

## **3M Transcript for the following interview: Ep-3-Hearing Protection Selection**

### **Part 1**

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Welcome to the 3M Science of Safety podcast presented by 3M Australia and New Zealand Personal Safety Division. This is a podcast that is curious about the signs and systems of all things work, health and safety, that keep workers safe and protect their health. I am Mark Reggers, an occupational hygienist, who likes to ask the questions Why, How, and Please Explain. Whether you are a safety professional, occupational hygienist, or someone with any level of WHS responsibility in the workplace, maybe you are a user of safety products or maybe you are a bit of a safety nerd who finds this stuff interesting, then this is a podcast for you.

(R) Today we are talking all about hearing protection device selection with Luciana Macedo from 3M. I had a fantastic conversation with Luciana. It was a bit of a long one because there is a fair bit of detail, so I have decided to split this episode into two parts, and this is part 1 of my conversation with Luciana. Enjoy!

How are you Luciana?

(R) Great, Mark, and yourself?

(M) I'm doing very well. Luciana is an occupational hygienist and has over 15 years' experience in the health and safety industry, both here in Australia and in Brazil.

She has a Master's of Occupational Hygiene Practice, she is a committee member of the Australia and New Zealand Standard of the 1269 Occupational Noise Management Series, so talking about noise and sound, because I am going to be talking about hearing protection devices, what is the difference between noise and sound?

(R) Right, that is a very good question. Noise and sound could be physically the same, the wavelength travelling through the air, but sound, what we call sound tends to be a more organised type of wavelength, it is a pleasant sound, something that...

(M) Music as an example, something you want to hear.

(R) Exactly, exactly, something that you want to hear, something that is pleasant to your ears, whilst noise can be quite annoying, it can be disturbing, even stressful, it can cause adverse health effects. But having said that, loud noise and loud sounds may cause hearing damage.

(M) So, Luciana, most people know what an earplug or earmuff is, so there must be some level people know they need to protect their hearing, so can you explain some of those finer points of why we should be protecting our hearing, why people should care about it.

(R) So, the human ear was designed to be able to listen to very soft sounds like animals in the forest, or leaves falling off the trees, but in our modern society, we live in a very noisy environment and we are surrounded by cars, by public transport, by machinery, and even electronics these days, even the kids these days are exposed to, or may be exposed to excessive noise just by listening to iPads and iPods for sleeping and without sound limiters in these electronics, so given that our ears are very sensitive and we cannot switch them off, eventually hearing

protectors can be quite beneficial to protect us against that excessive amount of noise that we are exposed to on a daily basis, especially in workplaces. And apart from that, hearing loss, or trouble with most other hearing loss that is diagnosed in our population could have been prevented, and once you acquire hearing loss there is permanent damage. So, the way that our ear works is behind our eardrums we have thousands and thousands of little tiny hair cells that are responsible to transmit the noise to our brains. And in the presence of excessive noise, those little tiny hair cells that are very, very delicate, they can have permanent damage, and not being able to bounce back to the original position, or they may even fall off the cochlea where they are attached to, causing a permanent damage. So just to make an analogy, of like a person walking on the grass, so if you have just a person and low traffic walking on the grass, the grass will be able to bounce back. But if you have a heavy traffic passing every day on the same grass, then all of a sudden the grass is not going to be able to bounce back to the original position, and if you have even heavier traffic, the grass can be damaged, and you are going to start to see the dirt. So that is similar to what happens in your ear canal if you have excessive noise. A little bit of noise, yes, your hair cells are going to bounce back or are going to bend over and bounce back to the original position, but once you are exposed to excessive noise and frequently repeatedly exposed to excessive noise, you may bend your hair cells permanently or even they can fall off your cochlea, causing permanent damage.

(M) I think that is a really powerful tool there to help visualise, I think if you are a safety manager or having to deliver training in the workplace, being able to visualise the damage that may be happening. So, for a workplace, it is noisy, how do they know, or how much noise is damaging noise?

(R) So, noise is measured in decibels and we are going to talk about that, we may talk about that later on. But what is common sense around the globe in the main nations that have standards for noise measurement is 85 decibels is the maximum

average for an eight-hour period. So that means at the end of eight hours you should not be exposed to more than 85 dB or decibels. But also the standards talk about peak levels, what is the maximum, the top level that you should never exceed in any circumstances at any time of the day, and that level is determined as 140 dB, 140 decibels.

(M) So, with that decibel scale, is there something a person can hear as it goes up, and say well that sounds louder, so that is more hazardous, or it doesn't sound any different so that mustn't be more hazardous or dangerous than the previous sound?

(R) Okay, let's put things in perspective. It is at times a little bit difficult to understand decibels, and what does that mean really. So, 85 dB, what does that mean? So, let's say, or let's imagine you are in a restaurant, okay, and you are trying to talk to your partner or to your friends in a restaurant...

(M) I'll be too busy looking at my phone if I was in a restaurant, isn't that the modern thing to do these days?

(R) [laughter] That is so true...Right, so a simple, very simple rule of thumb to identify if you are exposed to more than 85 dB, is if you have to raise your voice at an arm of distance, at a metre of a distance, that is a good indication that you are exposed to 85 dB or more than that, so that is a good indication of excessive noise in that environment, and very easy, anyone can identify, can understand, it is just a measure of being aware. When you need to raise your voice at the arm of a distance, that means you are exposed to 85 dB or more than that. But let's say if you are mowing, for instance, your mower will be emitting about 95-100 dB, so it is a really good practice to use hearing protectors when you are mowing during the weekend. A jet taking off, for instance, in an airport, that can reach about 140 dB, the limit that we were talking about as a peak, and that is actually very close to the pain threshold.

(M) So, can you expand a little bit more about these decibels and the scale and how that works?

