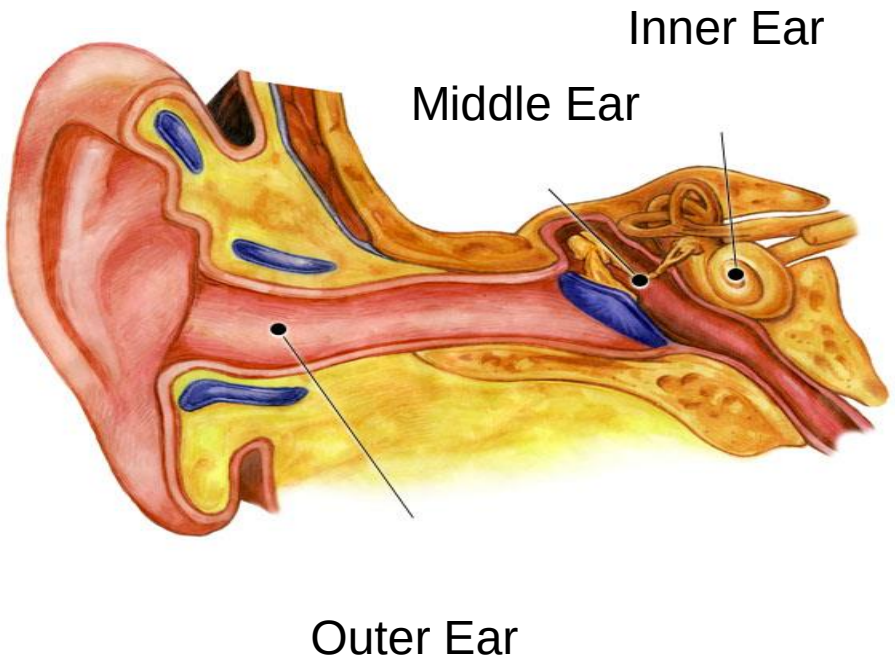
What does a hearing loss sound like?

- Let's hear a simulation.

Types of hearing loss

1. Conductive – loudness issue

Sound is blocked in outer or middle ear



Causes:

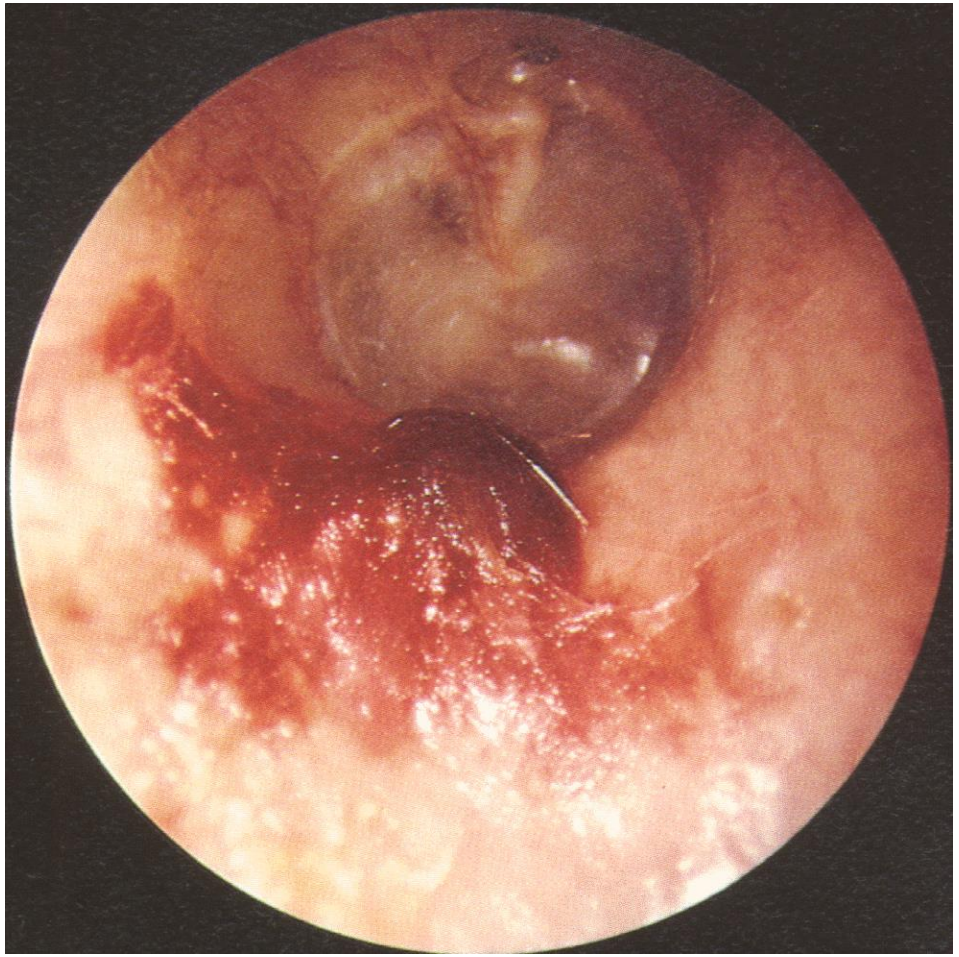
- Excessive earwax
- Damaged eardrum
- Ear infection or fluid in the middle ear
- Stiffness in the bones of the middle ear (otosclerosis)

