



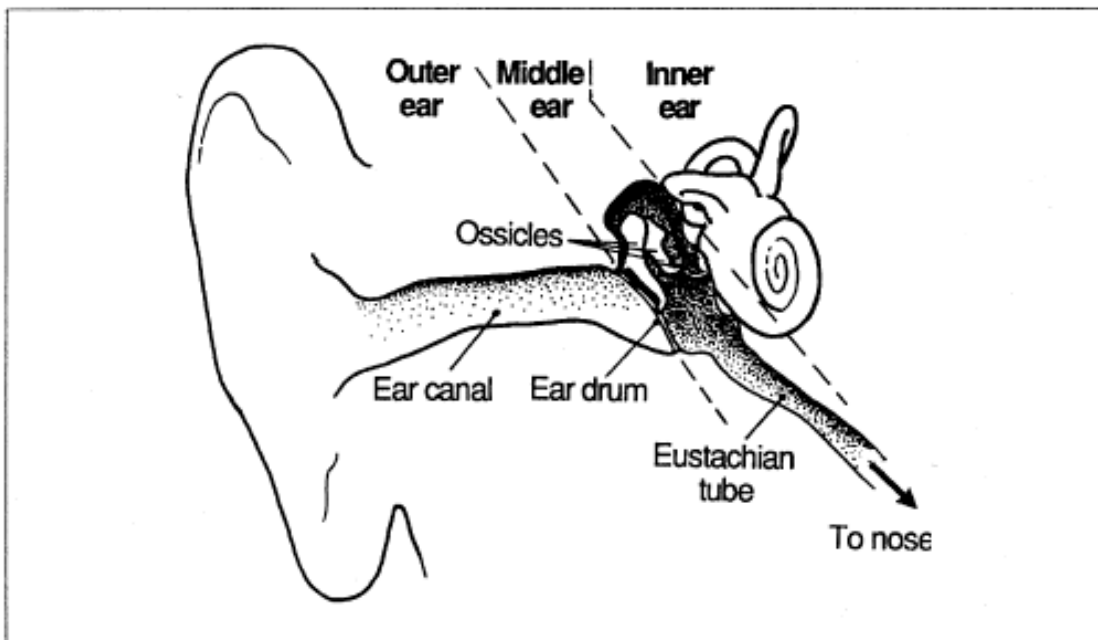
Down's Syndrome Association Medical Series

4. HEARING PROBLEMS IN PEOPLE WITH DOWN'S SYNDROME

Notes for parents & carers

HEARING PROBLEMS IN PEOPLE WITH DOWN'S SYNDROME

Many children and adults with Down's syndrome have hearing problems. In children the most common cause is a condition called glue ear. As with other medical problems in children with Down's syndrome the same problem occurs in ordinary children though not so frequently.



HOW THE EAR WORKS

The ear is divided into three parts, an outer ear, a middle ear and an inner ear. Sound enters the outer ear through the ear canal and hits the ear drum, then vibrates through the three small bones (ossicles) in the middle ear and into the inner ear, from which messages are sent to the brain. Transmission of the vibrations through the outer and middle ear is purely mechanical. If anything goes wrong with this part of the process the hearing problem is called *conductive deafness*. Conversion of the mechanical vibration signal to a nerve message in the inner ear,

its transmission from there to the brain and its decoding within the brain depends on nerves and brain tissue functioning normally. If anything goes wrong in this part of the transmission process it is called *sensorineural deafness*.

GLUE EAR – WHAT IS IT?

Glue ear is a form of conductive deafness caused when a sticky fluid fills the middle ear space. This space normally contains a film of clear fluid and air. The glue prevents the ossicles from vibrating freely and so transmission of the sound vibrations to the inner ear is faulty. The effect on hearing is much the same as filling a musical drum with water – sound is muffled.

HOW IS IT CAUSED?

The Eustachian tube (see diagram, page 1) connects the middle ear with the back of the nose. It allows any fluid formed in the middle ear to drain away and admits air into the middle ear space. In children the Eustachian tube is more horizontal and smaller than in adults, and in children with Down's syndrome it can be particularly narrow.

It is quite common when someone has a cold and a streaming nose for the infected mucus to get into the middle ear too. This causes temporary deafness. Many people experience this from time to time. Usually, when the cold gets better, the Eustachian tube clears and the mucus drains away. Sometimes doctors prescribe decongestant medicines to help dry up the secretions during an infection of this sort.

Sometimes however a single infection, or repeated upper respiratory infections such as colds, infected or enlarged adenoids and allergies, can cause a more long-term obstruction which never drains away from the middle ear space. Initially the fluid is thin and watery but gradually it becomes like a thin jelly (or glue) and hearing is affected. This happens more frequently in children with Down's syndrome than in the general population.

