Claire Schultz: I'm Claire Schultz, CEO of Hearing Health Foundation (HHF). I want to thank you for joining us for our second research briefing this year. Today we have a special research update by one of our Hearing Restoration Project (HRP) research consortium members, Dr. Andy Groves.

Joining us for the live presentation are members of the Hearing Health Foundation (HHF) board of directors, staff, as well as longtime supporters of Hearing Health Foundation. Thank you for your continued support and interest in HHF and our groundbreaking research.

For some of you this is an introduction. Others have heard a little about the HRP at the research webinar earlier this year or through friends, colleagues, or loved ones. We're all here today because we have one thing in common: a personal connection to hearing loss.

Our goal is that everyone who listens to the presentation will obtain some new information on hearing loss, and our research toward a cure. It doesn't end today. If after listening to the briefing, time passes and you have questions or thoughts, we are your source for reliable, accurate, up-to-date information on hearing loss and other hearing-related conditions.

We intend to have many more webinars with researchers in the future, and there will be plenty of opportunity for learning as we go forward. Thank you again for your time and interest.
Agenda

- Welcome & Introductions
- History of Hearing Health Foundation
- Introducing: Dr. Andy Groves
- Unlocking the Potential for Hair Cell Regeneration
- Q & A
- Conclusion
Claire Schultz: Hearing Health Foundation was founded in 1958, almost 60 years ago. We have a reputation for pioneering breakthroughs in hearing and balance research. Some examples include:

- We were early supporters of the revolutionary cochlear implant and today over 220,000 children and adults now benefit from them.
- We advocated for the passage of Universal Newborn Hearing Screening legislation in the ’90s. Today, 97% of newborns are tested for hearing loss at birth.
- Throughout our history, our Emerging Research Grants program has and continues to provide seed funding for researchers in hearing and balance science and has led to innovations that increase options for those living with hearing loss, as well as protecting those at risk.
  - Since 2006, 44% of ERG-funded researchers have gone on to obtain federal funding!

Since 2011, focused on discovering a biological cure for hearing loss and tinnitus through hair cell regeneration!

Claire Schultz: Hearing Health Foundation was founded in 1958, almost 60 years ago. We have a reputation for pioneering breakthroughs in hearing and balance research. Some examples include:

- We were early supporters of the revolutionary cochlear implant and today over 220,000 children and adults now benefit from them.
- We advocated for the passage of Universal Newborn Hearing Screening legislation in the ’90s, and now about 97% of newborns are tested for hearing loss at birth.
- Throughout our history, our Emerging Research Grants program has and continues to provide seed funding for early stage scientists—many of our funded researchers have gone on to obtain federal funding for their work and this is one of the measures of success.
  - In 2015, through our Emerging Research Grants program, we awarded grants in hyperacusis, tinnitus, Ménière's disease, and central auditory processing disorder (CAPD).

Our experience throughout the years leads us to the focus today to find a biologic cure through the Hearing Restoration Project.
Claire Schultz: Since the last webinar in May, HHF has been very busy.

• Through our communication channels, such as the web, Hearing Health magazine, and social media, HHF has highlighted recently published research from the HRP and ERG researchers.
  o Published research demonstrates your impact on the advancement of hearing and balance science in the path to a cure.
  o It is also a significant success metric for the scientific community.

• Through webinars and our spotlight on series, HHF is bringing the HRP to you.
  • This provides an opportunity to get to know the life and work of researchers working collaboratively toward a cure.
  • Please email us if you have any questions after the presentation.
Claire Schultz: Now I would like to introduce Dr. Andy Groves, HRP consortium member. Dr. Groves has been a HRP consortium member since its founding in 2011.