Solution:

- Most often medically treated with high success
- Very successful with hearing aids if unable to treat medically

Swimmer's Ear

Hematoma- don't use swabs!



“Don’t stick anything in your ears smaller than……”

Earwax

- Very effective toxic germicide even diluted.

Earwax removal

- Curette
- Waterpick – very dangerous
- Vacuum – very loud
- Cerumenolytic – for hard cerumen
  - All commercial brands are 6.5% carbamide peroxide
  - *Anyone heard of ear candling?*

Why does seniors have earwax?

- The skin is drier.
- They do not move their mouths as much.
- Health care professionals should check for earwax whenever possible.

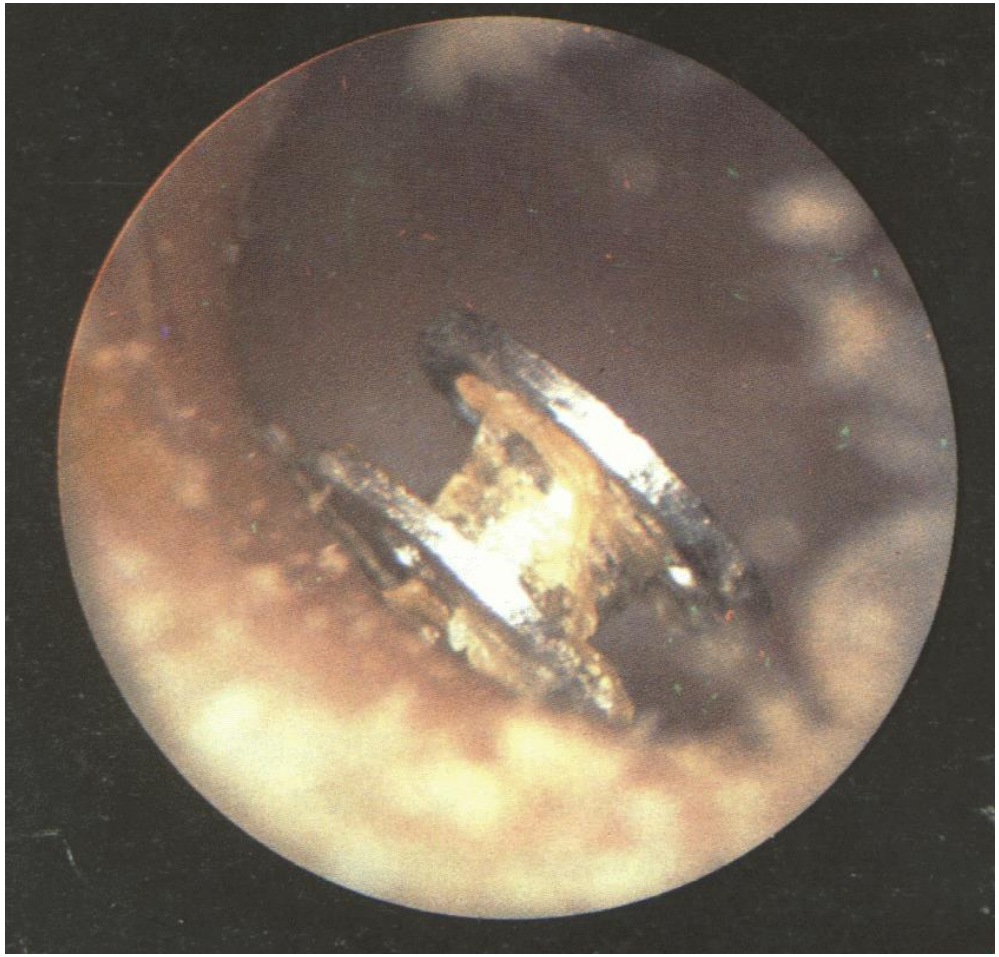
Middle Ear Parts

- Eardrum
- Three Bones (smallest in the body)
  - Malleus (Hammer)
  - Incus (Anvil)
  - Stapes (Stirrup)
- Air-filled cavity behind eardrum
- Eustachian tube