WHY SHOULD GLUE EAR BE TREATED?

Glue ear can cause deafness, infection, pain, delayed speech development, temporary behaviour problems and poor school progress. If left untreated any of these conditions are likely to persist, possibly affecting long-term speech, language and educational development. The more able children will be more adept in compensating for hearing loss; the less able they are, the less they can compensate. Thus, it is even more important to treat glue ear in a child with Down's syndrome than in an ordinary child.

HOW IS GLUE EAR TREATED?

If a child develops glue ear one of four things may be done:

1 WAIT FOR IT TO GET BETTER ON ITS OWN

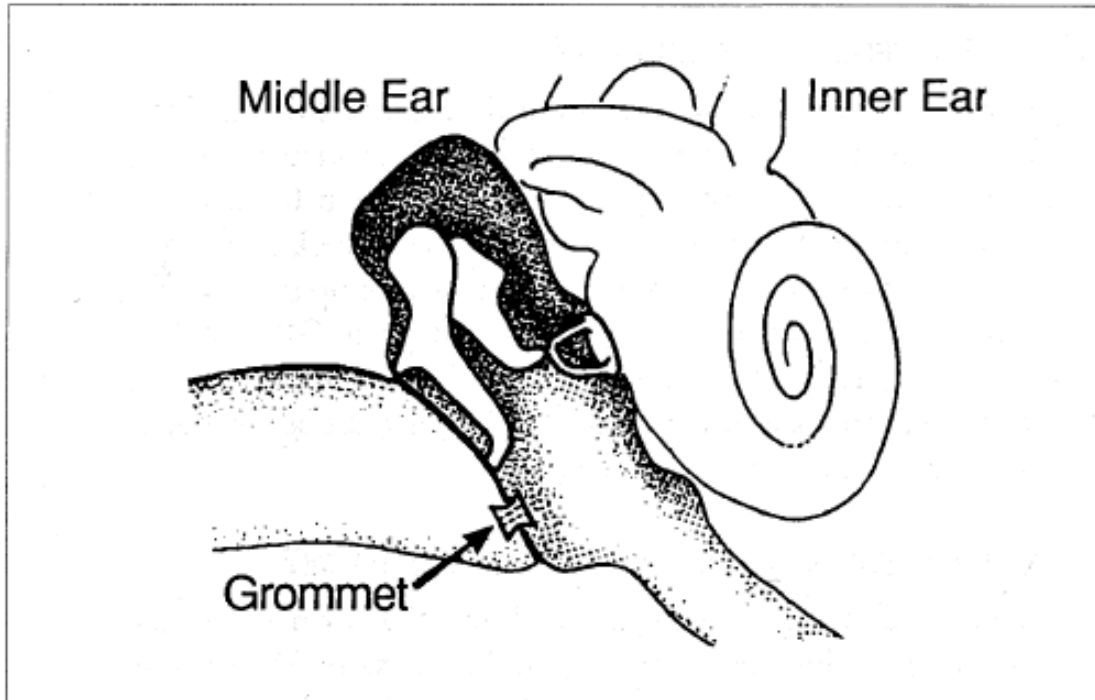
In ordinary children glue ear is a self-limiting problem and children tend to grow out of it as the Eustachian tube and other cavities become larger. It is rare to find glue ear persisting beyond age 7. It can come and go in early childhood and often fluctuates during the year, being much better or non-existent in the summer months.

In children with Down's syndrome however, the condition tends to be much more persistent and the glue formed seems stickier than in ordinary children.

2 ANTIBIOTICS AND DECONGESTANT MEDICINES

If the glue ear seems to be triggered by an acute infection or by recurrent upper respiratory infections a doctor may give a course of low-dose antibiotics for about 6 weeks. This may be combined with decongestant medicine to dry up secretions. For some children this clears up the problem so that no further treatment is necessary. Some may benefit in the short term but need a further course the next time they get an infection. For those awaiting grommet operations this treatment sometimes proves a useful interim measure to keep things at bay and improve hearing until the operation can be done.

Decongestants given as nose drops are not recommended and can lead to overproduction of mucus once the immediate effect wears off.



3 INSERTION OF GROMMETS

If glue ear does not clear up spontaneously in a few months or respond to antibiotics, a small operation can be carried out to remove the cause of the obstruction and clear fluid from the middle ear. Under a general anaesthetic the ear drum is punctured with a very fine instrument. The fluid is then sucked out and a grommet may be inserted into the opening in the ear drum. Sometimes removal of the adenoids is also indicated. A grommet looks like a small plastic dumb-bell with a hole through the middle to ventilate the middle ear (see diagram above).

Sometimes larger drainage tubes called T-tubes are used.

