Gasaway Lecture
Hearing Health and the Grand Scheme of Things

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The findings and conclusions in this presentation are those of the author and do not necessarily represent the views of the National Institute for Occupational Safety and Health.
One lecture at the NHCA annual conference is designated the Gasaway Lecture in recognition of Donald C. Gasaway’s long and exemplary years of service and contributions to NHCA and the field of Hearing Conservation. Previously presented by:

- Elliott Berger
- Ted Madison
- Theresa Schulz
- Dick Danielson
- Jim Banach
- Nancy Vause
- James Lankford
- Doug Ohlin
- Billy Martin
- Christine Harrison
- Laurie Wells
- Dennis Driscoll

Immediate response to the invitation: “YES! Of course, great honor!”

The Gasaway lecture!!! There is no way I can talk about hearing loss prevention and motivation to this crowd, to follow such great previous presenters and not preach to the choir.”
He was a true leader, as defined as someone who not only shows us a path, but makes us want to take that path.

NHCA is truly fortunate to have an abundance of talented, dedicated members.

Don is known best for his ability to successfully motivate people to protect their hearing.

Donald Gasaway

Don has excelled. As a hearing conservation specialist at Aearo Company, as well as serving as a consultant in numerous other positions, Don has helped spread the hearing conservation “gospel” across the United States and Canada and in 20 other foreign countries. The impact of these efforts is incalculable. He has

Research on the effects of noise led to the development of audiolologic examination methodology for assessing the adequacy of auditory performance among workers with hearing loss. His methodologies are still in use today by the Air Force and have served as a model for other efforts to establish criteria for performance requirements in hearing-critical jobs. His methods for identifying standard threshold shifts were derived over 30 years ago and were subsequently adopted by the Department of Defense. They have stood the test of time, corresponding closely with the 1998 NIOSH recommended method for identifying STS (“15dB-twice”). Those of you who use micro-processor audiometers owe a partial debt to Don Gasaway. Given the daunting task of managing several hundred thousand audiograms a year, Don

NHCA Spectrum, Volume 17, Supplement 1, 2000
As Lincoln and a companion walked back to the White House after a sermon, the president’s companion asked:

-“What did you think of tonight’s sermon?”
-“Well,” Lincoln responded, “it was brilliantly conceived, biblical, relevant, and well presented.”
-“So, a great sermon?”
-“No,” Lincoln replied. “It failed. It failed because Dr. Gurley did not ask us to do something great...”
Enjoyed info on Cochrane Review
Not enough time to write down URL for some of the research web addresses before
Great opener/cheerleader for the conference
Excellent as always. Very much appreciated the topic particularly emphasis on what
I wish "long-lasting school interview" had been better described. Presenter is well
Great message on the Cochrane report as a practical tool for all NHCA and supporting organizations.
Great ideas! Thank you!

Hard to follow with so many words 1st thing in the morning
The speaker introduced some good resources to look into.

Very helpful approach to how we can do more effective research.
Excellent
always great

Very informative, Dr. Morata presentation was enlightening and effective.
Important issue; it is the goal of what we are doing.
Liked the Holistic approach to evaluation
Little difficult to hear words
This speaker is adorable!
Nothing was presented that we already didn't know. The topic and relevance is well
Evidence-based practice needs a greater focus so it gives us greater ability to do
E.g.

Speaker’s accent was a little difficult to understand
Great overview for what needs to be done!
I hope references are available

Nice info. Love Thais’ passion for HLP!
Thais did a great job setting the stage for today's presentations. Wonderful start for
Relevant and applicable to our program.
Slides were a bit hard to read
Thank you for the lead to log on to Cochrane Review.
Best

Would have liked more details regarding the effectiveness research. Too general
I have -many- stories, quotes, metaphors about and even degrees on Communication Disorders.

“Storytelling is the single most powerful communication tool ever created; ...there are specific ways to use stories to advance an organization’s mission.” CDC

“A story is the relationship that you develop between who you are, or who you potentially are, and the infinite world” Shekhar Kapur
...I am a rock,
I am an island.

I've built walls,
A fortress deep and mighty,
That none may penetrate.
I have no need of friendship; friendship causes pain.
It's laughter and it's loving I disdain.
I am a rock,
I am an island.

....

I have my books
And my poetry to protect me;
I am shielded in my armor,
Hiding in my room, safe within my womb.
I touch no one and no one touches me.
I am a rock,
I am an island.

And a rock feels no pain;
And an island never cries.

Early influence:
Paul Simon
My personal communication disorders experience

• I generate communication disorders (many stories, like NHCA evaluation, basic needs as ordering pizza on the phone, and on and on and on …)
• I experience communication disorders, started career as educational audiologist, had a teenager daughter, have older relatives. I live in a country where the first language is NOT Portuguese. I lived in country where I did not even know how to read (Sweden).