Otitis media

- Bacteria breed in hot, dark, wet places
- Fluid accumulation helps bacteria
- Eustachian tube swells shut
- Treatments: tubes and/or antibiotics
  - One million surgeries annually

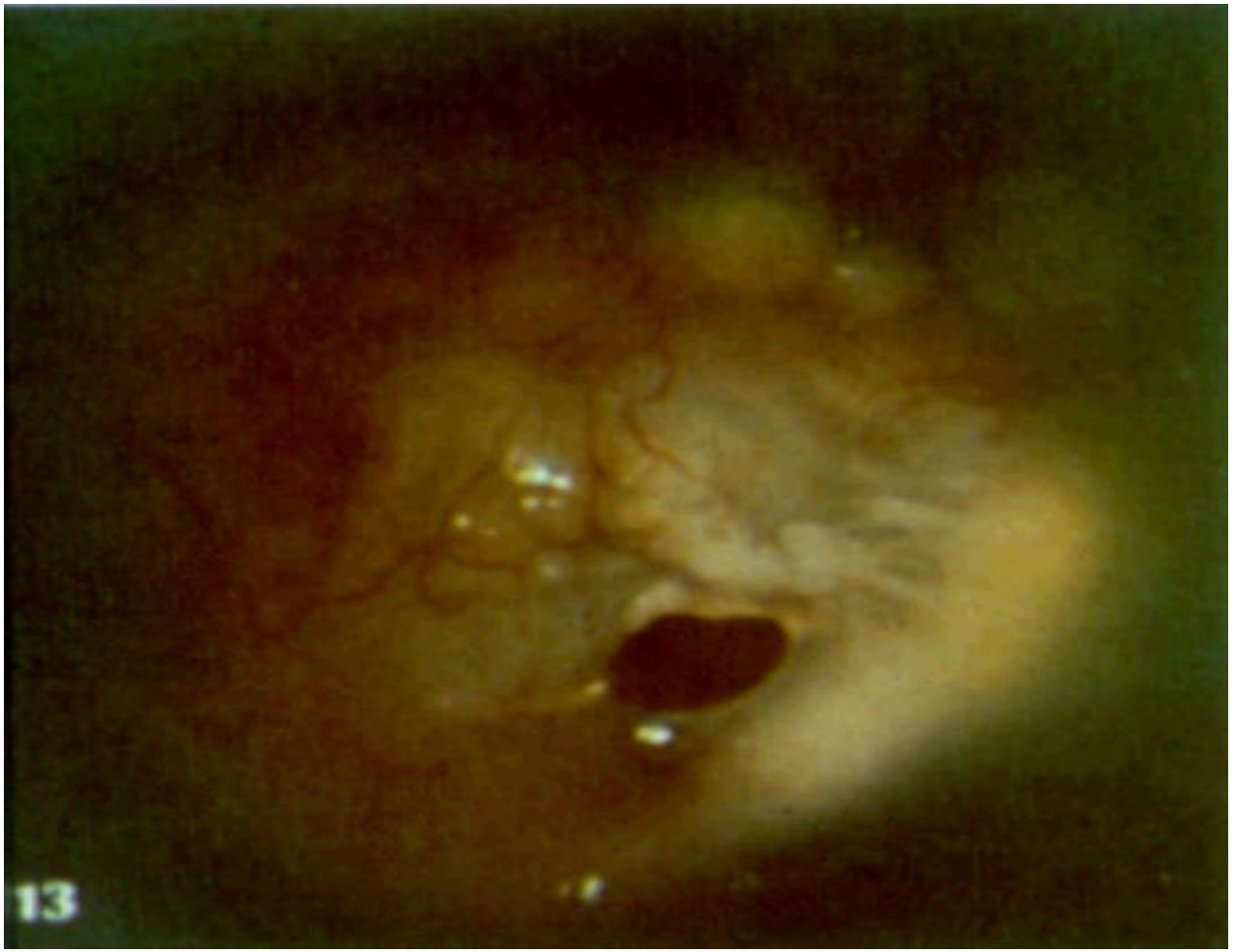
Extruded Tube



Perforated ear drum

- May heal with scar tissue
- Can be patched surgically
- Varying effects on hearing
- Don’t use swabs in the bathroom when your wife is around.

