



Chat Transcript
“The latest on Research on Hair Cell Regeneration”
Dr. Douglas A. Cotanche
November 19, 2009 – 9:00 P.M. EST

Moderator

Good Evening, The Hearing Loss Association of America (HLAA) is proud to present live moderated chats, featuring the nation's leading experts in hearing loss and hearing loss issues. This is your opportunity to ask a question and learn more about hearing loss from leaders from a variety of disciplines associated with hearing loss.

Our program this evening will be moderated throughout the next hour. We will first answer any questions sent in advance, and then you may type in your questions below and click “ask”. We will do our best to have all your questions answered in the hour we have together.

This evening our topic is “Regeneration of hair cells – the latest news in research” with our Expert Guest Dr. Douglas A. Cotanche.

Douglas A. Cotanche is an Associate Professor in the Departments of Otolaryngology- Head & Neck Surgery and Anatomy & Neurobiology at Boston University School of Medicine. Dr. Cotanche was a panelist at the research symposium that was sponsored by the Deafness Research Foundation at the last HLAA Convention in Nashville

We are honored to have Dr. Cotanche with us this evening. Welcome Dr. Cotanche to the HLAA Chat room.

Dr._Cotanche

Hi Toni and hello to everyone online. I'm certainly glad and excited to be here!

Moderator

We have many questions that have been sent in so I suggest we get started with the first question.

Eileen from Utah asks: I suffered sudden hearing loss 3 years ago. I was placed in the hospital for 2 days while I was given an MRI because the doctor thought I had a brain tumor. I didn't, it was clear; I was tested for a stroke, MS and had a spinal tap to rule out meningitis. My doctor now calls me a medical wonder because he doesn't know why I lost my hearing. I was referred to Dr. Shelton from the U of Utah and last year he mentioned this new technology being introduced on implanting hair follicles and it was presently being tested on birds. I was surprised when I found your site last night and your also mentioning the same technology. Can I be a candidate for this transplant? Let me know what I need to do and whether I need to be referred by Dr. Shelton. This is the most exciting news I've read since my hearing loss. I'm on my 4th pair of hearing aids in 3 years, amazing they are not covered by any health insurance. I'm a federal civilian employee and you'd think they would cover hearing aids

when you realize how many young troops are coming home from war hearing impaired. Mostly because of the gun fire and explosions. Thank you and any help you can provide me is greatly appreciated. I've been tested for everything and out of 3 doctors none can tell me why I lost my hearing. It's been frustrating.

Dr._Cotanche

Hi Eileen, Sorry to hear about your unexplained hearing loss. Unfortunately, at this time there are no clinical trials for therapies to regenerate hearing in humans. The work you're referring to is experimental basic science that is being conducted on birds and mice. Although we are learning more every day about hair cell regeneration, it is not yet at a point where any experimental therapies and at a point where they can be tried on human patients.

Moderator

Kathleen from NJ: I am deaf since I was about 5 years old, though it was progressive. No one knew I was deaf until I was a teenager. I had been given drugs in a hospital for pneumonia. They think that's what caused my nerve deafness. Right now, I am 62 and in good health and most people don't even realize how deaf I am. Deaf enough to be awarded SSD. My question is, are there any clinical trials going on for regeneration of nerves in the ear? I would love to be part of one.

Dr._Cotanche

Hi Kathleen, Unfortunately, at this time there are no clinical trials for therapies to regenerate hearing in humans. Although we are learning more every day about hair cell regeneration in animal models, the science is not yet at a point where any experimental therapies and at a point where they can be tried on human patients.

Moderator

Lin from Texas: I read about research on hair cell regeneration a number of years ago, and am excited to learn about your Webchat on its progress. You will probably answer this question without being asked, but I am asking just to be sure. When do you think these procedures are likely to be available for those of us with profound hearing losses who are no longer able to use hearing aids? Thank you for your continuing with this research, and for your response.

Dr._Cotanche

Hi Lin, Thanks for your interest in our work and for following over the years. We are still in the very early stages of developing techniques for inducing hair cell regeneration in damaged mouse and guinea pig ears. To date, we have not yet perfected a technique that leads to full or even partial functional recovery in a damaged cochlea. I would project that a potential therapy will not be available for at least 20 years.

Moderator

Carol in Connecticut: Do you expect that people with Cochlear Implants will be eligible for hair cell regeneration when it becomes available? And, how far off in the future would you predict this procedure might be available to general patients with sensorineural hearing loss? Finally, what are researchers finding are the unexpected side effects - long term health effects of gene therapy for things like hair cell regeneration?