- Dr. Groves is originally from London, resides in Texas, and works at the Baylor College of Medicine.
- Dr. Groves studied natural sciences at the University of Cambridge, and completed his Ph.D. training at the Ludwig Institute for Cancer Research at University College London, where he studied the early development of the nervous system.
- He moved to California for postdoctoral training at the California Institute of Technology, where he shifted his research focus to the development and regeneration of the inner ear.
- Dr. Groves then went on to become the section chief at the House Ear Institute in Los Angeles, and an adjunct assistant professor at the University of Southern California.
- In the summer of 2008, he was recruited by Baylor College of Medicine where he is today the co-director of the Graduate Program in Developmental Biology.
- Over the course of his career, Dr. Groves' research funded by the National Institutes of Health, March of Dimes, the Human Frontier Science Program, the Department of Defense, and, of course, the Hearing Health Foundation.

It is with great pleasure that I hand it over to Dr. Groves who will present his thoughts on how the HRP is unlocking the potential for hair cell regeneration.
Dr. Andy Groves: Thank you all for joining us this afternoon.

What I'm going to tell you about this afternoon recent work done by members of the Hearing Restoration Project that is starting to look at the ability of mammals and we hope one day the ability of humans to regenerate hair cells.

What I want to do first is to give a recap, and this subject matter may be very familiar to some of you; my overview is to simply to get us all on the same page.
Our ear comes in three parts:

1. An **external ear**, whose job is to capture sound waves.
2. A **middle ear**, whose job is to take those sound waves and to amplify them and then our inner ear.
3. And the **inner ear** in which is the cochlea, and it is this organ whose job is to take sound waves and convert them into information that our brain can use and perceive as sound.

Focusing on the cochlea and magnifying it by about 100x times, you can see this structure, the one in yellow and red, which is the organ of Corti, the hearing component of the cochlear duct.

As sound waves travel through the two fluid-filled spaces above and below the organ of Corti, they cause the organ of Corti to vibrate up and down.

Suspended in the organ of Corti are tiny cells called hair cells, and it is the motion of the hairs on these hair cells which you see magnified again by another 100x times that are able to convert sound waves in the form of these vibrations, and to make the hair cell become electrically active.

The hair cell makes connections to neurons and these send electrical signals initially to the brain stem and then up through the brain into our auditory forebrain, where we perceive and interpret those sounds as speech or music and so on and so forth.
So, this is a picture that some of you may have seen before. This is looking down at the hair bundle of the hair cell: the top surface of the hair cell.

The rest of the hair cell would be below the surface of this image and it is the movement of this hair bundle that causes the cell to become electrically active.

These cells are incredible sensitive; you only have to take this bundle and deflect it by just a few atoms, and this allows us to hear incredibly soft sounds and hair cells can also respond to over a trillion-fold range in sound pressures. This allows us to hear from a whisper to an orchestra going full bore.
If we look at this schematic view of the organ of Corti, the hair cells that are shown in red are really the sound transducers, the business end of hearing. But equally importantly, these hair cells are also surrounded by supporting cells, shown here in yellow, and these supporting cells, as the name implies, are there to physically support the hair cells.

But they also perform a number of tasks that are crucial for the hair cell to have its function, to stay happy and healthy, and to continue throughout our life to transduce sound waves.

The disadvantage of having these incredibly sensitive little nano machines is that these incredibly sensitive hair cells, while they are indeed impressively sensitive, also means that they are quite easy to kill or to damage.
I'm sure many of you know that exposures to intense noises or pressure changes are very good at killing hair cells.

Certain kinds of drugs such as aminoglycosides also able to kill hair cells.

As we are all aware, gradual wear and tear of old age can take its toll on hair cells as well.

What I'm showing you on the left is an electron micrograph looking down on the surface of the organ of Corti where you can see these beautiful rows of hair bundles.

And over on the right here, if you look at an animal that has been damaged by noise, I think it is pretty clear that one of these things is not like the other, and that many of the hair cells here have been destroyed and the surrounding supporting cells have filled in the gaps and created a sort of scar.

Hair cells in mammals will generally not recover, and as a result, what you may have heard is that hearing loss is progressive in humans and permanent.
What some people refer to as the dogma of hair cell regeneration is that non-mammals, such as birds or frogs or fish, are capable of quite impressive hair cell regeneration.

