Students who are deaf-blind have varying degrees of residual hearing. This article will focus on the importance of optimizing that hearing using appropriate amplification and auditory training. We have tried to include practical tips for parents and teachers that we have used successfully in our teaching careers.

We’re all in this together.

We cannot emphasize enough the importance of the team approach in obtaining the most accurate information regarding a child’s hearing loss. Many of our deaf-blind children are difficult to test using traditional approaches. Those working with the child in different settings may observe responses to voice and environmental sounds. All observations should be shared prior to the hearing test: responding to Dad’s voice more consistently than Mom’s; hearing the school bus honk when it arrives in the morning; hearing the school bell or fire drill bell; reacting to a favorite sound-making toy; responding to a radio or tape player; rock music vs. nursery rhymes. Ideally, the classroom teacher should attend the audiological appointment along with the parent and child. Practically, the parent and child will go together, so as much information as possible should be provided to the audiologist by the teacher about the child’s responses to voice and other sounds in the school setting.

1. Helpful tips for preparing for the audiological exam: children should be introduced to wearing a headset (earphones) for periods of time. Conditioning a child to respond to certain sounds in a quiet environment (the student drops a block or otherwise indicates hearing a sound when the teacher beats a drum, rings a bell, blows a whistle, etc.) can provide information to the audiologist about the child’s ability to hear. For the child who is unable to respond physically, more subtle responses (eye blinks, head turns, cessation of movement, etc.) may be observed. The child who is well rested and comfortable will respond much better during the exam.

1. The adult accompanying the child may or may not be present during the actual exam. This will be dependent upon the age and ability of the child being tested. The audiologist will summarize the results by doing an audiogram, a graph that shows the degree and range of hearing loss. If the child’s responses to sounds are inconsistent or nonexistent, then the use of an auditory brain stem response (ABR) should be considered.
1. Depending on the degree of hearing loss, hearing aids can provide benefits that range from ability to understand speech with reasonable clarity to awareness of environmental cues such as the honking of a car’s horn or the siren of an emergency vehicle. Hearing aids come in different shapes and sizes. A specific aid is chosen to match each child’s unique needs. The most common types of hearing aids are:

- **In-the-ear:** The hearing aid and ear mold are one unit.
- **Ear-level or behind-the-ear:** The aid is connected to a plastic ear mold and fits over the ear.
- **Body-style:** The receiver attaches to an ear mold and is connected to the body aid by a cord.
- **Bone-conduction:** Sounds are transmitted through an oscillator worn behind the ear to stimulate the inner ear. This should be considered for a child with tiny, malformed or no ears.

In the school environment, the child may have the opportunity to wear an auditory trainer with an FM system. The teacher, school mate or other person wears a small microphone to amplify his voice, which is then transmitted directly to the student’s aid. This type of system can serve as a personal hearing aid and provide direct amplified speech to the wearer.

Ideally, the child will be wearing the hearing aids from the time they wake up until the time they go to bed. Wearing the hearing aids should be a normal part of the child’s routine. The user should be taught and encouraged to assume as much as responsibility for maintenance and care of their hearing aids as possible.

A hearing aid is not a cure for a hearing loss of deafness. Proper, consistent use of appropriate amplification devices can help a child to maximize their residual hearing for educational benefit and a richer, more satisfying life.

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**Me and My FM**

by Megan Jones, Consumer and Doctoral Student, San Francisco State University

During my last year as an undergraduate at UC Berkeley, my hearing sensitivity dropped rapidly. My life became a mad search for a solution to my hearing loss. I set up camp at my audiologist’s office. I tried several different kinds of hearing aids, but if they were powerful enough they sounded like tin cans to my practical ears, and if they were too sensitive they would have to be worn on a low volume to avoid “squealing” (AKA: feedback). I was ready to concede that I was just going to have to give up and forget about ever understanding speech again.