Perforated eardrum



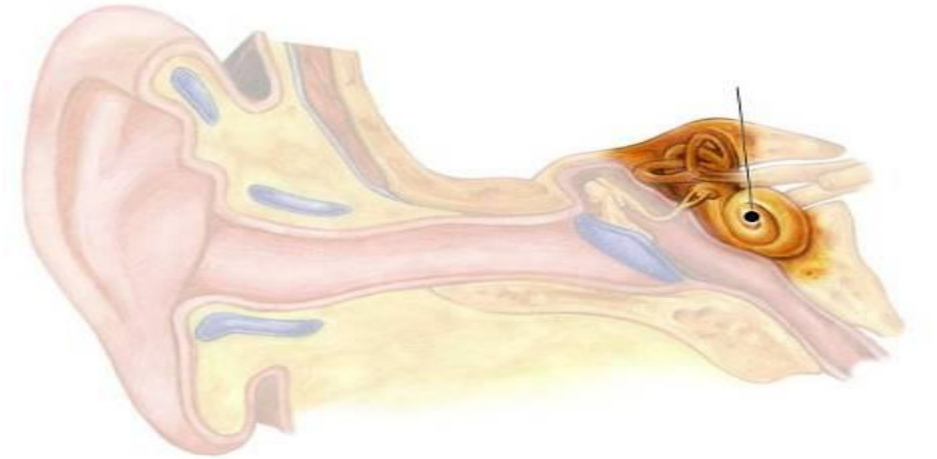
Eustachian tube dysfunction

- Equalizes pressure on each side of eardrum
- Never feed a baby on her back
- Can easily collapse or swell shut with infection or allergies

Types of hearing loss

- 2. Sensorineural hearing loss

- Inner ear hair cells or hearing nerve damaged and cannot send complete signals to the brain.
- Usual causes:
  - Aging
  - Noise exposure
  - Hereditary factors



Inner Ear

- Cochlea for sound
- Vestibule for balance
- The cochlea, vestibule, and brain are all connected and contain the same cerebrospinal fluid. Anything which enters the spinal cord or brain can enter the inner ear. Anything that enters the cochlea can enter the vestibule and vice versa.

Inner ear – cochlea

- Cochlea – hearing ("sensory" hearing loss)
- Sound vibrations cause nerve cell "hairs" to touch membrane causing nerves to send information to the brain by pitch and loudness
- 30% more nerve cells than needed for hearing (surplus kidney, liver, etc). Damage done at an early age may not appear until later in life.

Where causes this hearing loss?

- Aging (presbyacusis)
- Congenital
- Medications
- Toxins
- Noise trauma
- Infection
- Birth defects
- Genetics
- Sudden Sensorineural Hearing Loss (SSNHL)

Aging (presbyacusis)

- Good low pitch hearing
- Diminished high pitch hearing
- Usually good understanding if loud enough
- Poor word understanding with enough damage to inner hair cells, auditory nerve, or brain. Low % correct or bad guessing.

- Men typically have worse hearing than women regardless of background

Medication

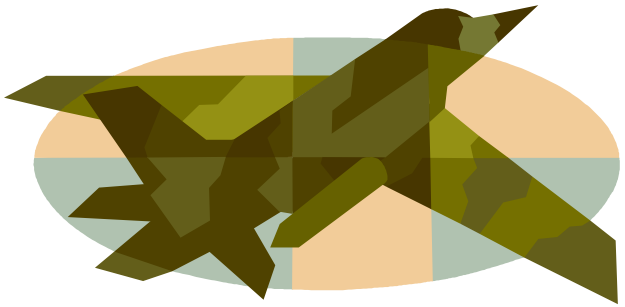
Medication

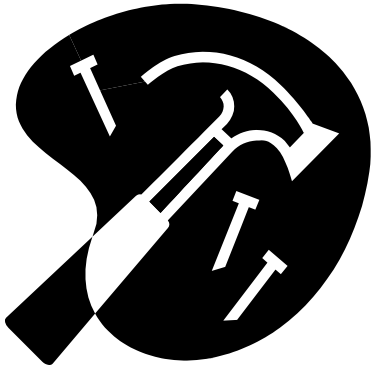
- At least 743 drugs damage hearing
- 2/3 of seniors take prescription drugs
- Women take more (anti-anxiety and mood elevation)
- Average senior takes 5 prescription drugs at a given time and fills 17 prescriptions per year