These operations can occasionally be difficult or impossible in young children with Down's syndrome because the ear canal may be so narrow that the surgeon cannot operate. In this situation hearing aids may be helpful, not only to improve hearing but because wearing an aid tends to widen the ear canal so that an operation might be easier at a later age.

WHAT HAPPENS TO A GROMMET?

It remains in the ear drum to help ventilate the middle ear. However the healing tendency of the ear drum pushes the grommet out in anything from 6-8 months, on average, and the hole then heals by itself. The grommet may easily be removed from the ear canal, in the outpatients' department, or it may fall out unnoticed, in a lump of wax. There is no need to look for the grommet, or consult your GP, unless you have problems. Your local ENT

surgeon will usually check the grommet around 3-6 months after the operation, and will check the hearing at that time and after the grommet has fallen or been taken out.

HOW SUCCESSFUL IS THE OPERATION LIKELY TO BE?

In ordinary children glue recurs in about 20% of patients and further grommets may be necessary. In children with Down's syndrome however, not only is recurrence much more likely, but because the glue is so thick, the grommet itself often becomes blocked within a month or two of operation and the improvement in hearing may be short-lived. Because of this often disappointing outcome some ENT surgeons, hearing therapists and audiometrists now recommend hearing aids as the preferred treatment for children with glue ear who also have Down's syndrome. Grommets do work for some of these but the failure rate is high. It is not good practice to carry out repeated operations because every time a grommet is inserted the ear drum has to be punctured and every time one falls out it leaves a tiny scar.

4 HEARING AIDS

Hearing aids merely amplify (make louder) the signal which is sent through the middle ear.

They can be fitted as early as the first year of life. (see page 14)

HOW WILL I KNOW IF MY CHILD IS NOT HEARING PROPERLY AND DOES S/HE NEED SPECIAL HEARING TESTS?

Children with Down's syndrome need to follow a regular programme of hearing checks. National programmes are gradually being set in place to screen all newborn babies to find out if they have a hearing problem. Babies with Down's syndrome are included in just the same way as other children. However newborn tests do not identify glue ear which may develop later on. As glue ear affects many children with the syndrome they all need further routine tests at a later age.

If you are in an area where health visitors still carry out distraction testing (see page 9) for all babies between 6 and 10 months your baby will be included in this screening programme. However if health visitor distraction testing has been discontinued in your area you must make sure that your child has a full hearing check (audiometry, tympanometry and otoscopy – see later) between age 6 and 10 months. Your doctor or health visitor will advise you about this and further information for healthcare professionals is available from the Down's Syndrome Medical Interest Group (dsmig.org.uk)

Don't worry too much if your child appears to fail the health visitor distraction test or visual reinforcement audiometry the first time round. These tests depend not only on having adequate hearing but also on the child having reached the stage of development when he/she can localise and turn to a sound made out of his/her sight. This skill is often slower to develop in children with Down's syndrome. However nearly all children with the syndrome should be able to respond to distraction testing by age 10 months. The skills required to respond to visual reinforcement audiometry may develop much later than this.

Your child should have a second check around age 18 months and then every year until age 5, and two yearly thereafter. If at any time you think s/he may not be hearing well you must tell your doctor or health visitor. Because your child has Down's syndrome it is reasonable to ask for a specialist hearing assessment and an examination by an ENT surgeon. It is more difficult to test the hearing of children with special needs and important that this is done by someone with experience in this area.

Hearing tests are set out in a graph called an audiogram (see page 11).

WHAT SHOULD PARENTS LOOK OUT FOR?

Although it is usually said that parents are very sensitive to hearing problems in their children this is not always so when the child has Down's syndrome. This is somehow mixed up with not being quite sure how much to expect of the child. I have certainly seen quite a few children with Down's syndrome whose parents have been very surprised to find that their child has a significant problem. It is important to realise that it is not sufficient to observe a startled jump from a child or for him/her to turn round when a door slams or the telephone rings or someone calls to them. This does not imply a level of hearing that is adequate to decipher ordinary conversational speech where sounds with a wide frequency range follow rapidly one after the other. Ask yourself instead whether your child responds if you call to him/her from another room or turns round when you mention his/her name or some other interesting word when you are talking to someone else.

ARE THERE OTHER WAYS OF DIAGNOSING GLUE EAR?

An important diagnostic test for glue ear is *tympanometry*. This measures the ease with which sound flows through the eardrum when the pressure in the ear canal is varied. Very characteristic responses are seen in children with glue ear and the test can be diagnostically very helpful.

The other diagnostic test is that a doctor can look directly at the ear drum either by using a magnifying tube and a strong light (an otoscope) or by using a head mirror and a magnifier. The drum looks different if there is fluid in the middle ear. This test is called *otoscopy*.