Dr._Cotanche

Hi Carol, The new cochlear implants are thought to not damage as much of the cochlear components as the original CIs. So it is possible that those who currently have a CI might be able to take advantage of any therapies that might be developed in the future. Again, I am predicting we will not develop a successful therapeutic approach to regenerating hair cells in humans for at least 20 years. At this point, we do not have any effective therapies, so we don't know of any long term side effects or health effects.

Moderator

Shirl from Texas: I read something recently about improving hearing loss by eating honey mixed with cinnamon. What is this all about?

Dr._Cotanche

Hi Shirl, Well, this is a new one on me. The only possible connection I can imagine is that the beneficial anti-oxidant properties of honey and cinnamon will protect existing hair cells from damage. I know of no way that this could help regenerate hair cells.

Moderator

Debbie from Colorado: There has been an individual promoting this YouTube video on hair cell regeneration as being proof that it is happening now. Is this true?
http://www.youtube.com/watch?v=i_jqPbTc0Ug Where should we go for credible updates on hair cell regeneration?

Dr._Cotanche

Hi Debbie, Thank you for pointing out this video. I am very suspicious of this testimony because they give no details of what therapy they are talking about. And when I go to the company website there is no information on this case or for using stem cells to treat hearing loss. I would be very cautious about believing that testimonial, even if both her parents are MDs. They need to provide more scientific data and show it happens more than once to demonstrate that the therapy she got was actually responsible for her recovery of her hearing. There may have been other things going on or other therapies she got that contributed to the recovery. A good resource for reliable information would be the National Institute of Deafness and Other Communicative Disorders (<http://www.nidcd.nih.gov/>) at NIH in Bethesda, MD.

Moderator

Rob from North Carolina: The topic concerns development and regeneration of hair cells but what about the auditory nerve? What research, if any, is there on the rehabilitation of the nerve cells from the cochlear to the auditory center of the brain?

Dr._Cotanche

Hi Rob, Good question! There are studies looking at recovery of the auditory nerve or keeping it healthy when hair cells are lost by the addition of growth factors and/or electrical stimulation. There

has been one animal study where stem cells were transplanted into a damaged cochlear nerve and they showed some regrowth of processes both toward the brain and toward the cochlea. So there are clearly possibilities for regenerating cochlear nerves as well as hair cells.

Moderator

Mike from Washington: Would the age of onset of hearing loss (sensorineural) be a factor on potential success in a stem cells treatment? Such as a baby born with a hearing loss versus late deafened person? And talking about stem cells are we talking about adult stem cells for this potential treatment or embryonic?

Dr._Cotanche

Hi Mike, It is not yet clear if stem cells could effectively replace hair cells lost many years before. All the animal experiments have been done shortly after the hair cells were lost. But this is an issue that will need to be explored in animal models before any experiments can be tried on humans.

To date, animal experiments with stem cells have used mouse embryonic stem cells, mouse adult stem cells, and now the newly discovered induced pluripotent stem cells (iPSCs) where adult skin or blood cells can be extracted and converted into cells that are functionally equivalent to embryonic stem cells. The benefit of this new technology is that they can take a person's own skin or blood cells and turn them into stem cells with the same genetic identity and immune markers as the person they hope to put the stem cells into.

Moderator

Ahmad from Egypt: I worked and lived in the US for many years and live in my home country Egypt at present. I suffer from profound hearing loss that developed over the past 20 years. My left ear is totally deaf and my right has residual hearing that serves me well with a Sumo analog BEHA. I was told by Dr. Michael Paparella in Minneapolis, MN, that the hair cells within my cochlea are damaged by the disease. Would the new development, if realized, help me at all restore some of my hearing? How soon could one expect it considering that I am already 70 years old? Is there any treatment available now for my condition?

Dr._Cotanche

Hi Ahmad, We are still in the very early stages of developing techniques for inducing hair cell regeneration in damaged mouse and guinea pig ears. To date, we have not yet perfected a technique that leads to full or even partial functional recovery in a damaged animal cochlea. We need to accomplish this before we can think of trying therapies in humans. I would project that a potential therapy will not be available for at least 20 years. Right now, hearing aids or cochlear implants are the only effective therapies for profound hearing loss.

Moderator

Shona from Nevada: How close or far away (in terms of time - years) are we from having hair cell regeneration in humans? Experimental or as a standard treatment. Is hair cell regeneration being looked out for the person with moderate sensorineural hearing loss or only with complete deafness?

Dr._Cotanche

Hi Shona, We are still in the very early stages of developing techniques for inducing hair cell regeneration in damaged mouse and guinea pig ears. To date, we have not yet perfected a technique that leads to full or even partial functional recovery in a damaged animal cochlea. We need to accomplish this before we can think of trying therapies in humans. I would project that a potential therapy will not be available for at least 20 years. If regeneration could be developed as a successful therapy, then it may be possible to use it to treat moderate as well as severe or profound hearing loss. But we would need to be able to show that the therapy did not somehow cause a reduction in the surviving hair cell population and lead to further hearing loss.