Amidst all of this hearing aid madness, I discovered, by chance, the existence of FM Assistive Listening Devices. So, on impulse, I ordered a five hundred dollar FM system and entered the
beautiful world of speech again. The FM device used a transmitter with a microphone worn by the speaker to transmit speech directly to a receiver which I wore using a teleloop (which in lieu of earphones, transferred the sounds from the receiver into electromagnetic signals and sent them to the telecoil in my hearing aids). I could not believe how much more clearly I could hear the professors in my classes when I used the FM!

As I began using the system I realized that there must be more powerful and effective systems available. There were problems. My receiver would not always amplify as much as I needed. I could not be more than a few feet away from the transmitter, and if I moved my head the sound would fade in and out.

After much investigation and several trials with different hearing aids and FM devices, I finally have a setup that I believe maximizes my ability to understand speech. I am currently using programmable behind-the-ear hearing aids and a high quality FM system. If I am in the classroom, in a noisy listening environment (such as a restaurant) or at a meeting, I can set the hearing aids so that they receive information from the FM system alone or from both the FM and my hearing aid microphone. The FM system connects directly to my hearing aids with a cord so that sound is not lost as with the teleloop. I can also set the FM to receive information from either just the transmitter microphone, just the environmental microphone on my receiver, or from both microphones.

All of these various settings may seem confusing but with practice and ingenuity I have found that this flexibility allows me to change the way sound is presented to me depending on the circumstances. There are more simple systems available for children and for people who do not need such versatility.

There are problems associated with this technology. Technology is not a person. No amount of yelling and stomping will convince a hearing aid that it is “beeping” (feeding back) and should stop. When the FM system has accidentally been left on (and the battery dies) it should work properly just because you have a meeting to attend! Other folks complain that the two by three inch blue transmitter does not exactly go with their outfit.

Sometimes I am also frustrated when my sophisticated hearing aids and FM system can only take me so far in the understanding of speech. I am still struggling to find ways to hear more than one person at a time in classroom discussions.

Sometimes the FM is too cumbersome and the hearing aids too limited to assist me in hearing casual everyday conversation.

Overall though, I would say that the use of technology has allowed me to participate in school and in the community as successfully as I do.
Application of FM Technology to Children

by Barbara Franklin, Ph.D. Department of Special Education, San Francisco State University

Classrooms and other public areas such as auditoriums, theaters and restaurants provide a poor acoustical environment for individuals who have a hearing loss, and it is often difficult for them to discriminate between the speaker and background noise with a hearing aid. The three environmental factors that account for a decrease in listening ability are:

1. Distance - Since sound decreases as distance increases, speech discrimination also decreases as the distance between the speaker and listener increases.
2. Background Noise - It is harder to hear as the speech to noise ratio increases.
3. Room Acoustics - when sound bounces off a surface it causes an echo and the resulting reverberation can mask speech.

The use of an Assistive Listening Device can significantly reduce the distance, reverberation and acoustic problems by providing a constant sound pressure level of the speaker’s voice. The two most typical types of Assistive Listening Devices are personal FM systems where the sound is sent through the hearing aid(s) and FM Auditory Trainers which are independent amplification systems. With a personal FM system, the speaker wears a microphone transmitter and his/her voice is sent to a receiver which is attached to the microphone of the listener’s hearing aid(s) in one of two ways:

1. by direct audio input coupling using a boot attachment with the hearing aid(s), or
2. by inductive coupling using a Teleloop worn around the neck. With an FM Auditory Trainer, the speaker also wears a microphone transmitter and his/her voice is sent to a microphone in the receiver that is contained within the device. In this way, the Auditory Trainer itself functions as a body-worn hearing aid. However, in both of these situations, the listener must wear a rather cumbersome receiver on the body.

A number of personal FM systems have two volume controls on the receiver; one controlling FM reception (speaker) and the other controlling the environmental signal. With this setup, the volume control on the FM system can hear the speaker as well as themselves and others.

