Whether it's rock, country, classical, or gospel, most people like listening to music. And, unless you're having one of those "Barry White moments," music usually sounds better loud. Not surprisingly, musicians like to listen to loud music too—probably even louder than the rest of us. And, in most cases, their exposure times are greater than ours. This, of course, creates the potential for a music-induced hearing loss, something that is very common among performers. There is a real need for hearing conservation for this professional group, but it's not an easy task. In many cases, their livelihood depends upon playing loud music and being and looking cool, and hearing loss prevention isn't always cool.

A few audiologists have focused their careers on hearing loss prevention for musicians. One of them is this month's Page Ten author, **Michael Santucci**, AuD. His practice in Chicago has catered to musicians for over 25 years, during which time he has also become a product designer and manufacturer while still maintaining his more traditional audiology services.

Dr. Santucci is a lecturer at Columbia College in Chicago, vice-chair of the Technical Committee for Hearing and Hearing Loss Prevention for the Audio Engineering Society, and an American Academy of Audiology Foundation trustee. You've probably heard some of his presentations, or maybe even attended the special training he offers to audiologists interested in this unique area of the profession. His company, Sensaphonics Hearing Conservation, won the inaugural Safe-In-Sound Award for innovation in hearing loss prevention from NHCA and NIOSH in 2009.

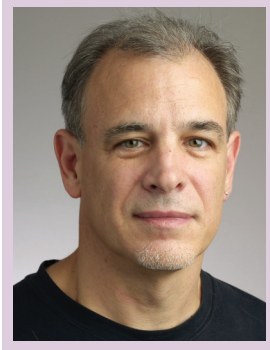
As you might guess, after 25 years in the business, Michael has some pretty good stories to tell. He says his first big break came in 1992 when he fit his first pair of in-ear monitors for Ken Nordine, a famous radio voiceover man who also performed jazz. By a stroke of good fortune, the engineers for the Grateful Dead were in the same studio. After the show, they talked at length and Michael was asked to work with the Dead. Today, Dr. Santucci continues to work with some of the biggest names in the music industry, including Stevie Wonder, Mick Jagger, and Steven Tyler of Aerosmith.

Whether the next musician you work with is world famous or merely the fledgling drummer for the "dessaBulls," I think you'll find Michael's excellent review interesting and helpful.

GUS MUELLER
Page Ten Editor

Saving the music industry from itself

By Michael Santucci



Michael Santucci

1 I know I've heard your name before, but what exactly is your connection to the music industry?

I'd say I'm an audiologist who specializes in serving a misunderstood, underserved market where hearing is mission critical. My primary work is to prevent hearing loss in musicians. It's an interesting job, as I have worked with over 1000 famous musicians, and many more not-so-famous ones.

It all started back in the 1980s when a local band here in Chicago came to me for help because the lead singer was having hearing problems and was going to quit. I was able to help her, and she kept performing. So basically, I saw a need, an empty space where there should be some sort of prevention program in place, and nobody was doing anything about it. I thought it was time somebody did.

2 So is your world similar to that of someone working in industrial hearing conservation?

It's similar, but there are important differences. This is a side of audiology that we're not taught in school. Unlike industrial hearing conservation, hearing loss prevention for music is not regulated. Some people refer to it as recreational, but we call it non-regulated. You're not going to convince Mick Jagger or Yo-Yo Ma that what they do is recreation. Danica Patrick is not driving for recreation, either. This is professional, it's occupational, and it's unregulated.

3 Hearing health for musicians seems like a natural fit. What's so different about it?

This isn't traditional hearing loss prevention; it is completely voluntary. At the end of the day, on-stage performance will always trump hearing concerns. Musicians want to put on a great show, and that will always be their focus. They need to hear their mix, which is done on a separate sound system from what the audience hears. In-ear monitors (IEMs) became popular because they made it easier to hear clearly and because they could be wireless, allowing the artist to move around on stage.

So really, it's all about the show, which makes it all the more important for the audiologist to find a way to address hearing issues within that context.

4 Is that attitude typical of musicians?

Absolutely. For most musicians, hearing loss prevention is definitely a secondary issue, at best. In fact, HLP is pretty much coincidental from their point of view. And there's some peer pressure involved. When you're in a group setting like a sound check, no one wants to appear uncool. So, the most typical attitudes I see

are because the musicians are underinformed or in denial.

Because noise-induced hearing loss is such a subtle thing, most musicians only seem to seek help when they're experiencing symptoms like distortion, dyplacusis, hypersensitivity, or, especially, tinnitus. These symptoms appear to be as disturbing as or even more frightening than actual loss of hearing.

5 Do you ever get the opportunity to do a little one-on-one counseling?

Fortunately, taking ear impressions gives me the opportunity to bring up the topic of hearing loss prevention. Since I have pretty much a captive audience, I attempt to enlighten them while the putty is in their ears. I ask about their listening habits, hearing concerns, when they last had their hearing checked—that sort of thing. I also make it a point to talk to them about the dangers of using in-ear monitors incorrectly.