But it is generally believed and accepted that mammals, such as the mouse, are unable to regenerate their hair cells.
The discovery that birds are able to regenerate their hair cells was made in the 1980s by Dr. Ed Rubel, a member of the Hearing Restoration Project, and his colleagues.

Above are a few pictures from some of the work of Rubel's lab.

In the before damage photo, you can see the hair bundles very beautifully.

If you damage a bird with drugs or with intense sound, you create a similar sort of scar that I showed you in a previous slide. However, if you let this bird recover for a number of weeks, you end up with something like the after damage photo, where the bird's hearing organ has been able to regenerate its hair cells.

Over the coming weeks and months in this bird, these hair bundles will reorganize and go back to the original shape that they were in before damage. Work by Dr. Rubel and his colleagues have shown over a period of months, birds have a really impressive recovery of hearing function.

And indeed you can damage the hearing of birds again and again—kill their hair cells, allow them to recover—and this process can be repeated several times.
Here, in the left part of the drawing, the hair cells are starting to become injured and are ultimately killed.

And at this point the supporting cells, which I have colored here in gray, begin to divide. One supporting cell shown here in yellow will undergo division to make two cells.

And then something quite remarkable happens.

One of them will remain as a supporting cell whereas the other shown here in purple will turn back into a hair cell again. By the time we get over here to the final time point, you have restored the system back to normal.

So, one way of thinking about the formula for hair cell regeneration is that if you are to evoke correct regeneration and functional regeneration, you need to stimulate both the division of supporting cells to make more, and you need to tell some of them to turn back into hair cells again, to restore the system back to normal.
Now, work over the past few decades has shown that fish and birds, such as chicks and frogs, have supporting cells that are able to divide and give rise to new hair cells through this process that I have just described.

In mammals, for example in mice, it seems that although there are still supporting cells present in mammals after damage, these cells do not divide. And they do not turn into hair cells after damage.

And this has been sort of the thinking in the field for the last 20 or 25 years.
My goal today is to tell you that that situation may not be as straightforward as previously thought.

And, indeed, work over the past five years or so both by scientists in the Hearing Restoration Project and other scientists around the world have suggested that this dogma that mammals are unable to regenerate their hair cells may not be quite as fixed as we maybe previously thought.

Just to jump to the bottom line, there is now evidence that at least the mouse here does have a modest capacity for hair cell regeneration.

However, I would say at the outset, that this capacity for regeneration is significantly lower than what birds and frogs and fish are able to do quite naturally after damage.

And moreover, as I will show you in a few moments, the bad news is that this modest regenerative ability is unfortunately largely lost by the cochlea before the animal is able to hear. So, there is this latent ability for regeneration, but it appears to go away.

And in the next few slides, I will highlight work from scientists in the Hearing Restoration Project to give a little flavor of the things that we have discovered.
My colleague, Dr. Neil Segil, an HRP member, and myself, developed with our labs a technique in which we were able to create a mouse in which the supporting cells in that mouse expressed, or made, a green fluorescent protein. This protein is normally made naturally in jellyfish. We, essentially, spliced its green fluorescent gene into mice.

And in doing so, we were able to create a cochlea in which the supporting cells were now fluorescent green and use cell sorting technology to purify these green fluorescent cells. We could then place them in a dish and give them nice medium and food, things to keep them happy and healthy. Then we could ask, can these green supporting cells taken from a mouse divide and make hair cells in the same way that one is able to see in birds and frogs and fish?

We were doing this in newborn mice.
Here is some data that we have published sometime ago.

What I'm showing you here is a whole bunch of cells that all started off as fluorescent green supporting cells.

What we did is to reveal the presence of dividing cells with a blue dye and reveal the presence of hair cells with the red dye.

After we keep the cells growing in a dish for some days, what you see is that lots of the supporting cells are dividing, and some of them, eventually, turn into hair cells.

So, put simply, what we showed is that in newborn mice, the supporting cells, if one is able to purify them from the cochlea of the mouse, are able to behave in a similar fashion to supporting cells that one sees in birds and frogs and fish.

