



Occupational
Hygiene Association
of Ontario
FORUM



President's Message

It's looks like it will be a "grey" holiday season, not just due to the wintery weather, but also due to the lockdown status (in Toronto, Peel and York regions anyway). COVID fatigue has set in, and we are all holding our breath waiting for vaccine approvals and distribution. Maybe I will be eligible to line-up for a vaccine by next summer, if I am old enough to be classified as higher risk?

In the meantime, sitting in my "office" (formerly known as the basement), my inbox was recently flooded with Cyber Monday sales, including huge discounts on air travel and hotels. This kind of mixed messaging in the middle of a pandemic is disheartening, given the public health advice we are getting that includes distancing yourself from even relatives who don't live under the same roof. I was even more amused to see Cyber Monday sales on textbooks and courses from AIHA and ACGIH. Did we at OHAO miss an opportunity to jump on the retail bandwagon and join in on the frenzy of cyber sales events? Maybe next year we should include a sales price for early OHAO membership renewal, if you pay in full on Cyber Monday? Half price for the Spring Symposium if you pay now? For this year, I just hope you noticed your renewal notice, and it didn't get lost in the spam filter along with all these other ads!

On a more serious note, news of COVID in Ontario workplaces seems to be increasing as much as the infection rates in the general community. The provincial school screening trial

of asymptomatic people in a high risk (high density population, high positivity rate (16%)) Toronto neighborhood revealed 20+ positive cases, including at least one staff member. Another workplace, State Window Corporation in Peel, reportedly had their second outbreak this year, currently with 62 workers testing positive. The MLTSD is apparently collaborating with Peel Public Health to intervene, including requirements for overcoming language barriers for training and instruction to workers. I hope the investigation and orders also included hygiene aspects that include assessing the adequacy of the HVAC system, and not just masks and physical distancing... remember the hierarchy of controls! These will be great case studies (in future when under control) and I encourage anyone with first-hand knowledge to contact OHAO if able to present details at the Spring Symposium.

Let me leave the depressing information for some non-COVID news from OHAO. Recently some of the Board members went back to school (virtually of course!). We attended a class at Western U's post-grad diploma in OHS to present some information on what a hygiene career can look like, using ourselves as examples. I was pleasantly surprised by some students who came from a non-science background (e.g. business) and were interested in how to become more proficient in hygiene aspects of OHS after graduation. All board members in attendance indicated that this outreach gave us hope that the next

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generation of OHS professionals are enthusiastic and looking forward to helping improve health in the workplace.

Here's hoping we all have a "green" New Year! (or at least orange, not red nor grey in terms of public health pandemic measures)

Paul Bozek, ROH, CIH

Editor's Message

Greetings fellow members,

It has been a while since we have all seen each other. I, for one, miss the in-person OHAO Symposia and PDCs, where we not only had a chance to learn, but also to catch up with our colleagues. Having said that, our OHAO board and committees are always hard at work overcoming all obstacles so that we can still have virtual get-togethers. I do hope that 2021 brings brighter tidings and we are able to see each other again.

As the year is winding down, our efforts against the spread of COVID-19 seem to still be increasing. I have, personally, had to do more respirator fit testing than ever before at my workplace to align with the new, more stringent, protection measures. When social distancing at work is not possible, we are now moving away from the use of surgical masks and donning our trusty half face respirators. I only hope that the supply of both respirators and cartridges remains strong in the face of this heightened demand.

I leave you with a hopeful message of peace, mental and physical health, and joy in this holiday season. Please enjoy this issue. We hope to continue to bring you interesting reads in the late winter season.

Happy holidays to all!

Negin Ghanavatian, MHS.

Email articles to: neginghanavatian@gmail.com

OHAO Save the Date

Save the Dates OHAO Spring PDC, Symposium and AGM 2021:

The OHAO 2021 Spring PDC will take place on Wednesday, March 24, 2021 and the 2021 Spring Symposium and Annual General Meeting will take place on Thursday, March 25, 2021.

At this point in time it is likely that the events will take place virtually.