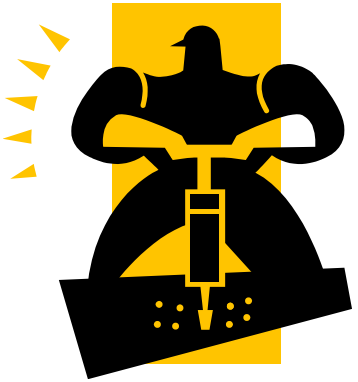
Potential causes of hearing loss

Occupational and environmental noise

Noise Trauma







Noise Trauma

- High frequency loss
- Can be one-time effect or long-term
- Historically has been military-related or industrial-related
- Noise trauma is now mostly recreational
- Often in middle ear (explosions)
- The 4th most common complaint of veterans of Iraq and Afghanistan is HL.

What is the most common source of hearing loss today?

Potential causes of hearing loss

Prolonged loud music

Recreational noise trauma

- iPods and personal stereos are damaging hearing
- 15% of all school-age children have a significant permanent hearing loss (up from 10% just 5 years ago)

Prenatal infections

- Rubella
- Cytomegalovirus
- Toxoplasmosis
- Hyperbilirubemia

Postnatal infections

- Meningitis
- Herpes simplex
- Toxoplasmosis
- Syphilis

Premature birth

- 3 – 10% of premies have hearing loss
- Some concern that loudness of incubators can cause HL

Diseases

- At least 50% of congenital HL are genetic
- Over 454 syndromes involve AVS
- Over 80% of syndromes involve hearing
- 80% of rare diseases involve AVS

Most common diseases with HL

- Diabetes
- Meningitis
- Multiple sclerosis
- Essential tremor (but not Parkinson's) have increased likelihood of HL
- Renal disease
  - Sodium build-up in cochlea damages nerve cells

Diabetes

- Diabetes- impeded blood flow to cochlea
- Connection to HL has been known since 1960s
- One recent NIH study found HL more than doubled in diabetics compared to non-diabetics (9% to 21%)

Meningitis

- Bacterial meningitis is the leading cause of acquired hearing loss.

Sudden hearing loss

- At least 1/5000 people
- Symptoms are stuffiness in ear, tinnitus, vertigo
- 50 times greater in health professions

Treatments

- Need intervention within 7 – 10 days!!!
- 50% of cases recover to near normal state
- 70% recover if treatment starts within 10 days
- 25% recover if treatment starts after 10 days
- Unlikely to recover if vertigo is present or hearing loss is profound

