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How the Ear Works & Hearing Loss

The ear is responsible for hearing and balance. In conjunction with our other senses, hearing is crucial for making us aware of and being able to participate in our surroundings.

The ear is made up of three main parts; the *outer*, the *middle* and the *inner* ear.

The Outer Ear

The outer ear is the 'sound collector'. Sound waves enter the outer ear canal and cause the eardrum to vibrate. The eardrum is connected to a chain of three tiny bones called the *ossicles*. The ossicles are part of the middle ear.

The Middle Ear

The middle ear is the 'sound transporter'. The middle ear intensifies the energy of sound vibrations and delivers this

sound to the *cochlea*. The cochlea is part of the inner ear.

The Inner Ear

The inner ear is 'hearing and balance'. Inside the cochlea there are over 10,000 'hair cells' and each one is sensitive to a specific frequency and intensity of sound. The hair cells are moved by the sound vibrations entering the inner ear. This movement causes the hair cells to generate electro-chemical signals and these signals can then travel along the hearing nerve to the brain where they are recognised as sound.

Hearing Loss

There are three types of hearing loss; *conductive*, *sensorineural* and *mixed* hearing loss.

Conductive Loss

Conductive loss is

caused by problems in the outer or middle ear that interferes with sound being 'transported' into the inner ear.

Sensorineural Loss

This is also known as permanent loss. People with permanent losses have damaged hair cells which means weaker electro-chemical signals are being generated which in turn means the brain is getting less sound information. 90% of all hearing losses fall into this category.

Mixed Loss

This loss is a combination of conductive and sensorineural problems.

All three types of losses can be assisted with hearing aids or cochlear implants.

Internet Sites

www.bernafon.com This site is recommended for further information on hearing and hearing loss.

www.widex.com This site provides a handy hearing encyclopedia and has a good section on adult hearing loss.

www.cochlear.com This is an excellent site for those wanting any information on cochlear implants, such as how they work or who they are appropriate for.

www.nidcd.nih.gov This site provides research on the causes of hearing loss and hearing disorders such as *Menieres* and *otosclerosis*.

www.auscap.com.au This site explains TV Captioning, and how to activate it on your home television.

How to Order Batteries

Hearing aid batteries supplied by hearing aid manufacturers (such as *ENR Top*, *Ray-O-Vac*, *Power One*) are superior to generic brand batteries. This is because they have been made specifically for hearing aid needs, causing less corrosion in the battery compartment and giving longer battery life. All clients are encouraged to use these batteries.

These batteries can be purchased over the phone (07 3720 9555) or via email (bhofmeister@wesley.com.au) from the clinic and cost \$7 for a card of six. Cards can be bought in small or large amounts, and cards have a shelf life of 12-18 months. By keeping batteries in the fridge their shelf life can be extended.

Batteries can be paid for by either credit card (over the phone or email), cheque or direct debit.

Presentation

If you are a member of a social / learning group (e.g., Probus Club, University of Third Age) or have an affiliation with a medical group, and think that your group would be interested in receiving a presentation on hearing loss, please contact Bronwen.

Bronwen has recently given several practical presentations and the positive feedback received from these certainly indicates a real community interest in hearing.

The following page is a brief summary of recent media articles pertaining to hearing.

If there are any hearing topics you're particularly interested in (e.g., tinnitus, cochlear implants), please let me know and I will include them in future newsletters.

Do not hesitate to contact me on (07) 3720 9555 if you are having any difficulties with your hearing aids or are concerned about anything. I value your support and feedback.

Warmest Regards,

Bronwen

Innovative Tinnitus Treatment (Australian Financial Review, 07/02/2005)

Tinnitus is a sensation of sound in the ears or head which is not present in the external environment. It can be heard as a ringing, buzzing, hissing, whistling, throbbing, booming, clicking, roaring or cicada-like noise. Tinnitus does not cause hearing loss, although it is often present with hearing loss. Many people with normal hearing also have tinnitus.

Tinnitus affects one in five people to some degree and becomes debilitating for a minority. Various treatments such as relaxation and listening to "white noise" have been used, but to limited effect. A Sydney-based company, Neuromonics Pty Ltd, is taking a different treatment approach and initial trials are showing very promising results. The technique has been developed by researchers at Curtin University of Technology, headed by audiologist Paul Davis who suffered debilitating tinnitus.

Davis's approach targets the neurological processes underlying the condition, aiming to reverse the changes that occur in the brain as tinnitus develops. Treatment involves an audiologist determining the nature of a client's tinnitus, and the development of a customized acoustic stimulus that is then embedded in normal music.

A specially designed processor the size of a mobile phone is used to listen to the music for two hours a day for up to six months, during which time the brain is desensitized to the tinnitus.

Over 200 people from Curtin and Macquarie universities have trialed the device and more than 90 per cent of these people have reported a 40 per cent reduction in tinnitus symptoms. "In treating the condition, we are dramatically improving our patients' quality of life," says Davis.

Two Neuromonics clinics are already operating in Perth and Sydney, with either company or franchise operations to follow in other capital cities and in the United States this year.

Hearing Aid Restores Surround Sound (ABC News, 05/04/2005)

A new hearing aid being developed by Australian scientists is described as surround-sound inside your ears. The aid helps people not only work out what is being said but where the sound is coming from. Even for people with perfect hearing, it is often difficult to understand what is being said in noisy places such as cafes. For people with hearing loss it can be impossible. "Going out with friends and being able to follow the natural flow of conversation, that's what is difficult with current hearing aids," said the device's inventor, electrical engineer Craig Jin. "That is really the problem that we are focusing our research on". Dr Jin has designed a hearing aid which restores directional or spatial hearing. While other hearing aids use directional microphones to pick up different sounds, his device uses software to move audio from a higher to a lower frequency. The brain can then determine more easily and efficiently where the sound is coming from. John Mack, who tried the device, said "what I was listening to was three voices that were so clearly differentiated, there was no problem in listening and realizing who was saying what." One hundred people will trial the device at the National Acoustic Laboratory in Sydney. However it will be at least three years before it is on the market.

Text to the Rescue (The Australian, 15/02/2005)

Mobile phone technology helped New Zealand rescue services make contact with a group of deaf people overdue on a deep sea fishing trip. Their deafness prevented the group from hearing voice messages on the emergency radio frequency, so rescue services sent them a mobile phone text message. A member of the party replied a passing boat had spotted them and was towing them to shore. Coastguard officer Mike Lawrence said it was the first time the coastguard had used text messaging in a rescue.



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