OH FORUM

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Mission Statement

To advance the profession of occupational hygiene and to serve the interests of our members by:

- sponsoring professional development and training;
- promoting public and legal recognition;
- developing partnerships with stakeholders;
- providing public education;
- fostering communication and networking.

rev. May 2010

Noisy News: Do We Really Need an Audiometric Booth?

Alberto Behar

The answer to the question: “What is required to perform an audiometric test?” is usually: “an audiometer, a person to run the test (automatically or manually), and a booth”.

Why a booth? Well, to reduce the background noise and, consequently, the number of false positive results that indicate hearing losses, when there are none. There is also another reason for the booth and that is to reduce the distraction of the patient from intermittent noises, such as conversations, the sounds of walking, car honking and engines, etc. The person being examined has to concentrate in order to detect even the faintest signals and to respond correctly as requested.

A low background noise is of such importance as to be included in standards for audiometric tests. As an example, Table 1 in the latest CSA Standard for audiometric tests ^[1], shows the maximum permissible sound levels at the different octave bands from 125 Hz to 8000 Hz. Two situations are included: use of a supra-aural and of insert earphones. Both types reduce the background noise; the second type more than the first. This is especially noticeable at low frequencies where the difference between the maximum permissible noise levels is 29 dB at 125 Hz.

It has to be noted, that those values are maximum, meaning that they should not be exceeded at any time. In the case that such a situation occurs, the test has to be interrupted and resumed once the noise levels drop below the limit. This is a situation found in rooms close to a corridor with audible traffic noise or with windows facing a street. This is also a frequent problem when mobile audiometric facilities are located in parking lots.

TABLE 1.
Maximum permissible ambient noise levels for audiometric testing with supra-aural and insert earphones used for testing in the frequency range 500 to 8000 Hz

Octave band (Hz)*	Maximum level (dB SPL)	
	Supra-aural earphones	Insert earphones
125†	49	78
250†	35	64
500	21	50
1000	26	47
2000	34	49
4000	37	50
8000	37	56

* The maximum noise levels by octave band specified in this Table are from ANSI/ASA S3.1.
 † Audiometric testing at pure-tone frequencies below 500 Hz, if conducted, requires lower maximum ambient noise levels at octave bands of 125 Hz and 250 Hz than those specified in this Table. See ANSI/ASA S3.1

The second issue is the space it takes and its weight. Again, the more sophisticated the booth is, the more space it requires as is its mass. If there is a need to also isolate the audiometric operator, then a double room is required and more space has to be allocated.

Claustrophobia is a situational phobia triggered by tight or crowded spaces. It can be triggered by things like being locked in a windowless room, being stuck in a crowded elevator, or driving on a congested highway. Some worker/patients tend to feel claustrophobic and uncomfortable while seated in an audiometric booth.

The third and perhaps the most serious issue is how to ensure that the background noise is within the recommended limits. This requirement becomes difficult to comply with when the location is exposed to non-steady noise levels. It is a regular problem with mobile audiometric facilities, frequently operating in busy parking lots. As per the above mentioned Standard (and, as a matter of fact, per all current, relevant standards) the background noise needs to be tested at least once a year to assure compliance. Unfortunately, not many booths are tested. To make things even worse, some studies claim that a significant percentage of the tested booths do not comply with the Standard.

Test without booths?

Is the use of an audiometric booth essential? The title of Table 1 states “Maximum permissible ambient noise levels...” without mentioning specifically “audiometric booths”. In other words, the issue is the ambient noise level and not the way it is attained. This is the reason for solutions, other than the use of audiometric booths, being proposed. All of them have been tried by comparing results from tests performed inside booths with others performed with no booths. These studies claim that their results apply for screening tests only, where the objective is the detection of hearing losses above a set hearing threshold.

Those studies can roughly be grouped as follows:

Use of a quiet environment: Rural environments or small villages are known for being quieter than many typical urban centres (and interestingly enough, environmental noise levels in the community have dropped by 3 dB on average since the advent of public health measures during our current COVID-19 situation). This author remembers auditing audiometric tests in a Bauxite processing facility in Guinea. Tests were performed in an office, where he couldn't perceive any noise. Obviously, this was an ideal location for performing tests even without a booth. Testing locations in health clinics or similar offices may not comply with the standard requirements for ambient noise level, but can be adequate for routine, supra-threshold screening procedures.

