What is Benign Paroxysmal Positional Vertigo (BPPV)?

In Benign Paroxysmal Positional Vertigo (BPPV) dizziness is thought to be due to debris that has collected within a part of the inner ear. This debris can be thought of as "ear rocks," although the formal name is otoconia. Ear rocks are small crystals of calcium carbonate derived from a structure in the ear called the utricle (Figure 1). While the saccule also contains otoconia, they are not able to migrate into the canal system. The utricle may have been damaged by head injury, infection, or other disorder of the inner ear, or may have degenerated because of advanced age. Normally otoconia appear to have a slow turnover. They are probably dissolved and reabsorbed by the "dark cells" of the labyrinth (Lim, 1973, 1984), which are found adjacent to the utricle and the crista, although this idea is not accepted by all (see Zucca, 1998, and Buckingham, 1999).

The symptoms of BPPV include dizziness or vertigo, lightheadedness, imbalance, and nausea. Activities that bring on symptoms will vary among persons, but symptoms are almost always precipitated by a change of position of the head with respect to gravity. Getting out of bed or rolling over in bed are common "problem" motions. Because people with BPPV often feel dizzy and unsteady when they tip their heads back to look up, sometimes BPPV is called "top shelf vertigo." Women with BPPV may find that the use of shampoo bowls in beauty parlors brings on symptoms. An intermittent pattern is common. BPPV may be present for a few weeks, then stop, then come back again.

What Causes BPPV?

The most common cause of BPPV in people under age 50 is head injury. In older people, the most common cause is degeneration of the vestibular system of the inner ear. BPPV becomes much more common with advancing age (Froeling et al, 1991). In half of all cases, BPPV is called idiopathic, which means it occurs for no known reason. Viruses affecting the ear such as those causing vestibular neuritis, minor strokes such as those involving anterior inferior cerebellar artery (AICA) syndrome, and Ménière's disease are significant but unusual causes. Occasionally BPPV follows surgery, where the cause is felt to be a combination of a prolonged period of supine positioning, or ear trauma when the surgery is to the inner ear (Atacan et al 2001).

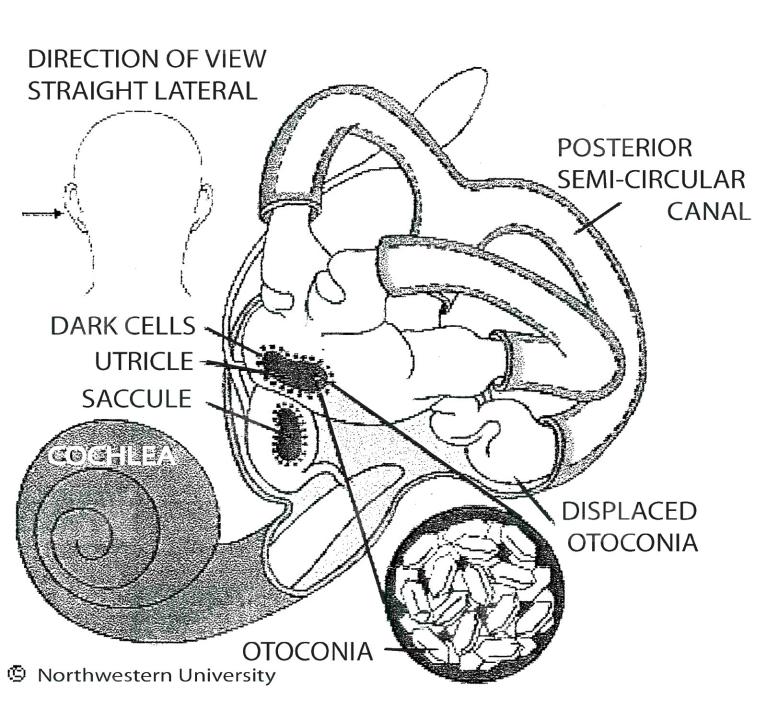
How is BPPV Diagnosed?