The manufacturers of these types of FM systems include: Phonic Ear, Telex, Comtex and Earmark. A relatively new type of FM receiver is now available which combines the hearing aid and FM system in a single behind-the-ear unit (BTE/FM). This new BTE/FM system eliminates the body-worn case as well as all loops and cords for the listener. The unit can function as a hearing aid alone, and FM system alone, or a hearing aid and FM at the same time. These FM systems were reproduced first by Phonic Ear which is called the “FREE EAR” and by AVR Sonnovation in Israel which is the “EXTENDED EAR”. The EXTENDED EAR comes in a variety of power and frequency combinations to cover a wide range of hearing loss configurations, from mild to profound. Telex has just come out with its own FM/BTE unit called the “Select 2-40”. All of these FM/BTE units have an antenna on the end. The devices are becoming more sophisticated in channel changeability-Sonnovation attaches a boot to the unit...
and Telex has two channels built into their system.

FM technology is continually expanding. There are two new developments that I will discuss which are just being introduced. The first is a “boot” attachment called the “UNICOM” developed by Unitron which will change one of their over-the-ear hearing aids—the US80—into an FM/BTE. This is designed for individuals with a severe to profound hearing loss who need to communicate in noisy environments. This product is the result of a joint effort by Unitron and Sonnovation.

The latest FM technological advance comes from Phonak and is called the “MICROLINK”. The company has developed the world’s smallest FM microchip ever designed for spoken communication and they consider it to be a revolution in hearing instrument technology. The MICROLINK is about 1/3 of an inch and is attached to a plastic boot which slips over the end of the over-the-ear hearing aid. Another advantage of the MICROLINK is that the antenna is built into the unit and does not stick out. This FM product has been designed to be compatible with the entire line of Phonak hearing aids, including their most sophisticated high-power digital aid.

I have a doctoral student who has both a hearing and vision loss. Her hearing loss has gotten progressively worse and now ranges from 90 to 100 dB. However, she is able to still get all of her information via the ear. She is using a Resound programmable hearing aid coupled to a Phonic Ear Personal FM system. She has adapted the system for herself in the most unique ways imaginable. She probably knows more about FM systems than the professionals. Although FM technology is expanding rapidly, it still is not as user friendly as one would hope. I am currently in the third year of a four-year Research to Practice Grant funded by the U.S. Department of Education, Office of Special Education Programs, to investigate the effect of FM systems on communication skills of children who are deaf-blind. I will be developing training materials during the final year, including a Video and accompanying Manual. I hope these materials will help make FM systems user friendly so that more individuals can profit from the improvement in communication that can be accomplished through current and future FM technology.

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**Hearing Aids: Love ‘em, Wear ‘em and Keep ‘em In**

by Debra D’Luna, Parent, CDBS Advisory Committee

Wouldn’t it be great if the resolution to deafness for a child who is deaf-blind were as simple as popping in a pair of hearing aids? Unfortunately, for many of us, surpassing the problem of obtaining the aids is the problem of keeping the hearing aids on our child. Resistance to hearing aids can spring from many different reasons, so the solution may take some problem solving on the parents’ part. When it comes to the problem of a child persistently removing hearing aids, first follow-up with your audiologist to make sure that the amplification is as close to perfect as he can manage and that the aids are functioning well. Once the possibility of over or under-amplification has been set aside, consistency is required. Matter-of-factly communicate to your child that you expect that the hearing aids will be kept on. One way to do this is to reinsert the
aids as soon as you reasonably can, whenever the child removes them. A hug and a kind word as soon as the aid is back in place and switched on will reinforce the message that you want your child to wear them. Make wearing hearing aids a desirable experience. Reward the child auditorily, not only with words, but also with music which is usually hard to resist. Sing and sign in whatever modality the child prefers. Use every opportunity to draw him into your world of sound and communication.

Dual sensory impairment makes it essential to get as much out of each sense as possible. Deaf-blind children can’t rely on their vision to fill in the auditory gaps or on their hearing to fill in the visual picture unless they have the advantage of functioning hearing aids in their ears. Wherever the child is, his hearing aids will make a major difference, so insist that care takers and teachers learn to insert and switch on the hearing aids. Learn to sign in whatever modality your child can use and send the message to him in every way you can that you wish to communicate and are eager to have him communicate with you.