Moderator

Jonel from Michigan: I have read about the research being done on hair cell regeneration. How is this research being funded? Is there any idea when this might be a possibility? I have Meniere's Disease, so I am very interested in this. If you have this disease, wouldn't the disease kill off any hair cells that might regenerate? Thank you for answering our questions!

Dr._Cotanche

Hi Jonel, Research on hair cell regeneration is funded primarily by grant funds from the National Institute of Deafness and Other Communicative Disorders (<http://www.nidcd.nih.gov/>) at NIH in Bethesda, MD. Some research is also funded by the Deafness Research Foundation, the National Organization for Hearing Research Foundation, the American Hearing Research Foundation and some private philanthropic support. However, the current economy has greatly reduced the amount of available funding and research is suffering. Please contact your local senators and congressmen and ask that they provide further funding for medical research.

As far as your Meniere's, you're right. We'd have to find a way to treat your Meniere's first and then try to regenerate your hair cells and hope the Meniere's doesn't come back

Moderator

Bob from California: When can we expect to see the beginning of clinical trials. Are drugs the only strategy for hair cell regeneration?

Dr._Cotanche

We are still in the very early stages of developing techniques for inducing hair cell regeneration in damaged mouse and guinea pig ears. To date, we have not yet perfected a technique that leads to full or even partial functional recovery in a damaged animal cochlea. We need to accomplish this before we can think of trying therapies in humans. I would project that a potential therapy will not be available for at least 20 years.

Moderator

Ann from California: There has been some recent online news of stem cell treatment overseas of auto-immune response deafness (Sohl). This 18-year old woman experienced deafness for only three years before her treatment. Don't know if this is proven fact, as medical research annals have yet to

report this successful treatment for hearing loss. Would stem cell treatment with one's own adult stem cells be as successful for one born prelingually deaf with 40 to 60 years of sensorineural hearing loss and who has worn hearing aids over his entire lifetime and maintains his speech?

Dr._Cotanche

Hi Ann, I am very suspicious of this testimony because they give no details of what therapy they are talking about. And when I go to the company website there is no information on this case or for using stem cells to treat hearing loss. I would be very cautious about believing that testimonial, even if both her parents are MDs. They need to provide more scientific data and show it happens more than once to demonstrate that the therapy she got was actually responsible for her recovery of her hearing. There may have been other things going on or other therapies she got that contributed to the recovery.

Moderator

Marisa from California: Thank you for sharing your knowledge. My 5 year old niece has LVA - enlarged vestibular aqueduct syndrome. The malformation of her inner ear causes a lack of hair follicles necessary for hearing. Do you think that advances in stem cell research might find a way generate these hair follicles?

Dr._Cotanche

Hi Marisa, The LVA causes a loss of the hair CELLS, the sensory cells in the inner ear. These are not the same kind of cells that produce the hair follicles on our head, arms and legs. But, it is possible that stem cell research may lead to the replacement of lost hair cells in the inner ear.

Moderator

Andrea from New York: Would hair cell regeneration be a future option for people who have cochlear implants?

Dr._Cotanche

Hi Andrea, The new cochlear implants are thought to not damage as much of the cochlear components as the original CIs. So it is possible that those who currently have a CI might be able to take advantage of any therapies that might be developed in the future. Again, though, I am predicting we will not develop a successful therapeutic approach to regenerating hair cells in humans for at least 20 years.

Moderator

Andrea in New Jersey: My 3 year old son has a mild to moderate bilateral sensorineural hearing loss. How much research is being done on stem cells reversing/repairing the hearing loss? I have searched the Internet, but it is very difficult to find out exactly how much, if any, stem cell research is dedicated to hearing loss.

Dr._Cotanche

Hi Andrea from NJ. To date, animal experiments with stem cells have used mouse embryonic stem cells, mouse adult stem cells, and now the newly discovered induced pluripotent stem cells (iPSCs) where adult skin or blood cells can be extracted and converted into cells that are functionally

equivalent to embryonic stem cells. The benefit of this new technology is that they can take a person's own skin or blood cells and turn them into stem cells with the same genetic identity and immune markers as the person they hope to put the stem cells into. These studies have shown some evidence that stem cells transplanted into a damaged cochlea can replace some hair cells and supporting cells. But now we just need to perfect these techniques so that significant numbers of new hair cells that would result in functional recovery can be made.

Moderator

Ed from Florida: Restoring hair cells has been a top priority for hearing research around the world for a long time now. I understand that we have known for 20 years or so that it seems theoretically possible to restore hair cells (eg. in a petri dish). But translating that ability to the human ear has proved more elusive than anyone forecasted. My question is two-fold.