The Down's Syndrome Medical Interest Group recommends that otoscopy and tympanometry are included at every full hearing check.

WHAT CAN I DO TO HELP MY CHILD WITH GLUE EAR?

AT HOME

1. Don't have the television on unless you actually want to watch the programme. The background noise of a television set constantly turned on can severely interfere with your child's ability to hear any other sounds, such as speech, which are going on at the same time.
2. Turn the television off and talk to your child quietly and clearly.
3. Make sure that your child is looking at you when you speak.
4. Give your child lots of visual clues - signs and gestures - to help him/her understand what you are saying.
5. Be patient and repeat things carefully if your child has not understood.
6. Don't shout, don't speak slowly, just raise your voice a little.
7. Always give your child plenty of time to respond to anything you have said. S/he will get very frustrated if you start saying something new before s/he has had time to respond to the first thing you said.

IN SCHOOL

1. Make sure that the staff know about the hearing problem and points 1-7 above.
2. The child should sit close to the teacher.
3. The teacher should make sure he gets the child's attention before giving instructions to the class.

WHAT ABOUT CONDITIONS OTHER THAN GLUE EAR?

In people with Down's syndrome wax can easily block the narrow ear canals and cause hearing difficulty. This is quite a common problem.

Some people with Down's syndrome develop nerve deafness (sensorineural deafness) as they get older. This occasionally occurs in babies and young children, becomes commoner in adolescence, and extends into adult life. It is very important that people with Down's

syndrome have their hearing checked from time to time because hearing impairment can affect how well they function in everyday life. The audiogram pattern produced by nerve deafness differs from that of glue ear - high frequency sounds are more affected.

Nerve deafness is treated by hearing aids. It is a good idea to have a hearing test around age twelve. If a problem is developing this is a much better age to introduce hearing aids than later in adolescence when a child may simply refuse to wear them. If a child is used to, and clearly benefits from, wearing an aid it is less usual for them to stop wearing the aid completely as a teenager.

HEARING TESTING AND HEARING AIDS

All children with Down's syndrome should have their hearing tested at birth and at least every year until age 5 and thereafter every 2 years whether or not parents feel there may be any problems. If you are worried, ask for a specialist hearing assessment by a community audiologist or by a specialist hospital based audiology and ENT team.

HOW IS HEARING TESTED?

We test hearing not only by looking for responses to non-speech sounds - like a bell, a spoon in a cup, and a variety of artificially produced sounds and tones - but also by testing how well a child can hear the sounds which make up ordinary everyday speech. An ability to hear pure tones does not necessarily mean that a person will be able to discriminate between all the different sounds used in speech. For this reason speech discrimination tests are always used alongside pure tone tests as soon as a child is old enough to co-operate.

IS TESTING DIFFERENT FOR PEOPLE WITH DOWN'S SYNDROME?

Responses to hearing tests depend both on whether the ear and its nerve connections are normal and on the stage of general development a child has reached (developmental age). Thus a test appropriate for an ordinary 18 month old may be beyond the capacity of a child with Down's syndrome until between 2 and 3 years. Apart from this however the actual tests used are just the same whether or not a person has Down's syndrome. It may nevertheless require more patience to test people with Down's syndrome. It may take them longer to understand how you want them to respond and it may be more difficult to keep them interested in the tests. For this reason it is important that children, in particular, are seen by people who have experience and interest in children with special needs. Having said this I am constantly amazed by how very well most young children with the syndrome respond in the hearing clinic.

WHAT TESTS ARE USED?

The ages given below are those at which a child with Down's syndrome is likely to be able to cope with the different items.

THE FIRST 2 OR 3 YEARS

Up to a developmental age of 18 months hearing is usually assessed by what are known as distraction tests. For children with Down's syndrome this period extends until they are from 2 to 3 years old. Distraction tests involve making a wide range of sounds, many of them normal everyday sounds and speech, out of sight of the child and assessing the child's response. The sounds made are carefully chosen to cover a wide range of sound frequencies (pitch) and intensities (loudness). What may seem to you like a few random noises are in fact very carefully chosen and carefully delivered. It may not look very scientific to the casual observer but it is a well tried and tested system when administered by skilled workers. Sometimes visual rewards are built into these tests (Visual Reinforcement Audiometry).

A warbler is sometimes used to produce some of the sounds for distraction testing. This instrument is held at different distances from the child's ear and produces narrow band white noise - ie a mixture of frequencies - within different frequency bands. It can also produce a swooping sound which goes up and down through the range of sounds we can normally hear. The trick when using distraction tests with young or learning disabled children is to do it fast and to keep changing the sort of sound presented. If this is not done the child may lose interest very quickly. The reactometer test does not require a person to wear headphones and it is called a *free field test*.