And in other words, for a limited time, they are able to divide and they are able in some cases to turn into hair cells.
Dr. Segil and I went on and used second strain of mice, labeled as a mouse with fluorescent green protein. We were able to take the cochleas from these mice and again place them in a dish. In this case, we are able to treat them with drugs that blocked a particular way that cells interact with another called the Notch signaling pathway.

What you can see here on the right is a newborn mouse cochlea that we have grown in controlled conditions. We haven't given them any drugs; however, if we treat them with a drug called DAPT that blocks the Notch signaling pathway, we have found is that many of the supporting cells, about 50% of them, turn into hair cells within about three days.

And I hope that you can see that compared to the situation on the left, on the right here we have many, many more hair cells.

Gratifyingly, this result has been reproduced not only by other members of the Hearing Restoration Project, but also by other labs around the world. And one of the great things in science is the more that people can reproduce your data, the more confidence that you have that it is actually real.
The lab of Dr. Albert Edge, another HRP member, has verified our results and gone on to show that some resident cells in the mouse organ of Corti are capable of regeneration after damage.

So, what Albert was able to do (I'm using a summary diagram from a paper that his lab produced recently) was that he was able to identify a population of supporting cells in the ear that expressed a particular gene, Lgr5.

What Albert was able to show was that if you placed this cochlea again in culture and damaged it with antibiotic drugs, you killed some of the hair cells. But what Albert showed is that—without doing anything—you could actually observe that the cochlea produced a small number of new hair cells after damage.

In this figure taken from Albert's paper, in which the resident hair cells are shown in green, and the white arrow indicating a new hair cell is, in fact, evidence that this new hair cell appeared in the mouse cochlea and it was generated from these Lgr5–expressing supporting cells.
This slide shows that the neonatal mouse cochlea has a latent ability to produce new hair cells. Albert's lab was able to repeat with variation so the experiments show that after damage, you kill many of the hair cells and then when you treat again with a drug that blocks the Notch signaling pathway, indicated by the yellow arrows, a number of new hair cells begin appearing.

This is suggesting that in early mice—*and I would stress again that is before these mice are able to hear*—that there are populations of supporting cells within the mouse organ of Corti that are able to in some cases divide, and in other cases to make hair cells.
So, here is the bad news.

I stressed to you that these experiments were carried out in young mice and in newborn mice. And what my lab and now other labs have also found is that as you repeat these sorts of experiments in older mice, even just three days or six days older, what we find is that the variety of interventions that I have described to you seem to stop working within the first week or two of the mouse's life—again, prior to the onset of hearing.

Something that I would stress is that what is going on here is that the supporting cells seem to lose the ability to respond to whatever manipulation it was that we were doing to them. These are the same supporting cells that were present at the time of birth and are the same ones that now just six days later are refractory to whatever manipulations we try to give to them.

And, so, one of the questions that I will return to in a little bit later, is why? Why have these cells over just a period of days appear to lose the ability to respond to whatever signals allow them to regenerate?

This is the case in the cochlea. I will get back to that later.
I want to hold onto some hope by talking about the research of HRP consortium members Dr. Jenny Stone and Dr. Ed Rubelin in Seattle. They used genetically engineered mice to kill all the hair cells in the inner ear. They looked for whether any hair cells reappeared in the cochlea, or a balance organ, the utricle.

Dr. Rubel, Dr. Stone, and their colleagues examined in the adult mice whether there was any evidence for regeneration. And, in particular, they looked not only in the cochlea, but also in one of the balance organs of the ear, the utricle. The utricle is like a gravity detector; it allows us to detect the position of our head in space, and like the cochlea, the utricle also contains hair cells and supporting cells.

It's just that those hair cells appear to be dedicated to detecting gravity, rather than detecting sound.
What I want to show you here is a comparison that the Stone lab made between the adult cochlea and the adult utricle.