Unilateral hearing loss problems

- Determining direction
- Understanding in noise

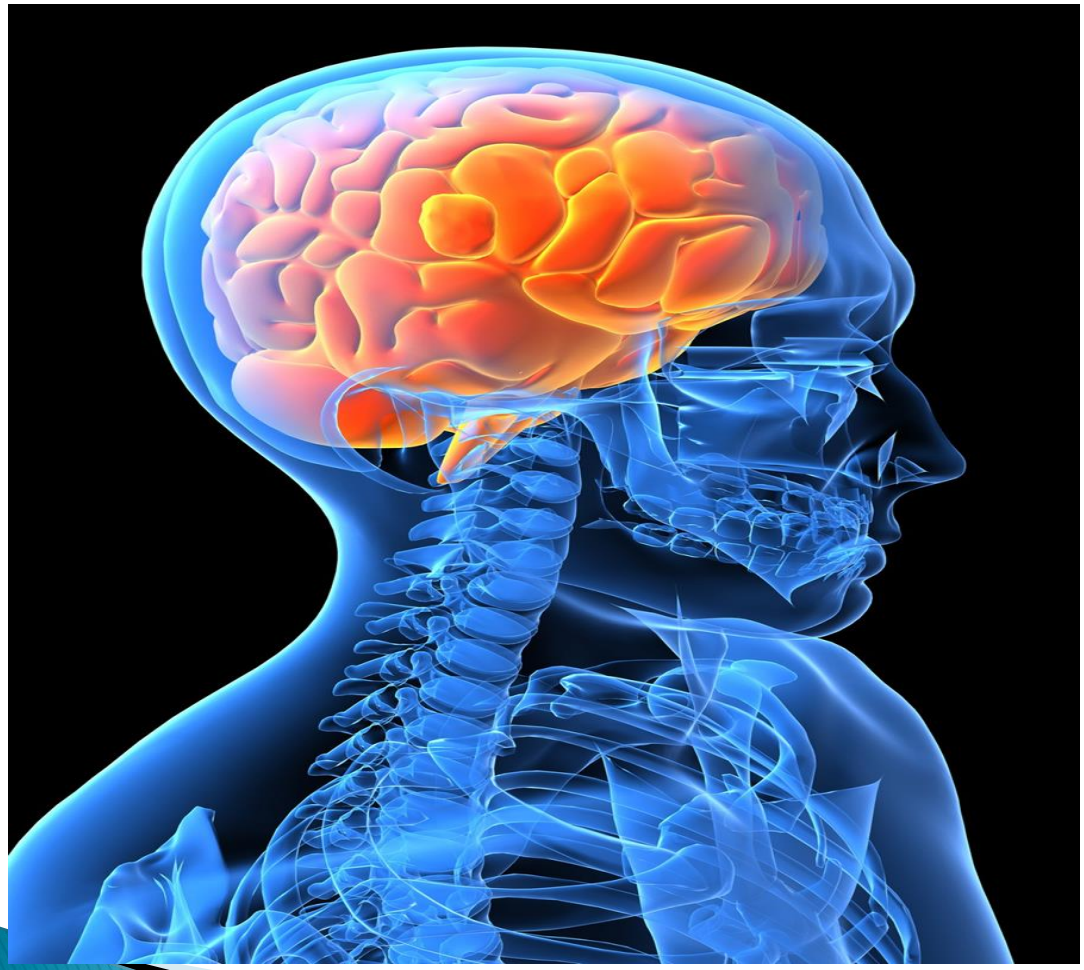
2 most common balance issues

- Benign Paroxysmal Positional Vertigo (BPPV)
  - Most common source of vertigo in elderly
  - Otoliths dislodge and migrate in vestibule
  - Easily treated by an audiologist
- Meniere's disease
  - Affects 1% of general population

Auditory nerve damage

- Connects cochlea to brain
- Acoustic neuroma is a benign tumor on auditory nerve, removed by surgery
- Do hear aids help this type of hearing loss?

You hear with your brain



Auditory centers in brain

- Poor word understanding even at a loud level can be caused by:

- Multiple sclerosis
- Stroke
- Tumor
- Meningitis
- Epilepsy
- Migraine

What is his problem?

TINNITUS

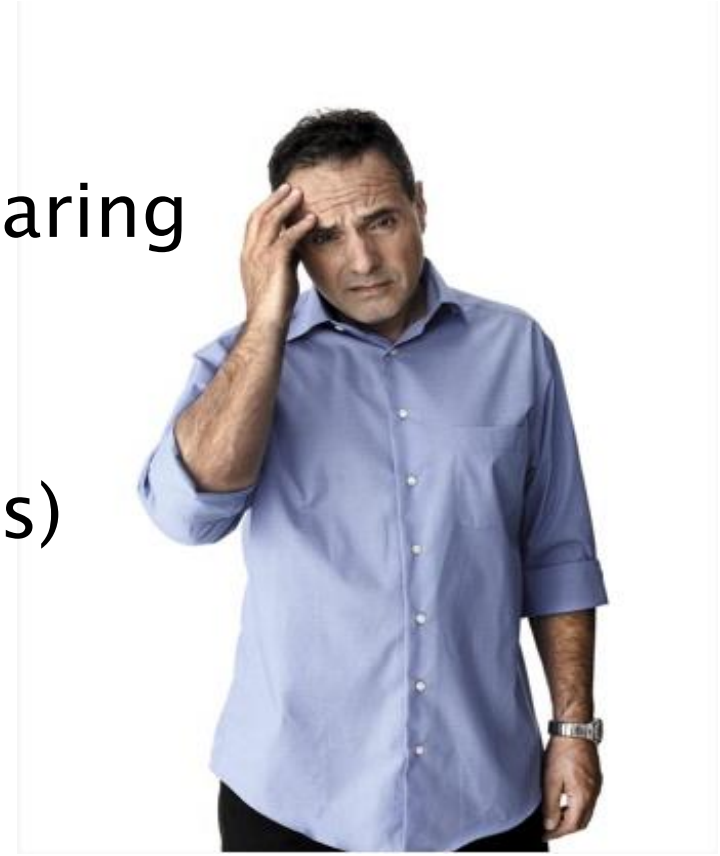
Tinnitus is the perception of sound (ringing, buzzing, humming, hissing, roaring) within the ear or head that does not have an outside source.