Personal conclusion: communication/hearing health matters to “my” grand scheme of things
My professional experience in communication disorders

From hearing loss to [risk evaluation for] hearing loss prevention...

Johnson AC, Morata TC. Nordic Expert Group Criteria Documentation #142
http://hdl.handle.net/2077/23240
## Animal studies

[www.nordicexpertgroup.org](http://www.nordicexpertgroup.org)

<table>
<thead>
<tr>
<th>NOAEL</th>
<th>LOAEL</th>
<th>Exposure duration</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Styrene - only</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-</td>
<td>250 ppm – 500 ppm</td>
<td>Gavage or Inhalation 3 w – 4 w</td>
<td><a href="#">Chen et al., 2007</a>; <a href="#">Lataye et al., 2005</a></td>
</tr>
<tr>
<td>300</td>
<td>600</td>
<td>Inhalation 4 w</td>
<td><a href="#">Mäkitie, et al 2002</a></td>
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<tr>
<td>- combined with noise (N)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>400 + 85 dB Leq8h</td>
<td>Inhalation and N 4 w</td>
<td><a href="#">Lataye et al., 2005</a></td>
</tr>
<tr>
<td>300+100-105 dB SPL</td>
<td>600 + 100-105 dB SPL</td>
<td>Inhalation and N 4 w</td>
<td><a href="#">Mäkitie et al., 2003</a></td>
</tr>
<tr>
<td><strong>Toluene - only</strong></td>
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<tr>
<td>-</td>
<td>900 - 1000</td>
<td>Inhalation 14 h/d, 14 w or 6 h/d, 2-4 w</td>
<td><a href="#">Pryor et al 1983a</a>; <a href="#">Johnson et al 1988</a></td>
</tr>
<tr>
<td>700</td>
<td>1000</td>
<td>Inhalation 14 h/d, 16 w</td>
<td><a href="#">Pryor et al 1984b</a></td>
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<tr>
<td>- combined with noise (N)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>500 + 87 dB Leq8h</td>
<td>-</td>
<td>Inhalation and N 90 d</td>
<td><a href="#">Lund and Kristiansen 2008</a></td>
</tr>
<tr>
<td>500 + 90 dB Leq8h</td>
<td>1000 + 90–100 dB Leq8h</td>
<td>Inhalation and N 10 d</td>
<td><a href="#">Brandt-Lassen et al 2000</a></td>
</tr>
<tr>
<td><strong>Xylene - only</strong></td>
<td></td>
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<tr>
<td>450 p-XYL</td>
<td>900 p-XYL</td>
<td>Inhalation 13 w</td>
<td><a href="#">Gagnaire et al 2001</a></td>
</tr>
<tr>
<td>- combined with noise (N)</td>
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<tr>
<td>No data</td>
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<tr>
<td><strong>Trichloroethylene - only</strong></td>
<td></td>
<td></td>
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<tr>
<td>-</td>
<td>2000</td>
<td>Inhalation 3 w</td>
<td><a href="#">Rebert et al 1991</a></td>
</tr>
<tr>
<td>800</td>
<td>2500</td>
<td>Inhalation 13 w</td>
<td><a href="#">Albee at al 2006</a></td>
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<tr>
<td>- combined with noise (N)</td>
<td></td>
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<tr>
<td>-</td>
<td>3000 + 95 dB SPL</td>
<td>Inhalation and N: 18 h/d, 3 w</td>
<td><a href="#">Muijser et al 2000</a></td>
</tr>
</tbody>
</table>
## Human studies – Styrene OEL 20-