Use of insert headphones: The Standard allows for significantly higher ambient noise levels when insert headphones are used. This is because their attenuation is much higher. As a result, the limit for a broadband background noise is 63 dBA while it is 41 dBA when supra-aural headphones are used.

Use of over-the-ear earmuffs: Earmuffs significantly reduce the ambient noise if they are well fitted. In some studies, the signal was fed through insert earphones located under over-the-ear ear muffs. In such circumstances, the ambient noise is 'twice attenuated'; by the insert earphone and by the earmuff.

Use of Active Noise Reduction (ANR) earmuffs: The ANR electronic technology relies on the principle of destructive interference to cancel noise. For that purpose, a control microphone located under the earmuff's cup picks up the noise that has penetrated the device. Its output is phase shifted 180°, amplified and fed to a speaker, that in turn sends noise into the cup. In theory, the fed back noise should completely destroy the original noise. However, due to practical limitations, the result is a significant reduction of low frequency noise below 1000 Hz. Low frequencies are known for causing upwards spread of masking, even affecting hearing thresholds at higher frequencies.

Advance technology: A relatively new device on the market consists of a computer-controlled audiometer, equipped with inserted earphones, covered by circumaural protectors. Those are fitted with external microphones that monitor the

environmental noise levels. The device also allows for interrupting the test if those levels exceed pre-set values.

Summary

The 'golden rule' for performing an audiometric test requires the use of a booth that assures a stable, controlled environment for performing any kind of audiometric tests. However, there are circumstances where use of booths can be avoided. The key issue is maintaining and controlling the background noise levels so that the hearing of the subject being tested is not affected.

A condensed version of this article has been published as "Do we Really Need an Audiometric Booth" in *Canadian Audiologist*, Vol.7, Issue 6, 2020.

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- [1] Z107.6-16. Audiometric testing for use in hearing loss prevention program. December 2016.1. Jana Lowry and Chun-Yip Hon: The public's exposure to and perception of noise in aquatic facilities: a pilot study. *Environ. Health Rev.* Vol. 61, Issue 4, Guelph, 2018.

Health Physics

—Column Editor—

Michael Grey, CHP, ROH
SAIC Canada



Radon Dosimetry

Radon gas and radon progeny account for approximately half of the annual dose to members of the Canadian public but the determination of dose due to radon exposure is notoriously difficult, and because of that, protection against radon is primarily based on the measurement and control of the level of exposure rather than the dose. This, of course, leads to the question how good is the correlation between radon exposure and dose?

The International Commission on Radiological Protection (ICRP) provides guidance on radiation protection and dosimetry that is almost universally accepted. The ICRP is currently releasing its most recent guidance on internal dosimetry. Part 1 of the new "Occupational Intakes of Radionuclides" (OIR) was published in 2015 and the fifth and final part should be published in the fall of 2021. New advice on the conversion from measured radon in air concentrations to lung tissue doses are based on the guidance presented in the OIR and, in August 2020, a group of 8

major international agencies, including the International Atomic Energy Agency (IAEA), the World Health Organization (WHO) and the European Union (EU) endorsed the new guidance.

Radon is a radioactive noble gas. Four radon isotopes can be found in the environment but only radon-222, a decay product of uranium-238, with a half-life of 3.8235 days, is sufficiently abundant to create a hazard to health. Radon-222 decays by alpha emission to polonium-218 and eventually to stable lead-206 through a series of radioactive progeny which includes four short-lived radionuclides: polonium-218 (half-life of 3.1 minutes), lead-214 (26.8 minutes), bismuth-214 (19.9 minutes) and polonium-214 (164 microseconds). Most of the adverse health effects are due to the alpha emissions of Po-218 (alpha energy of 6.00 MeV) and Po-214 (7.69 MeV), rather than exposure to the radon itself.

The concentration of radon-222 in air is measured in Becquerels per cubic meter (Bq/m³) and the concentration of short-lived radon progeny in air is measured in Working Levels (WL). A Working Level was originally defined as the concentration of short-lived radon progeny in equilibrium with 3.7E8 Bq/m³ (100 pCi/l) of radon-222 but this definition was eventually changed since the short-lived radon progeny is often disrupted so the definition of a Working Level was changed to a potential alpha energy concentration (PAEC) of 1.3E8 MeV/m³ (or 20.8 µJ/m³) due to the short-lived radon progeny in air.