Tinnitus

Tinnitus is a symptom of something…it is not a disease or condition

Side-effect of damaged hearing

It is not really there
(except for some rare cases)



Tinnitus sounds like…

- Ringing
- Chirping
- Clicking
- Pulsating
- Continuous
- Sudden

Tinnitus treatments

- Hearing aids
- Hearing aid tinnitus program maskers
- Drugs
- Decrease stress
- Vasodilators increase blood flow to cochlea
- Cognitive therapy

- *No evidence that anything works*

Auditory hallucinations (Paracusia)

"Phantom perception of music or distorted voices"

- Any voices present do not command action
- Usually women

So……

?

What is the best treatment for most hearing losses?

Great! I get hearing aids!

- They sure are cheap.
- Medicare pays for them.
- I get to hear like I was 16 years old again.

Sources of hearing aids

- DARS
- VA
- Some insurance plans
- Audiologist

People generally do well except:

- Poor word understanding
- Wrong hearing aids or audiologist
- Quit

Size and style

Behind the ear (BTE)

Mini behind the ear (BTE) with thin tube

In the ear (ITE) full shell

In the ear (ITE) half shell

In the canal (ITC)

Completely in the canal (CIC)

ReSound Unite™ wireless accessories

ReSound Unite™ Phone Clip

ReSound Unite™ TV

ReSound Unite™ Remote Control

Receiver-in-canal ("RICs")

Discreet RIC

- Ultra-small RIC capable of fitting severe losses
- Rechargeability option
- Wireless connectivity
  - Many different colors with Siemens color exchange kits
- Innovative features