<table>
<thead>
<tr>
<th>Exposure levels</th>
<th>Styrene groups</th>
<th>Evidence of HL shown</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>S= Styrene, N= Noise</td>
<td></td>
<td></td>
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<tr>
<td><strong>S:</strong> Mean 3.5 ppm &lt;br&gt; <strong>N:</strong> S+N mean 89 dBA</td>
<td>65, S &lt;br&gt; 89, S and N; &lt;br&gt; 81 controls</td>
<td>++</td>
<td>Morata et al, 2002, Johnson et al, 2007</td>
</tr>
<tr>
<td><strong>S:</strong> Mean ca 5 ppm (bior. monit) &lt;br&gt; <strong>N:</strong> 73 dB(A)</td>
<td>32 S &lt;br&gt; 60 controls (age matched)</td>
<td>++</td>
<td>Mascagni et al, 2007</td>
</tr>
<tr>
<td><strong>S:</strong> Mean 8 ppm &lt;br&gt; <strong>N:</strong> &lt; 85 dB</td>
<td>44, S; &lt;br&gt; 49 S in mixt &lt;br&gt; 33 controls</td>
<td>++</td>
<td>Morioka et al., 1999</td>
</tr>
<tr>
<td><strong>S:</strong> Mean 11-38 ppm &lt;br&gt; <strong>N:</strong> 70-93 dBA (&gt;85 S+N)</td>
<td>220 S &lt;br&gt; 70 S and N &lt;br&gt; 157 controls</td>
<td>+++</td>
<td>Sliwinska-Kowalska et al, 2003</td>
</tr>
<tr>
<td><strong>S:</strong> Mean ca 22 ppm (bior. monit) &lt;br&gt; <strong>N:</strong> not given</td>
<td>16 S &lt;br&gt; 16 controls</td>
<td>-</td>
<td>Hoffman et al, 2006</td>
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<tr>
<td><strong>S:</strong> &lt; 26 ppm. &lt;br&gt; <strong>N:</strong> 80 to 89 dBA</td>
<td>170 dir exp &lt;br&gt; 86 indir exp &lt;br&gt; 43 controls</td>
<td>-</td>
<td>Sass-Kortsak et al, 1995</td>
</tr>
<tr>
<td><strong>S:</strong> &lt; 25 ppm. &lt;br&gt; <strong>N:</strong> not given</td>
<td>18 S &lt;br&gt; Comp to reference pop.</td>
<td>+ &lt;br&gt; ++ Bal</td>
<td>Möller et al, 1990</td>
</tr>
<tr>
<td><strong>S:</strong> Mean &lt; 30 ppm &lt;br&gt; <strong>N:</strong> S + N =76 dBA</td>
<td>23 S and N &lt;br&gt; 12 controls</td>
<td>++</td>
<td>Morioka et al, 2000</td>
</tr>
<tr>
<td><strong>S:</strong> &lt; 35 ppm. &lt;br&gt; <strong>N:</strong> &lt; 85 dBA</td>
<td>59 S &lt;br&gt; 94 controls</td>
<td>+</td>
<td>Muijser et al, 1988</td>
</tr>
<tr>
<td><strong>S:</strong> &lt; 54 ppm &lt;br&gt; <strong>N:</strong> not given</td>
<td>20 S</td>
<td>- &lt;br&gt; ++ Bal</td>
<td>Calabrese et al, 1996</td>
</tr>
</tbody>
</table>
Frequency (kHz)

Threshold (dB HL)

- Control
- Noise
- Styrene
- Styrene & Noise

Best ear

Morata et al., 2002

1998-2013

**TLVs® and BEIs®:**

“Exposure to certain chemicals may also result in hearing loss. In settings in which there may be exposure to noise as well as toluene, lead,... periodic audiograms are advised and should be carefully reviewed.”
Position Papers


ACOEM Evidence-based Statement Noise-induced Hearing Loss, JOEM 2003, 2012:

“Clinicians evaluating cases of possible noise-induced hearing loss should keep in mind the following clinical concerns:...
Coexposure to ototoxic agents, such as solvents, heavy metals and tobacco smoke, may act in synergy with noise to cause hearing loss”.
US Army Regulation 1998-2012

Dept. of the Army Pamphlet 40-501 Hearing Conservation Program: Requires consideration of ototoxic chemical exposures for program inclusion, particularly when in combination with marginal noise (¶ 3-3).


Fact Sheet 51-002-0903 suggests Action Level for chemicals for inclusion in Hearing Conservation Program.

The European Community directive on noise (2003/10 EC noise) requires that the interaction between noise and work-related ototoxic substances, and noise and vibration be taken into account in the risk assessment of exposed populations. (Article 4 of Section II)


Several country members also enacted similar provisions and Sweden, France, Switzerland adopted a “noise notation”.

Countries (Australia, New Zealand, Brazil) started to accept link between chemical exposure and hearing loss in compensation cases.
Happy “ending” for focused effort! What about the Grand Scheme of Things?

- HL still leads work-related conditions (BLS)
- Funding! Increasing pressure and demands in accountability (what are the applied implications of what has been or will be funded?).
- Can we provide evidence-based answers to “how can one control hazards and prevent hearing loss (& tinnitus) at work?”
American Recovery and Reinvestment Act 2009

Among the provisions in the economic stimulus package signed by President Obama was $1.1 billion in federal funding to investigate how different treatments and other interventions stack up against each other.