Your doctor can make the diagnosis based on your history, findings on physical examination, and the results of vestibular and auditory tests. Often, the diagnosis can be made with history and physical examination. Most other conditions that have positional dizziness get worse on standing rather than lying down (for example, orthostatic hypotension). Electronystagmography (ENG) testing may be needed to look for the characteristic nystagmus (jumping of the eyes). It has been claimed that BPPV accompanied by unilateral lateral canal paralysis is suggestive of a vascular etiology (Kim et al, 1999). For diagnosis of BPPV with laboratory tests, it is important to have the ENG test done by a laboratory that can measure vertical eye movements. A magnetic resonance imaging (MRI) scan will be performed if a stroke or brain tumor is suspected. A rotatory chair test may be used for difficult diagnostic problems. It is possible but very uncommon to have BPPV in both ears (bilateral BPPV).

How is BPPV Treated?

The following treatment options are available:

- Office Treatment
- Home Treatment
- Surgical Treatment



BPPV has often been described as "self-limiting" because symptoms often subside or disappear within six months of onset. Symptoms tend to wax and wane. Motion sickness medications are sometimes helpful in controlling the nausea associated with BPPV but are otherwise rarely beneficial. However, various kinds of physical maneuvers and exercises have proved effective. Three varieties of conservative treatment, which involve exercises, and a treatment that involves surgery are described in the next sections.

Office Treatment of BPPV: The Epley and Semont Maneuvers

There are two treatments of BPPV that are usually performed in the doctor's office. Both treatments are very effective, with roughly an 80% cure rate, according to a study by Herdman and others (1993). If your doctor is unfamiliar with these treatments, you can find a list of knowledgeable doctors from the Vestibular Disorders Association (VEDA).

The maneuvers, named after their inventors, are both intended to move debris or "ear rocks" out of the sensitive part of the ear (posterior canal) to a less sensitive location. Each maneuver takes about 15 minutes to complete. The Semont maneuver (also called the liberatory maneuver) involves a procedure whereby the patient is rapidly moved from lying on one side to lying on the other. It is a brisk maneuver that is not currently favored in the United States.

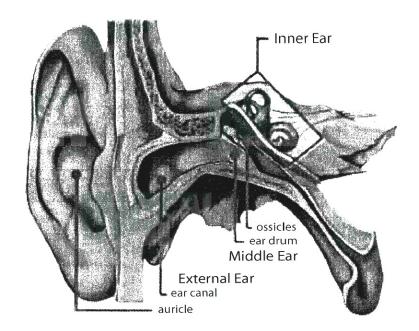
The Epley maneuver is also called the particle repositioning, canalith repositioning procedure, and the modified liberatory maneuver. It is illustrated in Figure 2. Click here for an animation. It involves sequential movement of the head into four positions, staying in each position for roughly 30 seconds. The recurrence rate for BPPV after these maneuvers is about 30% at one year, and in some instances a second treatment may be necessary. While some authors advocate use of vibration in the Epley maneuver, we have not found this useful in a study of our patients.

After either of these maneuvers, you should be prepared to follow the instructions below, which are aimed at reducing the chance that debris might fall back into the sensitive back part of the ear.

Instructions For Patients After Office Treatment (Epley or Semont Maneuvers)

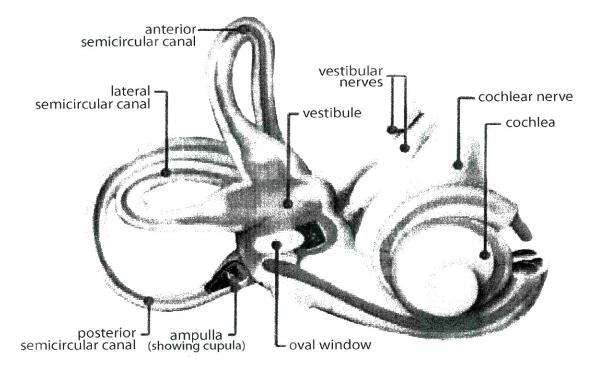
- 1. Wait for 10 minutes after the maneuver is performed before going home. This is to avoid "quick spins," or brief bursts of vertigo as debris repositions itself immediately after the maneuver. Don't drive yourself home.
- 2. Sleep semi-recumbent for the next two nights. This means sleep with your head halfway between being flat and upright (a 45 degree angle). This is most easily done by using a recliner chair or by using pillows arranged on a couch (see Figure 3). During the day, try to keep your head vertical. You must not go to the hairdresser or dentist, or engage in exercise that requires head movement. When men shave under their chins, they should bend their bodies forward in order to keep their head vertical. If eye drops are required, try to put them in without tilting the head back. Shampoo only under the shower.
- 3. For at least one week, avoid provoking head positions that might bring BPPV on again:
- Use two pillows when you sleep
- Avoid sleeping on the "bad" side
- Don't turn your head far up or far down

Be careful to avoid head-extended position, in which you are lying on your back, especially with your head turned towards the affected side. This means that you should be cautious at the beauty parlor, dentist's office, and while undergoing minor surgery. Try to stay as upright as



The external ear consists of the part of the ear you can see (the *auricle*) and the ear canal.