Radon-222, Po-218 and Po-214 all decay by emitting an alpha particle with a charge of +2. An alpha particle travelling through the cloud of electrons orbiting the nucleus of the atom will, on average, eject 4 electrons from the atom leaving the progeny as an ion with a charge of +2. Typically, 90-95% of these positively charged ions become attached to negatively charged particulates in the air which may eventually settle out of the air column. This settling disrupts the equilibrium between the radon and its airborne progeny. The Equilibrium Fraction is the fraction of the short-lived progeny that remain suspended in air. It can vary from as low as 5% to as high as 90%. The equilibrium fraction depends on both particulate size and air movement. It is higher in outdoor air than indoor and it is lower in environments, like underground mines, where particulates are

larger. It is typically assumed to be 40% in residential air, but this assumption is not always dependable.

When radon and its progeny are inhaled into the lung, the radon itself and its unattached progeny are usually exhaled but the attached radon progeny may impact the bronchial lining at the points where the airways bifurcate (tars and other components of cigarette smoke deposit in the same locations which may explain the synergy between radon exposure and cigarette smoking that is observed in epidemiological studies). The deposited radon progeny will eventually decay and emit an alpha particle causing radiation dose to the nearby cells. These irradiated cells can transform to malignant cells. The equivalent dose to an organ or tissue is used as a measure of the risk resulting from the absorption of the energy from the alpha irradiation. This is usually reliable for low LET (Linear Energy Transfer) radiations like gamma and beta, but it is less reliable for high LET radiations like alpha.

A typical human cell has a mass of about 1 nanogram (1E-12 kg) and the alpha particle emitted by Po-218 has an energy of 6 MeV (9.6E-13 J). If all of this energy is absorbed in one cell, which is likely given the short range of an alpha particle, then the absorbed dose in that cell will be 960 mGy (0.96 J/kg) which is a very high absorbed dose. Since the radiation weighting factor for alpha radiation is 20, this absorbed dose would be an equivalent dose of about 19 Sv to the cell, but it is not meaningful to talk of effective dose to a single cell. However, only a small fraction of the cells in the lung will receive such a high dose while most will receive no dose at all therefore, the dose averaged over the entire lung would be small.

Given this information, I still have not mentioned the new guidance on converting measured radon in air and radon progeny in air concentrations to dose. This will be the subject of the next column.

Fungal Exposure II: Guidelines and Principles of Interpretation

E.A. Sullivan, PhD, CIH, ROH, CChem

Occupational hygienists use air sampling data either to determine whether a fungal population is ‘normal’ or to fulfill a post-remediation verification (PRV) requirement for re-occupancy. Quantitative PRV guidelines¹ are intuitively appealing but with assertions such as ‘There is no agreement on requirements for, methods of, or interpretation of microbiologic sampling for clearance purposes’² and ‘... airborne fungal analyses alone may not be sufficient to classify a building as clean or moldy without a thorough visual inspection’,³ interpretations can be problematic. Investigators often ‘use diverse investigation approaches and take wide liberties in their interpretation of the environmental significance of airborne fungal spore concentrations’³ since the ‘lack of a consensus “decision strategy” incorporating explicit decision criteria requires professionals to establish their own personal set of criteria when interpreting air sampling data’.⁴ Inevitably, even knowledgeable and objective practitioners can reach inconsistent conclusions.⁴

The following are some of the issues in interpreting fungal air sampling data:

- Guidelines and decision criteria for remediation protocols often lack authoritative rationale and professional consensus.
- Remediation involves aggressive disturbance of fungal material; remediated environments potentially have airborne residuals of previously disturbed fungal growth.
- Limited utility of outdoor samples as references undermines the indoor/outdoor comparison.
- Short-term air samples can require impractically large sample sizes to demonstrate statistical relevance.
- Application of statistics can result in unwarranted failures for specific remediation projects.
- Superseded or withdrawn quantitative criteria continue to be cited.
- Comparing biodiversity in remediated buildings to ‘normal’ conditions both in non-contaminated buildings or outdoors is conjectural.
- Comparing biodiversity in commercial, residential, non-complaint and remediated premises, is conjectural.