Hearing research was mentioned in the first quartile of 100 recommendations for studies.
• between what individual professional knows and the population he/she serves knows and
• between people's awareness of health risks and their actual behavior (health promotion). Examples: HPDs, Music players

Sept. 22, 2009, Dr. Thomas Frieden, CDC Director (@DrFriedenCDC) challenged staff to minimize the 2 gaps:
• What we know and do not know
• What we know and what we do
What is there to be done?
Research, policy and practice

✓ Information to scientists
✓ Publication of guidelines, best practices in different formats
✓ Information to policy makers

The article "Prevalence of Hearing Loss in the United States by Industry" was chosen as one of the Top Read Articles of 2012 on MDLinx.com. The MDLinx Web site sorts, ranks, and summarizes medical journal articles and news.
What is there to be done? Research, policy and practice

- Information to scientists
- Publication of guidelines, best practices in different formats
- Information to policy makers
  - Evidence-based information to general and targeted public
  - Regulation
  - Awards and Incentives

To assess the effectiveness of interventions for preventing occupational noise exposure and occupational hearing loss compared to no or alternative interventions.

The Safe•in•Sound Award™ was created in 2009 by NIOSH in partnership with the NHCA to formally recognize and disseminate the methods of organizations that have demonstrated excellence and innovation in hearing loss prevention programs.
What else can we all do?

Develop simple and clear messages

CLEAN IT UP and QUIET IT DOWN!

Reduce hazardous exposures, thinking of the big picture

- Engineering controls, Buy-Quiet, Quiet by Design
- Protective equipment (e.g. respirators, gloves)
From hearing loss prevention to hearing health promotion (TWH)...
What else can we all do?

Tell everybody about it!!!

Improve the exchange of information on evidence-based practices. Share your stories, so many avenues exist today for us to reach out to the general public and health community!

“A new funding policy by the US National Science Foundation represents a sea-change in how researchers are evaluated.”

“In the next five years, I believe that it will become routine to track — and to value — citations to an online lab notebook, contributions to a software library, bookmarks to data sets from content-sharing sites such as Pinterest and Delicious. In other words, to value a wider range of metrics that suggest a research product has made a difference.”
1995, me, NRC postdoc
Sound familiar? Those of us involved with hearing conservation develop many schemes as we attempt to motivate people to preserve their precious sense of hearing. Today, a hearing conservation program in industry should involve every employee and even their family members. That's correct! Hearing conservation has expanded beyond the factories and military compounds. Today, as never before in North America, noises that can damage the integrity of hearing are no longer resident only in industrial plants, military facilities, and the like. Unfortunately, many young people today who reveal evidence of noise-induced hearing loss have never worked in a noisy occupation, fired guns, or served in the military.

It is my hope to present occupational hearing conservation in a way that makes the topic enjoyable and informative. My desire is to present features, characteristics, data, technology and related material in an operational and applied manner: translating compliance into practical application. We have learned many lessons about how to conduct such programs and my desire is to share findings and observations of those who have helped me understand this challenging field of human endeavor.

Donald C. Gasaway

Before TWH & social media Don Gasaway shared his expertise and enthusiasm with basically ALL he could reach in all possible ways.
GOAL SOUGHT FROM MOTIVATION

Create an appreciation of hearing that elicits self-discipline concerning ALL encounters with potentially hazardous sounds and noises.

UNLOCKING AWARENESS OF IMPACT OF HEARING LOSS

Which would you choose to "keep" if for the remainder of your life you could only have one of your two senses - your hearing or your vision?

If you chose to keep your vision to the loss of your hearing -- you made a choice you would regret for the remainder of your life.

HEARING IS IMMEASURABLY MORE VITAL TO LIFE AND LIVING THAN VISION!
Helen Keller
“Blindness separates us from things, but deafness separates us from people.”

“I long to accomplish a great and noble task, but it is my chief duty to accomplish humble tasks as though they were great and noble.”
Challenges

We do not always see how much of what we do is meaningful and important.

Sometimes we do not perceive a mission as our responsibility. But if not ours, whose?
No pressure, but it is up to us to do something GREAT!

...Us, who are aware of the multi-dimensional impact of hearing loss on:
- interaction with our 'communication partners',
- development,
- education,
- employment and careers,
- interacting with and contributing to society,
- healthy aging,
- managing home and health matters effectively.
No pressure, but it is up to us to do something GREAT!

...Us, who have the knowledge, the tools, opportunity and are in strategic positions to facilitate or advocate for hearing loss surveillance and prevention.
Now...

[I can’t wait to see my NHCA 2013 Evaluation Results!]

In case it did not work for you, “NHCA is truly fortunate to have an abundance of talented and dedicated members”
To conclude, in the end...
Does hearing health matter in the Grand Scheme of Things?

It does! **Hearing health matters** unless....

You are a rock, or you are an island!
Thank you Don Gasaway and NHCA! Thank you choir, all!

tmorata@cdc.gov

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Follow the Cochrane Collaboration at www.twitter.com/CochraneCollab