AGE 2 OR 3 TO 4 OR 5 YEARS

From a developmental age of 18 months a child's understanding of spoken language becomes sufficiently well developed to allow speech discrimination tests to be used alongside, for instance, reactometer tests. If a child has Down's syndrome this stage is usually reached between age 2 and 3 years. The ability to discriminate speech sounds of different frequencies is tested by the toy test. The child is asked to pick up various toys without looking at the tester's face. The tester uses different voice intensities when speaking to the child. Testers need to check the tone and strength of their voice from time to time to make sure that the test is reliable.

AGE 4 OR 5 AND OLDER

By a developmental age around 2½ to 3 years children are able to co-operate with so-called performance tests. These are used to test the response to pure or modulated (warbler) tones. The child is taught at the beginning of the session to respond by some fun activity - such as putting a peg in a hole - whenever s/he hears a noise. This is called conditioning. Children usually enjoy this a lot but some children with Down's syndrome either find it very difficult to understand the rules of the game or simply will not co-operate. However once a child can cope with performance testing, pure-tone responses can be tested in free field conditions (ie not wearing headphones). At a variable but later developmental age when the child can cope with headphones, pure-tones can be delivered through the headphones - a procedure known as *warble tone audiometry*.

WHAT DO THE RESULTS MEAN?

Audiometry results are described in terms of frequency and intensity of sounds. Frequency relates to the pitch of the sound and is measured in units called Hertz (Hz). The higher the sound, the higher the frequency. The normal range within which people are expected to hear sounds is from around 250 to 8000 Hertz. Intensity is measured in decibels. The higher the decibels, the louder the noise.

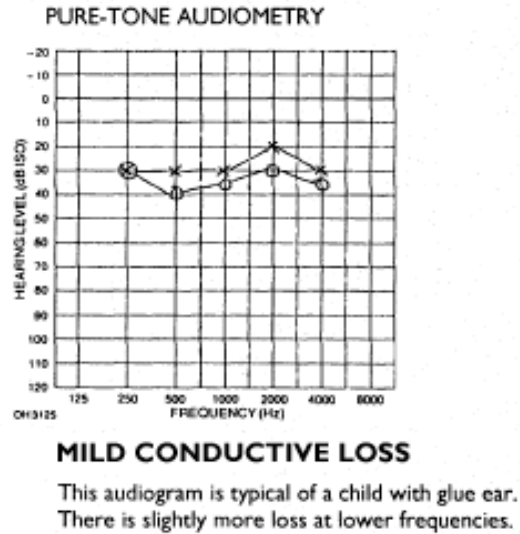
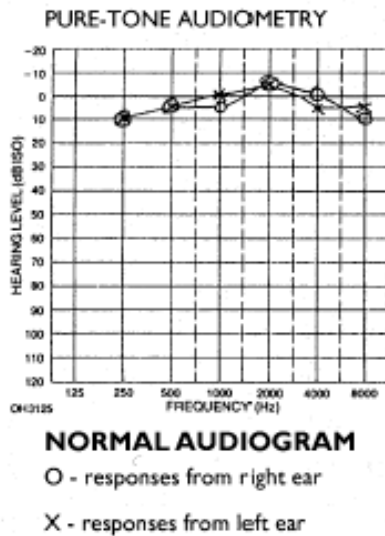
Pure-tones audiometry results are set out in a graph called an audiogram. The audiogram tells you how loud (in decibels) sounds of different frequencies (250Hz-8000Hz) have to be before the child can hear them. Different types of hearing problem show different patterns of frequency loss. The audiogram is considered normal if sounds are heard at all frequencies at a level quieter than 20 decibels. If it takes more than 30 decibels of sound at one or more of the frequencies tested before a person responds, then one is likely to be thinking in terms of treatment or close follow-up.

Conductive deafness produced by middle ear problems such as glue ear results in loss at low rather than high frequencies, so the person misses out or confuses sounds like 'c' 'd' 'l' 'tr' 'ch'. Sensorineural deafness, which may start to affect some people with Down's syndrome in later childhood, produces loss in the higher frequencies, so sounds such as 'f' 'v' 's' 'sh' are lost or confused. Some children have mixed loss over a wide range of frequencies. People with Down's syndrome also have problems in discriminating between similar sounds which seem to be caused by the way the brain decodes the sound signals rather than because anything is wrong with the ear itself or with the transmission of the nerve signal. But that is

4. HEARING PROBLEMS IN PEOPLE WITH DOWN'S SYNDROME. Notes for parents and carers

Revised 2001

another story. It does mean however that by and large people with Down's syndrome are more disadvantaged at any level of hearing loss than are most other people.



AUDIOGRAMS

The two figures show a normal audiogram and one from a child with mild hearing loss due to glue ear.