- The image on the left is looking down on the surface of the adult cochlea before damage, with the hair cells, here, in green.
- The middle two panels reflect the situation in sibling mice two weeks after damage, where most of the hair cells have been killed here.
- If you now let the sibling animals survive for a further six weeks, what you can see on the right is that in the adult cochlea, there are still no hair cells present. They were killed and there are none left.
- But the work from Dr. Stone's lab suggests that at least in some parts of the adult utricle, within six to eight weeks after damage, there are now significant numbers of new hair cells that have reappeared.
  - They are now investigating where these cells are coming from, with the hunch that they are, indeed, being generated by supporting cells in the adult utricle.

To recap, what this is suggesting is that in the adult ear, or at least in one of the balance organs of the adult ear, there are supporting cells that have retained at least some capacity to make hair cells.

What we now want to understand is: What is different about these cells? How are they different from the supporting cells in the cochlea that seem to be unable to produce new hair cells?
This is a good time to revisit the strategic plan of the Hearing Restoration Project.

What we have been doing over the past few years is to look at fish and birds and mice—both before and after hearing damage to try to understand the way in which these hearing and balance organs are changing, and, in particular, the genes that are being switched on and off after damage.

And of particular relevance, which I have just discussed, is that we have been trying to compare young mouse supporting cells with supporting cells that are a little older that appear to have lost the capacity to regenerate. We are comparing the behavior of these supporting cells with those in the adult mouse balance organ, the utricle, and what we're asking again and again is: What is changing here? What are the differences that are happening with age?

An analogy to help describe our strategy is to imagine a city, such as New York or Los Angeles, after a devastating insult (damage), whether an earthquake in Los Angeles or a flood in New York. What you see is a whole bunch of different systems are brought together to recover and respond to the damage and to bring the city back to normal functioning again.
In a similar fashion, we believe that after damage there will be pathways activated or mobilized in supporting cells consisting of many different genes being switched on and off over the course of hours and days and weeks that in birds and frogs and fish will restore the system back to normal. What we want to understand is whether similar pathways exist in mammals and to what extent those pathways can be activated.

The second phase of this work is, indeed, to test those pathways using fish and birds and mice as model systems and to start to develop potential regeneration strategies.

This is with the idea that in the HRP’s third phase of work we would come up with drugs or other interventions that might trigger hair cell regeneration—initially in mice but obviously ultimately in humans.

So, one of the things we are doing is taking tissue from birds and fish and mice after damage and to look at the genes being switched on or off.
What Dr. Segil, Dr. Stone, and myself are doing is comparing young mouse supporting cells with older supporting cells in the cochlea, and then comparing these to those in the utricle to ask: What is different about these three populations of cells?

Clearly something is different because we see regeneration in some of them, but not others. If we can understand the pathways, we may be able to manipulate them. What this involves, obviously—considering the large number of genes present in the mammalian genome, about 25,000—is gathering large data sets in the experiments.
A new discipline that has come to the forefront over the last 10 to 20 years is the field of bioinformatics, which uses computational and statistical techniques to observe or detect patterns in the huge numbers of data points that are changing over time—in this case, after an animal is damaged.
In the second phase, we hope to take some of these pathways that we have discovered—some of the response pathways that we see happening in young mice or in birds and frogs and fish—and test and screen them in the damaged cochlea, with a goal of seeing if we can restore new hair cells.

And there are currently new projects that are starting in this second phase of the HRP consortium.
Obviously the final goal, which has not yet begun, is to then use drugs that can manipulate these pathways to effect regeneration in damaged inner ear tissue.
So, as I alluded to just now, we have made some substantial progress in this first phase.

We have bioinformatics data from fish and birds and mice that is starting to suggest candidates that may be triggering hair cell regeneration in frogs and fish and young mice, and which may be blocked or at least attenuated in older animals. We're also now following the interesting work of Dr. Stone—starting to look at this in the balance organ of adult mice as well.

We're also proceeding with phase 2. The goal here is to test some of the candidates that have been identified in phase one, and attempt to either block them in birds or fish with inhibitors or to use activators.