The middle ear includes the eardrum (tympanic membrane) and the three bones, or ossicles, of the middle ear, the malleus ("hammer"), meus ("anvil"), and the stapes ("stirrup").



The inner ear is a fluid-filled series of chambers. One of these chambers, the *cochlea*, is responsible for converting sound vibrations into nerve impulses. It is these nerve impulses that the human brain interprets as sound and what we call "hearing".

possible. Exercises for low-back pain should be stopped for a week. No sit-ups should be done for at least one week and no "crawl" swimming. (Breast stroke is all right.) Also avoid far head-forward positions such as might occur in certain exercises (for example, touching the toes). Do not start doing the Brandt-Daroff exercises immediately or two days after the Epley or Semont maneuver, unless specifically instructed otherwise by your doctor.

4. At one week after treatment, put yourself in the position that usually makes you dizzy. Position yourself cautiously and under conditions in which you can't fall or hurt yourself. Let your doctor know how you did.

Massoud and Ireland (1996) stated that post-treatment instructions were not necessary. While we respect these authors, at this writing (2002), we still feel it best to follow the procedure recommended by Epley.

What if one has bilateral BPPV?

There is some concern in this situation that treating one side followed by treating the other might "undo" the positive effects of the first. Therfore, acommon approach is to treat one side, and move on to the other a week later. Nevertheless, some physicians treat both sides in the same session, with good results. In either case, a followup visit is usually needed at roughly a week from the initial attempt.

What if the Maneuvers Don't Work?

These maneuvers are effective in about 80% of patients with BPPV (Herdman et al, 1993). If you are among the other 20%, your doctor may wish you to proceed with the Brandt-Daroff exercises, as described below. If a maneuver works but symptoms recur or the response is only partial (about 40% of the time according to Smouha, 1997), another trial of the maneuver might be advised. When all maneuvers have been tried and symptoms are still intolerable, then surgical management (posterior canal plugging) may be offered.

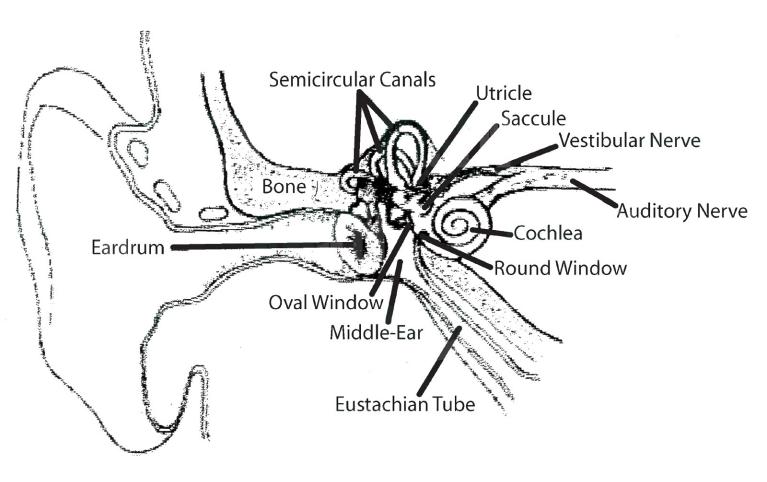
BPPV often recurs. About 33% of patients have a recurrence in the first year after treatment, and by five years, about half of all patients have a recurrence (Hain et al, 2000; Nunez et al; 2000). If BPPV recurs in our practice, we usually re-treat with one of the maneuvers above, and then follow this with a once a day set of the Brandt-Daroff exercises.

In some persons, the positional vertigo can be eliminated, but imbalance persists. In these persons it may be reasonable to undertake a course of generic vestibular rehabilitation, as they may still need to accommodate to a changed utricular mass or a component of persistent vertigo caused by cupulolithiasis. Fujino et al (1994) reported conventional rehabilitation has some efficacy, even without specific maneuvers.