1) What are the biggest hurdles to seizing this opportunity? My sense, as with most hearing research, it is a manpower issue. Unlike some other medical research, there are just not enough people working on it. Translation, there is not enough money supporting this mission. True?

2) Would the research efforts be more successful if they focused at more attainable objectives? For example, would PRESERVING hearing cells be a more achievable "stepping stone" goal than RESTORING them?

Dr._Cotanche

Hi Ed. As for your first question: Yes, you're correct that money has been limited the last few years. More money available for research would certainly help!

In response to your second question: Actually, there has been quite a bit of progress in our understanding of how hair cells die from noise and antibiotics, how they develop in the embryo and whether regeneration can be stimulated in the mature mammalian inner ear. We've come a long way and have many answers, but we still need to know more. From what we learned in the bird studies, we've been able to show that mouse hair cells can be coerced to regenerate, but some signal in the ear understands that these new hair cells are not normal and they are eventually eliminated. So we now need to know how to keep regenerated hair cells in the mammal ear from dying off and determining if they can regain function. A number of studies are looking at protecting hair cells from being lost by increasing levels of anti-oxidants around the hair cells during damaging events. There are a few human clinical trials looking at whether anti-oxidants can protect hair cells from loss due to noise exposure but the answers are not yet available.

cary

Please explain just how the hair cells can be regenerated?

Dr._Cotanche

Hi Cary, Wow, what a simple but complex question! There are two main ways we hope to be able to regenerate hair cells. One is by using the native supporting cells still remaining in the ear. If we can stimulate the supporting cells to start dividing to make more new cells and then coax them to differentiate as new hair cells and supporting cells, that would work using the cells already present in one's ear.

The second way would be to transplant some kind of stem cell or hair cell precursor into the ear and that cell would then integrate into the damaged cochlea and develop into new hair cells and/or supporting cells to replace the lost ones.

cary

Would the regeneration of hair cells apply to younger people rather than seniors?

Dr._Cotanche

It would probably not only be do-able in young people. Birds of all ages can regenerate; even really old birds regenerate as well as spry young chicks. One aspect of your question might be how long has someone been deaf and if it's been a long time could they regenerate? We don't know the answer to this yet. Most animal studies have induced regeneration in recently deafened animals. There are a couple of studies just under way looking at whether animals deafened for a long time can regenerate as readily as those recently deafened. We'll have to see how those turn out.

Bailey_CT

Why do otherwise healthy people lose their hair cells? What are the causes of hair cell loss?

Dr._Cotanche

There are many reasons for hair cell loss. Some could be genetic where you're otherwise healthy but some gene stops working that is critical to the ear and this leads to hair cell loss. Hair cell loss is also caused by exposure to loud noise, such as factory noise, gun shots repeatedly over a long time (hunters, military folks), recreational vehicle noise (snowmobiles, jet skis, chain saws, etc), recreational toys like iPods played very loud. Sometimes drugs we take to treat other problems can cause hair cell loss, i.e., aminoglycoside antibiotics or chemotherapy drugs. And finally, there may be combined effects of all these that lead to hearing loss.

mike_m

Could you summarize the status of hair cell regeneration research (it sounds like in mammals at this time?)

Dr._Cotanche

Hi Mike_M, We know now that mammal cochlear hair cells will not regenerate on their own when the native hair cells are lost. But experimental models have shown that we can induce some levels of regeneration by stimulating genes that cause cells to divide. So we do see an initial burst of regeneration, but then the ear somehow senses that this should not happen and eliminates these cells. So now we need to find a way to prevent the mammal ear from eliminating these newly regenerated hair cells. But we're getting there slow but sure!

Hollace

Where in the ear are the hair cells?

Dr._Cotanche

Hi Hollace, Hair cells are located in both the auditory part of the ear, the organ of Corti, where you detect sound vibrations and in the vestibular, or balance part of the ear where you detect your position in space and whether you're moving forward, backward, or spinning. The hair cells are basically very fine tuned motion detectors. In the auditory part they detect the motion of sound waves. In the balance part, they detect the motion caused by your body moving in space.

Moderator

I see our time is just about up. I don't think we have enough time to ask another question. Dr. Cotanche, I cannot thank you enough for being with us tonight. I do hope you will come again when there is more research information to share.

Dr._Cotanche

Thank you all for sending such good questions! It's been lots of fun. I know it's been 20 years since we first discovered regeneration and that seems like a long time with still no solution for humans. But the research has come a long way and we hope to get much further in the next 20 years. Thanks everybody!

Moderator

Thank you all for joining us tonight.

Our next chat will be in January and will be especially important to Veterans.

Date: January 20th, 2010 EST Guest
Speaker; Dr. Gene W. Bratt, VA Administration
Topic: Hearing Health Benefits for Veterans

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