The ultimate goal phase 3 is taking the experimental models from phase 2 and screen for drugs—focusing first on mice. This work is ongoing.

What we are doing in phase 2 is testing some of the pathways. Some of the approaches so far are quite low in output. They are not very efficient. So, some members of the consortium, including my own lab, are now trying approaches to scale the approaches up.

Instead of testing a handful of compounds, we can now test scores or hundreds, one after the other, or all at once to see if any of these candidates can promote division and regeneration of supporting cells in to hair cells.
And, in fact, in the upcoming weeks, the consortium is going to convene in Seattle for its annual meeting, and this meeting takes place over a series of days. Here we will be reviewing the work from different labs in the consortium, pursuing these different phases. We will review the progress that we have made and then chart or modify our proposed experiments for the coming year.
I will conclude there by saying that in the consortium we believe that the prospect of hair cell regeneration is a plausible goal for eventually treating hearing and balance disorders.

The kinds of experiments that I have described to you—trying to understand how cells work when they are damaged and when they regenerate—is starting to yield at least some insights into possible therapeutic targets, and I'm thankful to those of you who have tuned in today to hear this presentation.

It's important to have your support and we hope that with your support and the support of others that we can continue to move our research forward to really find more clues and pathways towards cracking the problem of hearing loss and tinnitus.
Q: On the topic of tinnitus how would you expect, if hair cell damage is what resulted in tinnitus in a person, that the recovery would occur by regeneration, given that many people in the tinnitus research community are focused more on upper auditory brain processing centers?

A: I would certainly not claim to be an expert on either the research or the clinical treatment of tinnitus. The consensus is that tinnitus starts with damage to the cochlea which causes ringing in the ears, and the entrainment of that ringing sound in the brain may be the end result.

There are some people who feel that if one was able to start providing input again, then possibly one could sort of break that pathological feedback loop. However, I don't know of any evidence to suggest that that might be a profitable way forward. But that's certainly at least one hope.

Part of the problem with tinnitus research, at least in animals, is that it has been a lack of good animal models. Simply put, it's hard for a rat or mouse to tell you whether they're experiencing ringing in their ears, although there are people who are trying to investigate this at the moment.

Certainly cochlear implants seem to give that same weight since they do help some tinnitus patients. I think there are also clinical trials on this, other forms of brain input have been suggested to provide benefits—things like meditation, relaxation, mindfulness.
Q: Is there any evidence of regeneration in the human utricle?

A: That's a really good question, and I don't know the answer to that. We have pretty good evidence of following the progress of hair cell loss by examining the ear bones of people once they have passed away and donated their ears for research. And it is possible to characterize the pattern of hair cell loss in the cochlea.

Off the top of my head, I don't know whether people have also done that in the utricle, the balance organ of the ear.

I also don't know whether there is any evidence of sort of hair cell regeneration in humans and whether that might lead to functional recovery.

One of the things that humans are really good at, at least with some balance disorders, is compensating for it by using visual cues and so on.

I think before we even start thinking about humans, we need to know more about what is going on in mice, and I think the recent work of Dr. Jenny Stone in the consortium is a really good step in that direction. So, there is going to be a big push to continue that work from her lab.

Q: Whether we're looking at fish, mice, or birds, are we seeing a difference in the recovery or regeneration of those hair cells depending on how the hearing loss was caused? Whether it is a genetic loss, sound-induced loss, or caused by one of the drugs that is administered? Does the cause of the hearing loss affect the ability of the cells to regenerate?

A: My knowledge of this is mainly from the work of Dr. Brenda Riles, a former colleague of Dr. Ed Rubel of the HRP. She has been one of the people to do different kinds of damage to birds and follow the progress of the birds, not just in weeks, but months. My understanding is that if you damage the birds with sound or with antibiotics, their recovery is pretty much the same.

However, other people have suggested that if you damage birds with chemotherapy drugs that it is much harder for the birds to recover.