In my experience, several little problems may cause a child to be uncomfortable and resistant to wearing hearing aids. Fixing these nagging issues will go far in encouraging compliance. My daughter, Alexis, who is nine and deaf-blind, began wearing hearing aids at eight months old in the cold climate of Rochester, New York. At that time her head control was not developed and due to the severe weather, she wore a hat and coat or sweater eight months of the year. The annoying, high-pitch squeal called feedback was so frequent that I wondered whether she could hear anything over that mind-numbing squawk. Feedback can occur whenever the hearing aid microphone is close to any surface which causes amplified sound to be directed back into the microphone. Even though she could do virtually nothing else, Alexis was able to reach up and yank the hearing aids out of her small malformed ears and quietly drop them.

In an attempt at finding a remedy, we started using a product called Huggie Aids (Huggie Aids, 837 N.W. 10th Street, Oklahoma City, Oklahoma 73106-cost under $20 from an audiologist). A Huggie Aid consists of three rings of plastic. It is somewhat bulky and needs to be replaced as the child grows, but these three rings can be made to hold the hearing aid tucked behind the ear or propped high and forward, clear of a coat collar or wobbly head. Controlling the feedback and corralling the aids behind her ears went a long way towards stemming Alexis’s impulse to toss them.

When she began wearing eyeglasses at age four, we chose a pair of spectacles that have a rubber-coated, soft spring that wraps over and partway around the ear. The Huggie Aids, in addition to the glasses spring-a-ma-jig, was too much for Alexis’ tiny ears. A new strategy was needed. I tried double-sided ostomy tape which can be cut into a shape which will hold the hearing aid in place behind the ear. The ostomy tape provides a firm hold, and is specially developed not to irritate delicate skin with frequent removal. Ostomy tape is available from a medical supply store. It didn’t work for us then because tossing the hearing aids was still an occasional hobby for Alexis, which meant that the stickiness wore off quickly and the tape had to be reapplied, which was irksome for everyone. It is a good solution, especially if your child’s outer ears are extremely tiny or missing.
Our most successful setup is the one we have used for nearly five years. The credit for this tidy innovation must go to an anonymous genius at the Rochester School for the Deaf in Rochester, New York, where the simple device is in common use. The Hilco Invisible Hugger Sports Band (made by the Hilco Company of Plainville, Massachusetts 02762) is a fine plastic coil with a single loop on each end. It is intended for holding eyeglasses in place, but when used with a pair of hearing aids, it gently retains them with slight backward pressure. This setup has several advantages. Simplicity: once it is attached to both aids, there’s no daily fiddling around with adjustment. Just put one hearing aid in, stretch the coil around the back of the head, under the hair and insert the other aid. Lack of bulk: it virtually disappears into the hair, so there’s nothing dangling to present a hazard, unlike some fishing-line-pinned-to-the-shirt productions I’ve seen used. The loops are thin and flat, so there’s no weight or bulk behind the ear. The loops can either be slipped over the hard plastic hooks above the ear molds or, with a bit of finesse, onto the hearing aid casing itself (my preference). Unity: a pair of hearing aids becomes one unit each, giving the other a little security. Alexis has accidentally “lost” one aid while pulling a turtle neck on or off, roughhousing, etc. and it dangled down her back, a cinch to retrieve.

Economy and durability: Even with moderately rough treatment, it will last for several months and costs about $4-$6. Aesthetics: it discreetly does the job without calling attention to itself. It also could be used with one aid and an eyeglass shank on the opposite side.

Hilco’s Invisible Hugger Sports Band has only one drawback. It can be difficult to find and is only distributed through optical suppliers. Ask your audiologist to contact the company, find a supplier in your area and order a small supply for yourself and his other pediatric clients, whose parents also seek a solution to the thorny and common problem of keeping hearing aids tidily in place on a galloping kid.