Home Treatment Of BPPV: Brandt-Daroff Exercises

The Brandt-Daroff Exercises are a method of treating BPPV, usually used when the office treatment fails. They succeed in 95% of cases but are more arduous than the office treatments. These exercises are performed in three sets per day for two weeks. In each set, one performs the maneuver as shown five times.

1 repetition = maneuver done to each side in turn (takes 2 minutes)



INNER EAR OR LABYRINTH

Suggested Schedule for Brandt-Daroff exercises

Time Exercise Duration
Morning 5 repetitions 10 minutes
Noon 5 repetitions 10 minutes
Evening 5 repetitions

Start sitting upright (position 1). Then move into the side-lying position (position 2), with the head angled upward about halfway. An easy way to remember this is to imagine someone standing about 6 feet in front of you, and just keep looking at their head at all times. Stay in the side-lying position for 30 seconds, or until the dizziness subsides; if this is longer, then go back to the sitting position (position 3). Stay there for 30 seconds, and then go to the opposite side (position 4) and follow the same routine.

These exercises should be performed for two weeks, three times per day, or for three weeks, twice per day. This adds up to 52 sets in total. In most persons, complete relief from symptoms is obtained after 30 sets, or about 10 days. In approximately 30% of patients, BPPV will recur within one year. If BPPV recurs, you may wish to add one 10-minute exercise to your daily routine (Amin et al, 1999). The Brandt-Daroff exercises, as well as the Semont and Epley maneuvers, are compared in an article by Brandt (1994), listed in the reference section.

Surgical Treatment of BPPV:

Posterior Canal Plugging

If the exercises described above are ineffective in controlling symptoms, the symptoms have persisted for a year or longer, and the diagnosis is very clear, a surgical procedure called posterior canal plugging may be recommended. Canal plugging blocks most of the posterior canal's function without affecting the functions of the other canals or parts of the ear. This procedure poses a small risk to hearing, but is effective in about 90% of individuals who have had no response to any other treatment. Only about 1% of our BPPV patients eventually have this procedure done. Surgery should not be considered until all three maneuvers and exercises (Epley, Semont, and Brandt-Daroff) have been attempted and failed. See the article by Parnes (1990, 1996) in the references for more information.

There are several alternative surgeries. Dr. Gacek (Syracuse, New York) has written extensively about singular nerve section. Dr. Anthony (Houston, Texas), advocates laser assisted posterior canal plugging. It seems to us that these procedures, which require unusual amounts of surgical skill, have little advantage over a canal plugging procedure. Of course, it is always advisable when planning surgery to select a surgeon who has had as wide an experience as possible.

There are several surgical procedures that we feel are inadvisable for the individual with intractable BPPV. <u>Vestibular nerve section</u>, while effective, eliminates more of the normal vestibular system than is necessary. Labyrinthectomy and sacculotomy are also both generally inappropriate because of reduction or loss of hearing expected with these procedures.

Where Are BPPV Evaluations and Treatments Done?

The Vestibular Disorders Association (VEDA) maintains a large and comprehensive list of doctors who have indicated a proficiency in treating BPPV. Please contact them to find a local treating doctor.

How Might BPPV Affect My Life?

Certain modifications in your daily activities may be necessary to cope with your dizziness. Use two or more pillows at night. Avoid sleeping on the "bad" side. In the morning, get up slowly and sit on the edge of the bed for a minute. Avoid bending down to pick up things, and extending the head, such as to get something out of a cabinet. Be careful when at the dentist's office, the beauty parlor when lying back having your hair washed, when participating in sports activities and when you are lying flat on your back.

What is Atypical BPPV (Lateral Canal BPPV and Anterior Canal BPPV)?

There are two rarer variants of BPPV that may occur spontaneously as well as after the Brandt-Daroff exercise, or the Epley or Semont maneuvers. They are thought to be caused by migration of otoconial debris into canals other than the posterior canal (that is, the anterior or lateral canal). There is presently no data reported as to the frequency and extent of these syndromes following treatment procedures. It is the author's estimate that they occur in roughly 5% of the time after the Epley maneuvers and about 10% of the time after the Brandt-Daroff exercises for a significant BPPV. In nearly all instances, these variants of BPPV following maneuvers resolve within a week without any special treatment. If they do not, there are procedures available to treat them.