(R) Sure, there are different weightings or different scales that you can use to measure sounds and noise. The most common in workplaces are what we call dB-A or A-weighting scale which mimics the way that human beings hear sounds and noise, because we don't hear all frequencies the same way, our ears tend to be better to hear high frequency noises as opposed to low frequency noises, so we don't hear all sounds in the same intensity. So, the A-weighting or the A-scale mimics human hearing, whilst a C-scale or a C-weighting scale is just a flat scale, you have no weight, so you measure all frequencies the same way.

(M) Is that because at that level, we are talking 140, really high, it is just a huge amount of energy that is just hitting your eardrum and hitting your cochlea?

(R) Yes, basically you are interested when you use the C-scale you are interested to measure the total sound that is emitted from machinery or from a blast or explosion or a shot, you are interested to measure the total amount of sound. You are not interested to measure the way that the human ear works.

(M) So, with that 85 dB-A average, so during the course of a day a worker's exposure may be going up 94, then dip back down, and up, so it is that average over the course of the day.

(R) Correct, that is a very important question. Sometimes professionals and workers think that 85 dB is sort of the limit, you can't exceed 85 dB, but it is actually the average, is the dose as you said so yeah, the sound and the levels of noise are going to vary during the day, you can have 94, and 100, or 70 if you are in an office for instance, but the average for the whole shift should not exceed 85 dB.

(M) So, if I am at a workplace and I know I've got to work in a noisy environment, where is a good spot I can go to start off to get information on what I need to do or how can I start to look at what is in my workplace?

(R) Okay, there are standards. There are methods and standards and national standards that provide you with guidelines on how to measure, what to use, proper instruments to measure the levels of noise in workplaces, how to start, and how to analyse and assess this data. So, the standards would be the first place that I would go as an official reference on how to do the proper measurement and noise survey.

(M) What about codes of practice? Are there any specific codes of practice, obviously each state has different codes of practice and regulations, but are there any good resources in that area?

(R) Yes, absolutely. So Safe Work Australia has the noise management codes of practice that also provides you with guidelines on how to do, when to do, what to use, etc. So apart from the formal references and documentation, codes of practices and standards, you also will find a good amount of information in the industry such as with manufacturers, acoustics engineers, consultants, and occupational hygienists' group can also provide information and guidance on how to conduct proper noise surveys and how to comply with the requirements of standards, etc.

(M) So, if I've got a noisy workplace, why can't I just go buy an earmuff, or earplug that has the highest attenuation because it is going to block the most noise, so is that the best way to go about?

(R) Right, right, so what is the best hearing protector? That is probably one of the most common questions that we receive as manufacturers. Um, when it comes to

hearing protection, the highest, or the most attenuating hearing protector is not necessarily the best one for you. It really depends on how much noise the worker is exposed to. Hearing protectors are classified from 1 to 5, 5 being the highest level of protection that you can get out of a hearing protector, and 1 being the least level of protection. And why workers don't simply use class 5 hearing protectors for all of the situations and exposures is simply because hearing protectors, or what we call passive hearing protectors, they have a limitation. Whenever we put a hearing protector on a worker who is exposed to noise, the hearing protector will also suppress conversation, speech, and the sounds that we want to hear. So basically if a worker that is not exposed to an excessively high amount of noise during the day uses a class 5 hearing protector, we may isolate, we may be creating other hazards such as isolation, inability to hear audible warning signals, loss of situational awareness, which means the worker may lose the ability to identify where the sounds are coming from, at what distance, at what speed.

(M) What would be some of those sounds that they would want to hear, like in a workshop, like what is going to be important to them to actually hear?

(R) Audible warning signals is the first one. Secondly, situational awareness, you must be able to understand where the sound is coming from, especially if you have vehicles and moving vehicles around you like in a warehouse, for instance, or in an airport. If you are not able to hear vehicles and if you are not able to understand where they are coming from, you end up creating other hazards for the workers wearing hearing protectors. Co-workers' communication is also very important, especially if you work in teams, for instance in a construction site where you have a combined effort to move cranes, and move heavy machinery for instance, so you must be able to maintain a clear and live communication, and excessive protection, what we call overprotection, may interfere in communication.

(M) What are the different types of hearing protectors that are out there that people can look at?

(R) Right, well there are several types, several models and types of hearing protectors commercially available. I think one of the most popular are the earmuffs, sorry, earmuffs, they are external, they are quite practical, and efficient when used correctly. But also, you have earplugs which we also call insertion hearing protectors, and amongst the earplugs you have different categories of earplugs. You have foam earplugs, you have what is normally called push to fit earplugs, which is a mix of plastic and foam, and also you have the reusable earplugs, the ones that you can wash and re-use it. Apart from those two major categories, you also have the banded hearing protectors, so basically the banded hearing protectors, they have a little band around, that goes around your neck, or could go underneath your chin, and you have two ear tips normally made of foam, that covers the entry of the ear canal. And so, the force, the pressure of the band keeps the ear tips nicely and snugly fit at the entry of your ear canal. And also, just the moulded ear plugs or hearing protectors that is, as the name suggests, fitted individually, so basically the material is inserted in the person's ear canal to take like a mould of the person's ear canal, and basically the hearing protector is tailored for that particular person from that mould. That covers the main range of what we call passive hearing protectors. And then, other than the passive hearing protectors you also will find electronic hearing protectors, or active hearing protectors. So, the reason why the diversity of electronic hearing protectors in the market as well, one of the main ones, are the electronic headsets that can combine either noise cancelling or level-dependent function.

(M) That is part 1 of my conversation with Luciana. I really hope you have enjoyed the topics and the information that we have covered so far. Be sure to make sure download part 2 to hear the rest of that conversation. If you have any questions, comments, suggestions for future topics or guests that you think we should get into



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