6 Are you saying in-ear monitors are dangerous?

They certainly can be, especially at the high sensitivities that some manufacturers use. Basically, IEMs are amplified earphones, and because they can get really loud, there's plenty of potential for abuse.

But what's really dangerous is that they're marketed as protective devices when actually they're not. This is especially dangerous with universal-fit products, where there is seldom an audiologist involved. The truth is, IEMs can only be considered as protective devices in conjunction with the user's behavior, by which I mean keeping them at safe levels.

7 I really know very little about custom IEMs. How would the average musician go about getting them?

Well, the process usually goes something like this: The artist has ear impressions made through an audiologist. The impressions are sent to the IEM manufacturer and used to create the custom earphones that the musician has selected. The earphones are delivered to the customer, preferably through the audiologist, who can then do a fitting to check for proper fit and demonstrate proper insertion and removal. That's very important, because poorly fitted earphones will not deliver the sound quality that the artist needs and expects.

I regard the audiologist's role as critical to success with in-ear monitors. Fitting the earphones also gives the audiologist the opportunity to talk to the musician about hearing loss prevention. Most musicians just want to buy the product and move on, so it's up to the audiologist to convince them of the importance of a baseline hearing test, a complete case history, some education on the hearing mechanism, possibly Musician's Earplugs as well, and sound-level measurements to direct them to safe usage. Frankly, one of my pet peeves is the tendency to treat IEMs like commodities when, in fact, they can easily reach dangerous volume levels.

8 So back to the danger aspect. How do audiologists react to that?

What's shocking is how few seem to realize it. We're supposed to be providing evidence-based audiology, yet people are taking ear impressions and fitting these products without knowing how loud they can get or how loud the musician will turn them up. I don't know if it's just about making a sale or being overwhelmed by celebrity, but to me, it's not responsible audiology if safety can't be demonstrated. Would an optometrist prescribe a contact lens without knowing if it was appropriate or without providing instructions on safe use? Of course not.

As doctors, we are compelled to practice evidence-based audiology, yet there are those who fit IEMs to trusting musicians even when safety can't be demonstrated. In fact, research suggests it's behavior that makes them safe, not the product itself.

9 What kind of research has been done on musician behavior with IEMs?

The study that really illustrates my point was done by Jerry Federman and Todd Ricketts at Vanderbilt University.[1] It showed pretty conclusively that musicians tend to set their in-ear monitors to exactly the same level that they're used to with floor monitors, which are the wedge-shaped speakers you see in front of musicians who don't use personal monitors. If you've been practicing guitar for years at 110 dB with wedges, the natural tendency will be to turn your IEMs to the same volume using IEMs, even if it's not needed.

10 Do you think they need that intensity to perform appropriately?

Probably not. An interesting finding from this study was that those same musicians, when instructed to monitor at a minimally acceptable level, could operate at significantly lower volume using in-ear monitors than when they were using floor monitors. So, in-ear monitors definitely have the potential to help achieve safer listening, but only when the musician is directed to change his or her behavior. While earplugs are inherently protective by their nature, this study shows that in-ear monitors require proper behavior to have any hearing health benefit.

11 I have to ask, if these monitors are so darn good, why do I always see performers on TV with them hanging out of their ears?

A lot of people ask me this, and there are several possible reasons. Generally speaking, an artist who is not wearing one or both earpieces is not hearing what he wants to hear. This could be due to a bad mix or discomfort due to a poorly fitted product, but it's most often caused by the musician's desire to hear ambient sounds directly. Typically, this would

include crowd noise, or perhaps the desire to hear one's own instrument or amplifier acoustically. Also, conventional IEMs offer so much isolation that they need to be removed in order to have off-mic conversations among band members.

This need for ambience can be addressed in various ways. The trick is to do so without compromising the isolation of the IEM system. Most commonly, the sound engineer sets up audience mics and adds them into the monitor mix. This has limited effectiveness, but is relatively easy to accomplish with the tools at hand—basically, a few spare mics. The high-tech solution is to integrate microphones into the IEM system, preferably at the ears, which is what we've done at Sensaphonics with the 3D Active Ambient. It's a patent-pending technology that mixes the ambient sound picked up at the ears with the band's monitor mix, and can be adjusted to the musician's taste.

12 Makes sense, I guess. Going back to what you said earlier, do you think that audiologists maybe need as much educating as their customers?

Absolutely. I offer the Golden Circle seminar several times a year. It's a 2-day event in Chicago where I share my experience and HLP strategies for the music industry. My sound engineer teaches audiologists about in-ear monitors and how they work, the basics of concert sound, even backstage etiquette and, of course, all about our products. Only a Golden Circle audiologist is eligible to be a dealer for Sensaphonics earphones.

13 When you're trying to instruct a musician on safe monitoring practices, how do you know how loud it is with the earphone inserted?

Great question. Until about 18 months ago, the only method was to use a probe-mic system, slipping a small plastic tube between the earphone and ear canal and taking measurements during a rehearsal. That was the method used in the Federman and Ricketts research I mentioned earlier. The problem is, a probe-mic system can be bulky and expensive, and it requires the audiologist to be on site. There's nothing more frustrating than going to a band's sound check only to find out that the lead singer is having a bad day, or the band is running late or hung-over and can't give you the time and access you need.