In clinical practice, atypical BPPV arising spontaneously is first treated with the same maneuvers as for typical BPPV, and the special treatments as outlined below are entered into only after treatment failure. When atypical BPPV follows the Epley, Semont or Brandt-Daroff maneuvers, specific exercises are generally begun as soon as the diagnosis is ascertained. In patients in whom the exercise treatment of atypical BPPV fails, especially in situations where onset is spontaneous, additional diagnostic testing such as MRI scanning may be indicated. Lateral canal BPPV is the most common atypical BPPV variant, accounting for about 3% of cases. Most cases are seen as a consequence of an Epley maneuver. It is diagnosed by a horizontal nystagmus that changes direction according to the ear that is down. More detail about lateral canal BPPV, as well as an illustration of a home exercise, can be found here. Anterior canal BPPV is extremely rare and likely transient when it does occur. It is diagnosed by a positional nystagmus with components of downbeating and torsional movement on taking up the Dix-Hallpike position, or a nystagmus that is upbeating and torsional when sitting up from the Dix-Hallpike. The upbeating nystagmus on sitting may be very persistent as the debris settles on the cupula of the anterior canal. Anterior canal involvement is probably transient because debris naturally works its way out of the anterior canal with the head in the upright position.

Research Studies in BPPV

Considerable research is ongoing regarding BPPV. This is an exciting area as considerable progress has been made once the mechanical etiology of BPPV has been appreciated. Areas of particular interest include methods of improving the results of treatments, and preventing relapses.

At the American Hearing Research Foundation (AHRF), we are interested in projects that might lead to a better understanding of the basic mechanisms involved in BPPV, and improved treatment. Click here if you would you would like more information about contributing to the AHRF's efforts.

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- A 4-page, 4-color BPPV handout as is used in Dr. Hain's practice is available at a small cost (click here for details).
- VEDA has recently published a patient-oriented book on BPPV.

Links

- Click here for very recent, but possibly less relevant references.
- http://www.charite.de/ch/neuro/vertigo.html -- This is a self-treatment Epley protocol.

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Acknowledgments

Illustrations are courtesy of Northwestern University.

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LET's TALK)

.FOR PEOPLE WITH SPECIAL COMMUNICATION NEEDS

Benign Paroxysmal Positional Vertigo (BPPV)

By Chris Zalewski, MA, CCC-A

This morning I woke up terrified because when I rolled over in bed, the world started spinning around me. What's wrong with me?

You are experiencing what is known as vertigo-an illusory sensation of motion that patients usually describe as a spinning sensation. Vertigo is often a result of some problem affecting the balance system, or vestibular system. The vestibular system is located within your ears and is responsible for sensing and monitoring your movement, as well as maintaining your balance when standing still. A problem within your vestibular system may often lead to feelings of vertigo, dizziness, dysequilibrium (a loss of balance), and sometimes lightheadedness.

The symptoms that you are describing are characteristic of a specific type of vertigo known as Benign Paroxysmal Positional Vertigo, or BPPV. Let me first say that you are not alone. Approximately 25% of patients who experience vertigo are suffering from BPPV. In fact, BPPV is the single most common cause of vertigo and dizziness, and affects more than 150,000 people each year. Although a definitive diagnosis of BPPV can be easily made by your doctor, the characteristic signs of BPPV are almost always the same. People suffering from BPPV will almost universally report the same symptoms. That is, they report experiencing their vertigo for only a brief period of time (usually less than 30-60 seconds) whenever they get up from bed, roll over in bed, look up into the sky or into a high cupboard, or when they bend over to pick something up. In fact,

these two characteristics, brief episodes of vertigo and vertigo following a change in head position, are usually reason enough for a physician or audiologist to suspect BPPV.

This sounds serious, should I be worried?

Vertigo and dizziness are always something to be concerned about, but let me continue. The diagnosis of BPPV is a fairly simple one and can usually be identified after performing a series of brief positioning tests in the office. If a diagnosis of BPPV is confirmed by your physician, RELAX. Benign Paroxysmal Positional Vertigo is often easily and effectively treated within a few minutes right there in the office; without any drugs, needles, or surgery—but I'm getting ahead of myself.