The way reactometer and free field audiometry results are reported may confuse you if you are looking at your child's record. They are usually reported on very similar grids but the free field reactometer results will always look worse than the free field pure tone results. The rule of thumb is to subtract 30 decibels from the reactometer result and it will then be comparable with a pure tone result.

Parents sometimes tell me that, for instance, they have been told that their child has a '30% hearing loss'. The tests however do not actually measure hearing as a percentage of a given total hearing range, also decibels are funny things and don't represent a straightforward percentage increase in loudness. I think therefore that this is a misleading way of reporting results. It is much more informative to find out the actual audiometry findings.

OTOACOUSTIC EMISSIONS

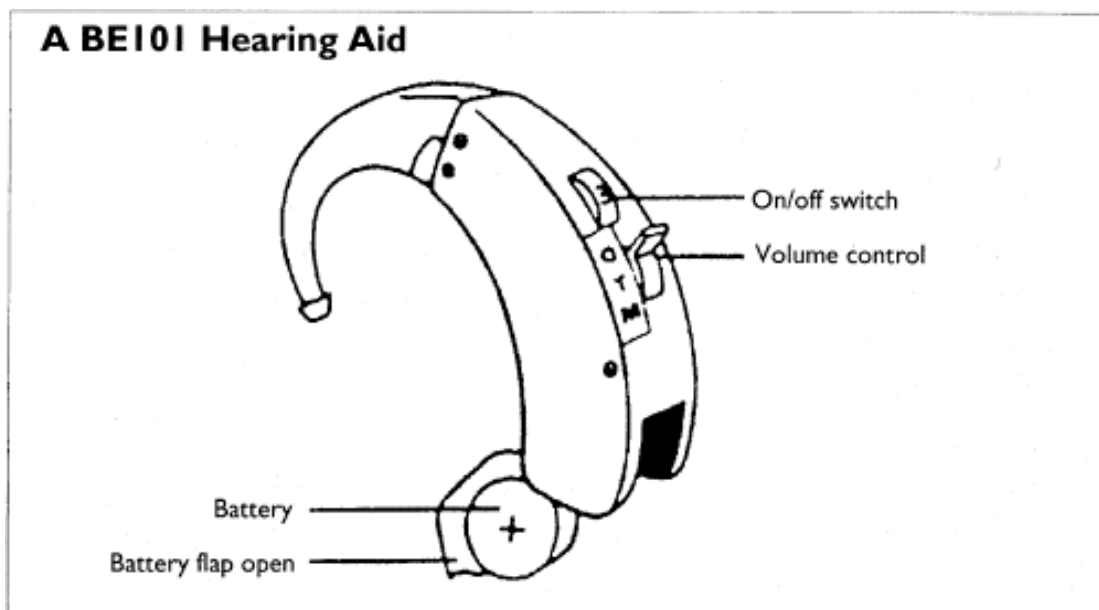
This is the test most frequently used for newborns. It may also be used for older children. A click noise is made and if the nerve organ (cochlea) in the inner ear is working properly it bounces a signal back which can be recorded.

AUDITORY BRAIN STEM RESPONSES (ABR)

These tests record the electrical discharges set up in the brain in response to sounds. These can be recorded in just the same sort of way as an electrocardiogram records the electrical activity in heart muscle. In the case of hearing the responses recorded are called auditory evoked potentials. If normal potentials are not recorded this indicates that some sound messages are not getting through to the brain so it is certain that the child cannot hear properly. The reverse however is not always true. Although sound impulses may be getting through to the brain this does not always guarantee that speech can be heard and interpreted normally. This is one of the tests which may be used with newborns. It is also useful for adults with profound disability.

HEARING AIDS

Hearing aids make sound louder. There are several kinds of hearing aid. The most common are *behind the ear* (sometimes called post aural or BTE) aids. There are also *in the ear* aids - which can only be obtained commercially - and radio aids which are very expensive and are provided through education authorities, not the NHS. There are hundreds of different commercial models. Most children with Down's syndrome and hearing impairment have mild to moderate conductive loss due to glue ear. For these children the aid most likely to be provided is a miniature aid which was introduced by the NHS a couple of years ago - model BE101. This is a very adequate aid which should meet most children's needs. Some NHS clinics however continue to buy in and supply a variety of commercial aids.



BEHIND THE EAR AIDS – WHAT ARE THEY?

Miniature aids measure only around 3cm x 1cm and are suitable for children of any age. Even smaller aids are available if a hearing loss is picked up in the first year of life. The aids are driven by miniature batteries and consist of a microphone which receives the sound; an amplification system; and a plastic tube (the elbow) which hooks over the top of the ear and fits into an earmould which will have been specially made for your child. The amplified sound travels along this tube and into the ear canal.