To address this issue, we developed the dB Check in-ear sound-level analyzer. It's an iPod-sized device that gives a real-time reading of levels in the ear by reading the drive voltage of any Sensaphonics earphone. It provides a readout in dBA of the average sound pressure level over time, and converts that to minutes of safe use for both the NIOSH and OSHA guidelines. Our next step is to promote this technology for use with IEMs from other manufacturers.

14 Is this device used by audiologists?

It could be, but it's designed to be self-administered. Any musician or sound engineer can easily check what level they're at and react accordingly. It's like a speedometer; it doesn't slow down the car, but it lets you know when you're going too fast.

15 That would seem to take care of the intensity issue. But, if you're not conducting probe-mic verification, how do you know that the ear canal frequency response is okay?

Since standard NIOSH and OSHA measurements were taken outside the ear, probe-mic measurements made in the canal must include an inverse of an average ear canal resonance that would have otherwise skewed the results. That same resonance is added to the calculations for dB Check.

In addition, if the isolation from the molds was compromised and ambient acoustic sound leaked into the canal, the user would then have to increase the intensity of the signal to hear over the noise, which would be reflected in the measured output electronically. A big benefit is that tube placement and tube pinching become non-issues. When we compared dB Check results to those obtained with an ER7-C probe-mic system, the dB Check results were spot on.

16 Many performers must already have a noise-induced hearing loss. How do you account for that in the IEM fitting?

Actually, we don't. The audio control all comes from the sound engineer, who has a mixing console with EQ and DSP effects that can achieve virtually any sound signature that the musician wants or needs. So our earphones are designed to reproduce sound with great precision and technical accuracy. The artists and engineers take it from there.

17 What about the IEMs themselves. How did you become one of the manufacturers?

Well, it certainly wasn't by choice. I learned early on that products for musicians needed great isolation, flat frequency response, and a soft material for extended wear on stage. But at that time, there really weren't any products out there that met those criteria and no lab or manufacturer that was willing to make them for me. I knew that if we could make it cool enough and potentially safe enough, I could direct people to proper use, which is really the important thing.

18 How do you decide on the best material?

It depends. For instance, when we designed Musicians Earplugs with the Etymotic filter system, we settled on cold-cure silicone for the plug material. As it turned out, silicone is extremely difficult to work with, and no one would do it for us or teach us here in the U.S., so we had to learn from two labs in Europe how to set up a lab and make Etymotic Research plugs from silicone.

When we developed our custom earphones, it was all about sound quality. The initial models were constructed in hard acrylic. We worked with some of the best sound engineers in the industry to create a product with the sonic accuracy that musicians require. Once we figured out how to make earphones in silicone, we knew we really had something. I mean, who makes high-isolation earplugs in hard acrylic?

Working in silicone means that all the products have to be handmade,

but our lab techs now have many years of expertise. Other IEM brands are constructed in hard plastic or acrylic shells, which is certainly easier, but less effective in my view. It's something that continues to differentiate us from others.

19 Thinking about the big picture, how do you go about getting these famous performers to take their hearing seriously?

The most important thing is that I am not intimidated by where I am or whom I'm talking to. I may find myself backstage, on stage, in a bus or hotel room, but I'm always prepared. I've got my portable audiometer and other equipment with me, and that sets a professional tone that most artists appreciate. I just try to be myself, conversationally and professionally. They want my earphones, and that gives me the opening to talk about their hearing, and from there it's a short trip to hearing loss prevention. Like any other audiological situation, it's up to the client to become engaged and do something about it.

In many cases, I can't share names because of HIPAA restrictions, but here's a typical example. A couple years ago, a very famous band flew me out to California to do ear impressions. They didn't want to learn about HLP; they just wanted new earphones. When I had them all around me with my portable audiometer, I asked, "So, when was the last hearing test you had?" Everybody kind of looked down and mumbled. So then I asked them, "Did you get your eyes and teeth checked last year?" And when they said yes, I said, "Hmm, that's interesting. Because you could go on stage toothless and blind and still perform, but what if you couldn't hear?" They looked at each other and said, "Never thought of it that way."

That's what I mean about having the discussion. Obviously, some musicians will always resist, but you get through to many of them. Even if you don't get a chance to do a hearing test that day, you've planted the seed. Sometimes it takes root and grows.

20 So, have you've seen some progress over the past 25 years?

Looking back at what it was like in 1985, I would have to say yes. But worrying about your hearing is still fundamentally at odds with the rock and roll lifestyle. Not to drop names, but it's like Steven Tyler of Aerosmith told me, "Michael, safety and rock and roll are like oil and water; they don't really mix." So I said, "That's true, Steven. But how about rock and roll and quality of life? Because I know you're into that, and if your hearing stinks, so does the quality of your life." That, he could relate to.

REFERENCE

1. Federman J, Ricketts T: Preferred and minimum listening levels for musicians while using floor and in-ear monitors. J Sp Lang Hear Res 2008;51: 147-159.