OK, but Benign Paroxysmal Positional Vertigo still sounds pretty threatening (not to mention a mouthful). What exactly is it and how did I get it?

Don't let the words trouble you. Let's break it down.

- *Benign* means that it's NOT life threatening.
- Paroxysmal simply means shortlived or lasting only for a brief period of time (often seconds).
- Positional means that the dizziness is provoked by changes in certain head or body positions.
- Vertigo characterizes the feeling of that spinning dizziness you feel.
 So, BPPV is simply describing

your symptoms of a brief period of vertigo brought on when you move you head (or body) in a particular

way, or place it in a particular position. And of course, it's not lifethreatening!

But how did I get it?

I'm getting to that. BPPV is often the result of some type of head trauma (even a slight bump to the head), inflammation of the inner ear (labyrinthitis), and,

oh yes, aging.
Unfortunately
though, the
cause may be
unknown in many of
the cases.

I'm feeling a bit better about this now. Can you explain what exactly is going on?

Sure. The inner ear is a fluid filled system about the size of a garden pea and is responsible for hearing as well as balance. Within the balance part of the system are two sticky structures that have small calcium deposits or granules stuck to them. At times, these calcium deposits, or otoconia, can become dislodged and float within the inner ear fluid. As they float within the inner ear fluid, they can often migrate into another area of the balance system called the semicircular canals. Still with me? When these calcium deposits, or otoconia, collect within these canals, the motion of inner ear fluid within these canals can become disrupted or disturbed. This disruption in fluid flow also causes a disruption

LET'S TALK)

in the neural signals sent to the brain, which gives the impression of your "spinning dizziness."

Whew ... still with me? Ok.

So it's a collection of these calcium deposits in an area where they shouldn't be, causing a disruption of the nerves firing signals to our brain, which we interpret as dizziness.



BPPV is the single most common cause of vertigo and dizziness, and affects more than 150,000 people each year.

Wow, very interesting. So is there anything that can be done about these calcium deposits?

Yes. Let me first say that having otoconia is good thing and we need them they're just in the wrong place. So we need to move them out of where they shouldn't be, and move them back to where they should be. If we can effectively move these "offending" calcium deposits back to where they should be, the vertigo should lessen or completely go away since they are no longer there to cause any problems.

Sounds simple enough ... almost too simple. How's it done?

It is simple. As you lie on your back, your physician or audiologist simply rotates or gently rolls your head around in a very specific way to assist in the moving of the calcium deposits back to where they should be. Once they get there, just a little bit of time is all that is necessary for the deposits to be reabsorbed back onto the structures where they originally came from. The whole procedure lasts about 5-10 minutes.

That actually sounds relaxing..... but does it work?

You bet! The effect of performing the head rolling maneuver (also known as the Epley Maneuver) can be quite dramatic. Many patients report an immediate improvement or a complete resolution of their dizziness after the maneuver has been done. Although it may take a follow-up visit to your doctor to repeat the maneuver (sometimes you don't get all the calcium deposits the first go-around), the success of the Epley Maneuver has been appreciated by thousands of patients each year.

I should, though, let you in on one of the downfalls of having BPPV. That is, those who develop BPPV are more likely to get it again in the future. For a variety of reasons, many of which you cannot control, the calcium deposits simply have a greater likelihood to become dislodged again, causing your vertigo to return-sometimes less and sometimes worse. Don't worry though. It usually can be treated effectively each time with the same head rolling procedure-but it is important to get your physician involved each time to make certain that nothing else is going on.

I'm feeling much better about this whole "BPPV" thing now. Is there anything else?

Absolutely. Although BPPV is the single most common cause of dizziness each year, I can't stress the importance of seeking the care of a physician whenever dizziness is experienced—no matter how benign or slight the experience is. I can't reiterate this point enough. The exact diagnosis of BPPV should always come from your physician. Dizziness and/or vertigo can be caused by a myriad of things, and it is always a good idea to get it checked out by a doctor as soon as possible.

For more information about hearing loss, hearing aids or referral to an ASHA-certified audiologist, contact the:



10801 Rockville Pike Rockville, MD 20852 1-800-638-8255 (Voice or TTY) E-mail: actioncenter@asha.org Web site: www.asha.org

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