Each child’s needs are unique so, as a parent, it is important to be flexible and diligent in addressing your own issues. My personal feeling is that a solution is best if it is inexpensive, requires little fiddling or adjustment, is unobtrusive, and, of course, solves the problem. In other words, it should fit easily into the routines of daily living and make a difference, because amplification should not be burdensome.

Remember, too, that hearing aids can only improve a child’s life if they are in his ears. It is up to you to set the tone for everyone else. Insist that your child’s hearing be amplified, everyday, everywhere. It is one thing that we can do for our children and if your child can benefit from amplification it is a thing that must be done.

Hand in Hand With Technology
by Deborah Roseborough, CDBS Family Specialist

Twenty three years ago my son Danny was born with Rubella Syndrome. He is totally blind and profoundly deaf. Danny is a very loving and special person. But we soon found out his disabilities complicated his life greatly, especially in the area of communication. Technology,
however, would prove to be a great friend to Danny and everyone in his world.

“Mom,” “eat” and “no” are simple words we take for granted. Communication does not come automatically for our deaf-blind children. In different ways they have different levels of hearing losses, which affect their communication. Hearing aids came into our lives in his first year. They were ugly and intrusive looking, but a necessary part of Danny’s quality of life. At first he had a hearing aid that consisted of a box that fit on his chest or hung on a pocket with cords leading to both ears. I had moments of denial about Danny’s deafness and even moments of not wanting to deal with it. But not seeing him react to my voice or call out to me made these negative moments very brief.

At the age of two or three my son began to mimic words like “momma,” “eat” and “no.” His speech didn’t advance much further for a long time. He found it easier to sign his needs and wants. Every three years he was eligible for new hearing aids. Each pair was an improved model. No more box on his body. He now wore hearing aids behind the ear. He went through periods of not wanting to wear the hearing aids as well as periods of taking them apart. We had many a search for little pieces of equipment. The hearing aid dealer recognized our baggie of parts as part of the deal when working with Danny.

At 14 years of age, Danny received yet another set of hearing aids. Technology had really improved. There was little or no feedback and his molds fit well. Maybe Danny had matured also. The pieces to the puzzle had finally come together. Danny would become inseparable from his hearing aids. He began to just stand still and listen for the sounds around him. We bought environmental tapes and played them over and over again and gave each sound a name. Danny can identify animals, cars, emergency vehicles, etc. He could now follow my voice and find me. This brought a big smile to both our faces. He learned to discriminate the sound of the telephone ring from the microwave beep. Our new problem is that he sleeps with his aids on so as not to miss anything.

Amplification has come a long way. We used to knock on his bedroom door and receive no response. Now he opens the door with a smile. He can handle simple verbal conversations. He can tell you who he is and asks you how you are. He expects most people not to respond so he will answer that you are fine. He has over 300 words in his vocabulary.

Danny uses total communication, tactile signing and voice where possible. At work he has two backup systems for communication. A card communication system was developed for him while he was in school. The cards are based on categories. There are words in English and Braille and pictures on the cards. If you want to communicate with him you can hand him a card, let him feel it in Braille and he will respond. He can ask you questions also by presenting a card to you with a message to read.

Danny’s other communication system is a voice box with fifteen squares called “Attainment Talker.” Each square has a Braille number on it. Each number has an item or a need connected to it. Danny knows which number says what. He pushes the Braille number and a prerecorded voice will speak for him. By having these different systems, Danny is more accessible to the world.
around him and it to him.

Technology is great and I’m always open to new ideas to make my son’s life more complete. Technology can also make our children’s world safer. Danny has a “mowat sensor” that tells him if he is nearing a change in surface, a wall or a person in front of him. He can distinguish between a bus or car that may be in front of him. One other piece of equipment that he uses is the silent pager. This item has three different vibrations that will tell him if there is an emergency. It will vibrate one way for a fire alarm, another way if his boss needs him to come to his office, or a third way for any drills they may be having at work.

Technology is invaluable. We as parents need to stay informed of what is new and helpful for our children. As long as we have the dream, new things can be developed to give higher quality to our children’s lives.