HOW ARE THEY FITTED?

The first thing that will happen if your child is prescribed a hearing aid is that the audiologist will take an impression of the ear so that a precisely fitting earmould can be made. The earmould is the most important link between the child's ear and the hearing aid. It also creates the biggest problem through being either too loose, or too tight, or not properly shaped to the ear. If the earmould does not fit well, the aid will make a high-pitched whistle which can be heard at a distance and is distressing for the child. Earmoulds nowadays can be made of soft silicone materials, some of which are non-allergenic, and should not have any hard edges or be uncomfortable in any way. A well-fitting mould is essential if the aid is going to be tolerated. Children with Down's syndrome often have rather floppy ears, some are unusually cup-shaped, and some have very small ear lobes. This means that getting a good secure fit can be quite tricky. It is very important therefore that the whole process of fitting is carried out by an audiologist who is used to dealing with babies and small children and preferably one with previous experience of children with Down's syndrome. Many small children have their aids kept in place by a Hucki, or similar band which loops round the ear. For very young children new earmoulds may need to be made as often as every 3 months as the child's ear grows and changes shape.



This photo shows a child wearing a hearing aid which is kept in place by a Huckl band.

HOW ARE THEY ADJUSTED?

There are two sets of controls on a hearing aid: those you can operate yourself and internal controls which are set by the audiological technician. You yourself can operate the on/off switch and the volume control. The internal settings are adjusted specifically for your child by the audiologist in the clinic. These determine the amplification (gain) needed at each frequency. This is tailor-made to suit your child according to his or her own pattern of frequency loss as shown by the audiogram. Most aids, including the BE101, also have an output limiting control. This prevents sounds being uncomfortable for your child. The level at which the cut-off occurs is determined in the clinic when the technician sets up the aid.

HOW WELL DO CHILDREN TOLERATE THEM?

This depends to some extent on the age at which aids are first introduced to the children and on the manner in which they are introduced; on the attitude of the family; on the amount of ongoing support and advice offered to the parents; and on the amount of benefit to the children who wear the aids. The first few days are all-important and during this time it is critical that when the children are wearing the aids they are kept busy and are supervised. This way they will not focus too much on the new situation.

4. HEARING PROBLEMS IN PEOPLE WITH DOWN'S SYNDROME. Notes for parents and carers

Revised 2001

It is undoubtedly a strain wearing aids all the time and children may need some time off. The most important thing is to wear the aids in situations where the children need to listen carefully - in school and at home. Very young children need their aids at home and when being talked to or read stories or going through picture books, but not necessarily when they are being taken out in a pushchair or in the car.

They need them in playgroup, in nursery school and of course during a normal school day though possibly not in the playground. It is much better to have a regime of wearing the aids for quite long chunks of time because taking them in and out can be quite a hassle and gives extra opportunity for damage or loss to occur.

It is very important that the wearing of aids should not become an area of confrontation between parents and child and between teacher and child. Children quickly learn that they have a powerful weapon with which to gain attention - pulling their aids out; throwing them on the floor; hiding them; putting them in the dishwasher; switching them off; chewing them. This has to be handled with a mixture of firmness and compromise and, above all, consistency. You need to decide just what the rules are to be, then stick to them. To help with this it is essential that all children are seen regularly by a peripatetic teacher of the deaf. One of the roles of these specialist teachers is to advise about these issues. Children often take their aids out when they are bored because they are more aware of them at these times. If this happens, don't put the aids back until the child is going to be busy and getting enough attention to forget about the aid.

Studies are showing that a few children with Down's syndrome are unduly sensitive to noise (hyperacusis) and these children may be distressed in some situations when wearing hearing aids, for instance in a noisy school classroom. A problem with most aids is that they are unselective and amplify all the background noise as well as the sound which the child needs to hear. If hyperacusis is a real problem you should discuss this with your child's audiologist..

Another reason for distress is when a child with fluctuating loss – which is quite common in glue ear - has a good hearing phase and the amplification is no longer needed and is indeed disturbing. Quite a few children with a tendency to glue ear need to wear their aids only in the winter months.

In general if a child seems distressed in any way by having his/her hearing aid switched on you must take the child back as quickly as possible to see the audiologist.

CHECKING AND CARING FOR HEARING AIDS

You will probably need new batteries every 2 weeks depending on how long the aids are switched on and how powerful they are. You should change the tubing every few months, otherwise it can become brittle and uncomfortable, or it can split which leads to interference with reception. Stiffening and discolouration are the signs which let you know that the tubing needs to be changed. You must check the earmould frequently to make sure it is not blocked with wax. Ideally the earmould should be washed every day in warm soapy water and the tubing dried by blowing air through. Unlike torch batteries, hearing aid batteries fail suddenly so you should check every day to make sure the aid is working properly. To do this turn the aid on, turn the volume up and hold it in your cupped hand. If working it should whistle. If it isn't working it is likely either that the batteries have run out or the tubing is blocked. If your child wears aids in both ears the settings will not necessarily be the same so it is very important, when disconnecting from the earmoulds, that you know which aid is for which ear. If you connect the aid from one ear to the earmould for the other your child may be at a grave disadvantage.