I think there is indeed some evidence from a HRP consortium member that the chemotherapy drugs can in certain circumstances kill supporting cells as well.

So, I think there may be some evidence that the drugs work differently, although I don't know if that has been observed or if there is evidence for that in humans from looking at human patients who have received antibiotics versus chemotherapy. We know they have a hearing loss. What is happening, I think is less clear because humans are not experimental animals.
Q: How has the collaborative model of the HRP enhanced the research effort compared with a standard model of funding one researcher at a time?

A: Biomedical research, in general, is becoming more collaborative. This is something that the National Institutes of Health (NIH) has recognized because they are supporting many more research proposals that involve bringing together people from different laboratories.

Simply put, we can't all be experts at everything, and as the approaches to understanding scientific problems have become more complicated, using more specialized equipment or different kinds of animal models, it has become harder and harder for anyone of us to be able to do it all.

The Hearing Restoration Project is a really good example of that. I think it is fair to say that not one of us within the consortium is an expert in all of the techniques and approaches that we are using as a group to investigate this problem of hair cell regeneration. We have people who are experts in fish regeneration, bird regeneration; and people are good at making genetically engineered mouse models that can help us understand this problem. Then there are people who are pioneering surgical approaches to delivering either chemicals or genes to the inner ear.

All of us are bringing together different forms of expertise, but also different backgrounds of perspectives, and I think that isn't just for our consortium in particular. I think it is vital in science, in general, that we have to get out of this idea that each one of us can be an expert in everything. And that we can achieve more by pulling our resources than we can by individual effort, and I think that is a pretty common sense way of thinking about it.

Q: Will the papers from the Seattle conference be available to the public?

A: To give a little more background on the annual HRP meeting, this is mainly a data presentation and planning session where we bring each other up to speed on what we have done, in person.

During the year, we have conference calls similar to this one, where we take turns to present data and updates. But at these annual meetings, it is more sort of planning session.

One thing that we have been doing already is publishing data that is being funded by the consortium. So there have been a couple of papers that have come out already. For example, one involving my lab and the lab of Dr. Heller, published a few months ago, the work and the data that we're generating is being published.
A: The group of Mike Lovett and HRP members have published some of their work and made the bioinformatics data sets available to anyone for free. It can be downloaded from NIH-funded websites.

So, to address your specific question, no, we won't be publishing papers from our conference. But that's because this gathering over a period of two days is more of a planning session.

However, we have started publishing some of the work already and we will continue to publish the work as the discoveries are made. It is important that other people are able to reproduce the things that we're finding.

Claire Schultz: After the retreat, Dr. Peter Barr-Gillespie, the scientific director of the HRP, will be writing a report and update of the retreat and we will send that out so you get an inside look at what transpired at a high level from the retreat. Dr. Barr-Gillespie's report will come out in early December.

Q: Will this recording be available for download?

A: Yes, after the meeting, we will be taking the transcription and transcribing each slide with summary notes and have the webinar available online.

So, both of those will be made available to you in the coming weeks.
Claire Schultz: Our goal today was to allow everyone to obtain new information about hearing loss research, research toward a cure, progress to date, and what's next as we go forward.

As I said earlier, we are always interested in your questions, your input, and your feedback, so please contact us, via email or by phone. If you find that when the information settles in and you have questions, please feel free to reach out to us at any time. That's what we are here for.

We will continue to be a reliable source of information for you all, particularly on hair cell regeneration, but also on other areas of hearing research.

And I would close by saying that we truly rely solely on the support from individual foundations and corporations to keep advancing the research. We receive no government funding; it all comes through the generous support of people like you.

We thank you for your commitment to the organization. We will continue to provide you with research updates in writing, in email, and continue to do these research webinars throughout the course of 2016. We have also started to do in-person research events. So, perhaps we will have an event coming to your community in 2016. If you would like to host one, please let us know.

Thank you so much for your time, your interest, and your commitment to Hearing Health Foundation. It truly means the world to us. Thank you and we will be back in touch with you very soon.