Pure Family Accessories

Note: eCharger is not an option for Pure SE

Nitro SP Color Options

Remote Controls

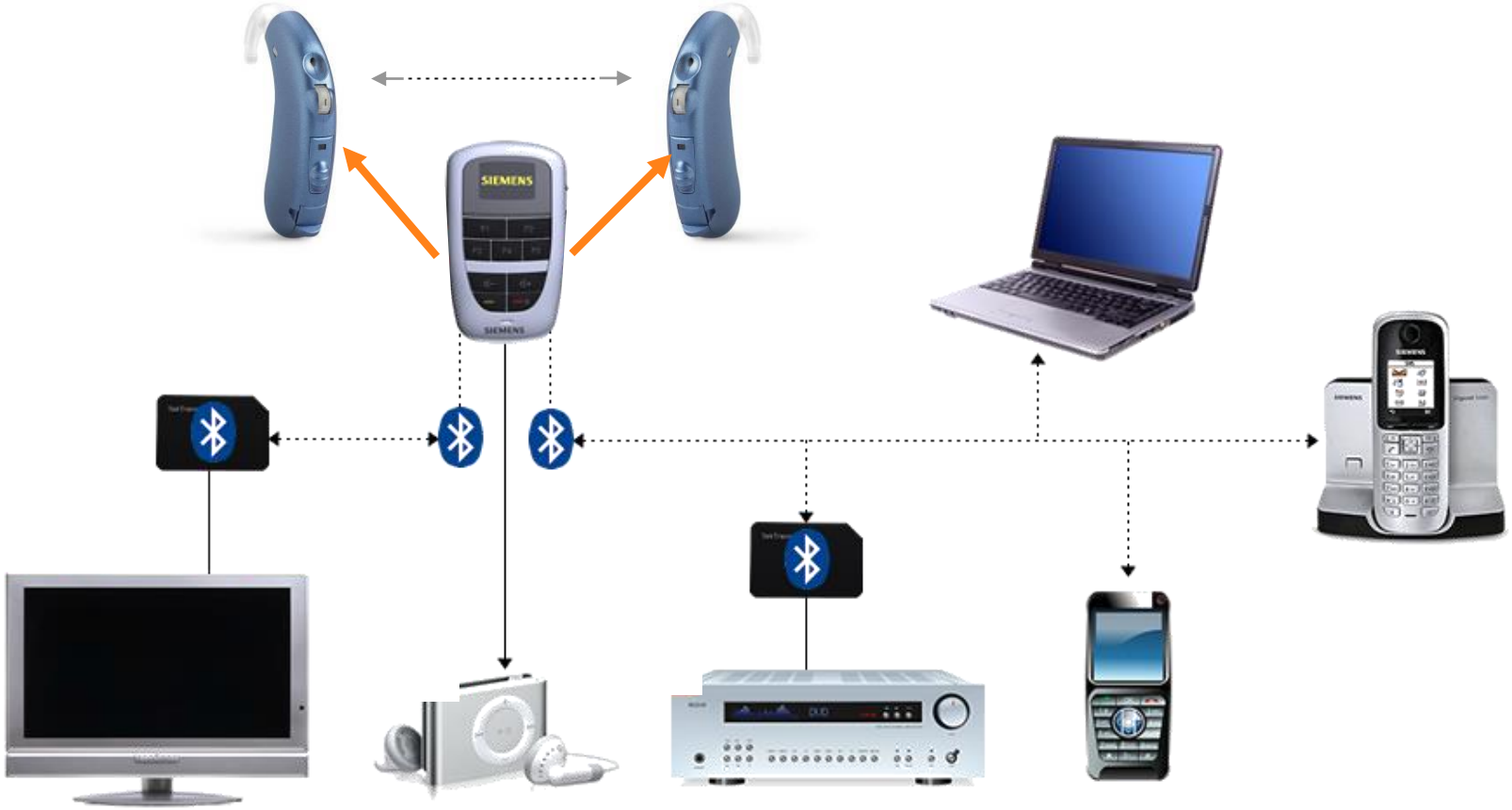
miniTek

Tek

ePen

ProPocket

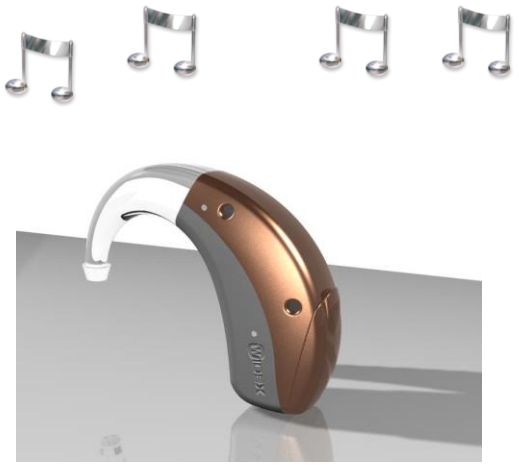
Tek Wireless Enhancement System



Zen for tinnitus

Zen is a listening program that plays continuous chime-like tone complexes using fractal technology.

- Based on the qualities of music that are most relaxing
- Can be modified for individual taste
  - 5 different Zen tones + broadband noise option
  - Can modify:
    - Tempo
    - Pitch
    - Loudness
  - With or without amplification



www.usa.siemens.com/hearing

(800) 766 - 4500

Are all hearing aids the same?

Hearing aids range in:

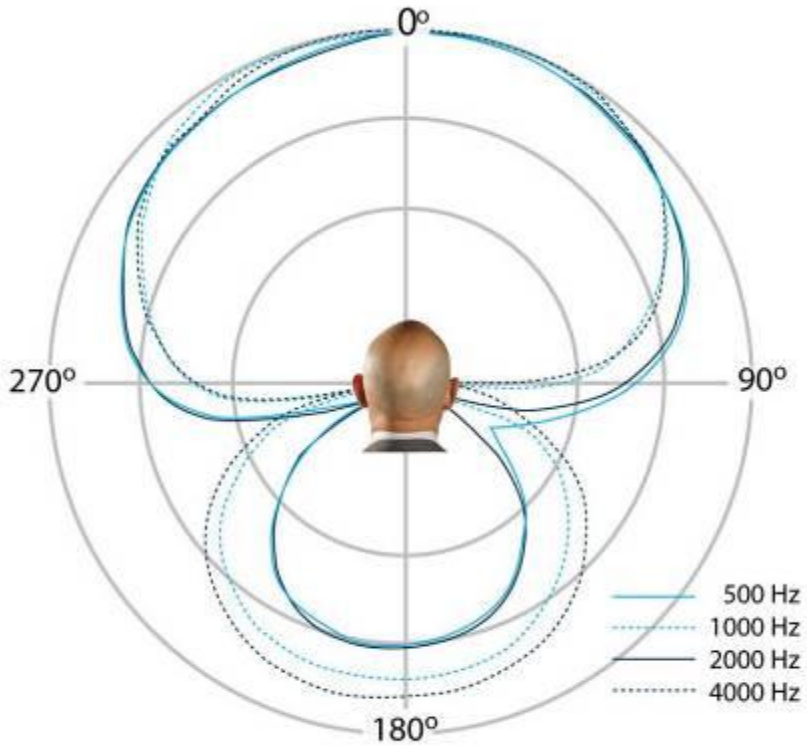
- Size and style
- Technology
- Flexibility
- Effectiveness within a noisy environment

All of the above affect

Hearing in noise:
directional microphones

Directional microphones

- Sound from the front is enhanced – face to face conversations are amplified
- Sound from behind is reduced – noise is suppressed



Directional microphone

Thank you for listening

Any questions???