AIDS THAT FIT THE EAR

The advantage of these aids is mainly cosmetic. They perform no better than behind the ear (BTE) aids. All the gadgetry is contained within a shell which fits into the ear itself. With small children, or anyone with a small ear volume, the technological problems can be considerable. It may simply not be possible to pack all that is necessary into the available space. In young children too the shell has to be totally rebuilt several times a year as the ear grows.

DIGITAL AIDS

These are no better than ordinary aids in helping people with conductive hearing loss due to glue ear. They may however offer advantage to some people with Down's syndrome who have sensorineural hearing problems.

RADIO AIDS

Radio aids are rarely used except for those with profound conductive or mixed conductive and sensorineural loss, which includes some children with Down's syndrome particularly as they get older. They are expensive and are provided by education authorities, not the NHS, because their main advantage is for an individual in school or in college. Their great advantage is that they can be adjusted to pick up only what is necessary to hear - e.g. the teacher - and background noise can be cut out. The system does however involve the child

and the speaker wearing some gadgetry. The speaker wears a microphone and transmitter hanging round the neck. The microphone picks up the speaker's voice. The sounds are then turned into radio waves and sent out via an aerial. These waves are then picked up by a receiver which the child or student wears on a neck loop also hanging round the neck. The receiver converts the radio waves back into sound which is transmitted via a lead from the receiver to the user's ordinary hearing aid. The strength of sound comes from the child's or student's own hearing aid, not from the radio aid, the quality is dependent on the quality of the regular aid.

A radio aid cannot be linked with a BE101. If one is to be supplied and the user's normal aid is a BE101 the audiologist will need to get the user a new commercial aid with radio input.

When using a radio aid of this type the student's own aid will be adjusted so that it does not pick up background noise or the student's own voice through its built-in microphone. The radio aid usually has a built-in microphone which can be switched on if it is necessary for the student to hear his/her own voice, but the level of impairment in children with Down's syndrome is rarely severe enough for this to be necessary.

The exact combination depends on the user's individual needs and will be the responsibility of the educational hearing adviser.

Radio aids are not without problems. They work on different frequencies - like tuning in to different radio stations. Care must be taken not to have two systems near each other on the same frequency because if this happens children may find themselves tuned in to a teacher in another classroom, or even in another building, rather than the one in their own classroom.

THE BLUE PETER RADIO AID LOAN SERVICE

As there are a number of different radio aid systems available it is possible for you and your child to borrow various models from the Blue Peter Library at the National Deaf Children's Society Information Centre –Telephone 0121 454 5151

HOW DO YOU WEAR BOTH HEARING AIDS AND SPECTACLES?

There is usually plenty of room behind the ear for both the spectacle arm and the hearing aid. If some adjustment is needed it is the spectacles which will have to be reshaped as there is nothing you can do to change the shape of the hearing aid! If the ear is naturally cupped forward this can pose a particular problem. Sometimes wig tape is helpful. This is double-

4. HEARING PROBLEMS IN PEOPLE WITH DOWN'S SYNDROME. Notes for parents and carers

Revised 2001

sided sticky tape made for keeping wigs in place and it can be bought from hairdressers. The tape can be used to stick the aid to the head behind the ear. It is possible to have custom-made spectacles with a hearing aid built-in, or to fix the aid on to spectacles with a special adapter. However these options are very restrictive as the spectacles and the aid always have to be worn together.

SPECIALIST HEARING SUPPORT SERVICES

All people with hearing problems should have easy access to specialist hearing support services (speech & language therapy; hearing therapists; teachers of the deaf etc). The advice and support of hearing therapists or teachers of the deaf is particularly important when hearing aids are introduced for the first time, when children first enter or change school, and when they move on into further education or employment.

Dr Jennifer Dennis

Director of Information and Research

Down's Syndrome Medical Interest Group

Revised 2001

I thank Mr Andrew Freeland and the ENT department at the Radcliffe Infirmary, Oxford for the diagrams of the ear and the photograph of the Hucki band which are reproduced in this booklet.

Evidence based information for health care professionals about hearing problems in Down's Syndrome is available on www.dsmig.org.uk or from: Down's Syndrome Medical Information Services. Telephone: 0115 962 7658 (x 45667). info@dsmig.org.uk