ACGIH recommends ‘gathering the best data possible and using knowledge, experience, expert opinion, logic, and common sense to interpret information’⁵. This approach also reflects the principles of hermeneutics: the theory and methodology of interpretation⁶. Hermeneutics has been broadly applied to textual analysis in the humanities – law, history and theology – and also in safety science, with demonstrable consensus in interpretations of qualitative safety data between different interpreters.⁷ Hermeneutics rules 1-3 listed below are basic requirements applicable to any document; rules 4-8 correspond directly to the ACGIH recommendations.

1. **DEFINITION:** Words should have their plain meaning.
2. **CONTEXT:** Meaning must be clear from the context.
3. **USAGE:** Interpretations should not be shaded by preconceived notions.
4. **HISTORICAL BACKGROUND:** The intention behind the creation of the original document is a consideration.
5. **LOGIC:** Interpretation must be based on logical reasoning.
6. **PRECEDENT:** Interpretations must use well-established precedents to support an alleged doctrine.
7. **UNITY:** The individual parts of interpretations must be consistent with the whole.
8. **INFERENCE:** The logical conclusion from a given fact or proposition should be established by competent and satisfactory evidence. Competent evidence refers to evidence that is relevant and of such nature that it can be received by a court of law; satisfactory evidence means credible proof which would ordinarily satisfy an unprejudiced mind beyond a reasonable doubt.

The hermeneutic approach could be applied to the interpretation of any document – including fungal remediation guidelines – to rate its credibility or reliability. Nationwide, Public Health strongly espouses the Alberta Health Services (AHS) guideline⁸ for mould remediation and clearance; because interpretations by public health officials significantly impact occupational hygiene practice concerning mould remediation, the soundness of this guideline’s tenets deserves scrutiny.

For example,

- Legitimacy of the AHS guideline relies on the authority of the formerly tentative and now superseded Health Canada guideline. (Rules 6-8)
- Application is primarily intended for remediated dwellings; the former Health Canada guideline referred specifically to proliferation-free, normal Canadian office buildings. (Rules 4,6,8)
- Cleanliness in normal office buildings, as an exemplar for remediated residences and commercial premises, is unsubstantiated. (Rules 5,6,8)
- Although purportedly for ‘buildings with large or potentially large mould contamination issues... attributable to a large adverse moisture control event, including use as a Marijuana Grow Operation’, comprehensive application to any situation is also asserted. (Rules 4,5,6,8)
- Many experts consider visual inspection sufficient for remediation projects with small water damage. (Rules 6,8)
- Clearance is contingent on ‘acceptable’ air sampling results; most authorities decline mandatory, quantitative benchmarks or action levels. (Rules 6,8)
- According to Health Canada, results from fungal air sampling cannot be used to assess health risks for building occupants. (Rules 6,8)
- PRV sampling conditions before build-back have no relationship to, and inappropriately simulate, normal occupancy. (Rules 5,6,8)
- Requiring operational ventilation for PRV testing misinterprets the intent of the former Health Canada guideline by conflating clearance and investigatory surveys; the requirement represents potential contamination and liability issues. (Rules 4-8)
- A rules-based, one-size-fits-all approach with mandatory criteria conflicts with professional judgment; ‘guidance’ is inherently advisory. (Rule 6)

Evaluated against hermeneutic rules and ACGIH principles, the AHS document would likely be rated ‘poor’ as a guideline. Fungal interpretation guidelines have accumulated inconsistencies over the decades. Consensus evaluation tools which incorporate Critical Thinking⁹ are long overdue in our profession, to ‘deconvolute’ the confusion.

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Significance of Hygiene in the Public Sector During COVID19

Maryam Khan and Jackie Sam
Health and Safety Consultants, Emerging Markets, PSHSA

Since the pandemic began in March 2020, public sector workplaces have faced closures, limited resources, out of stock PPE, and a requirement to reimagine the same work but with different techniques to reduce exposure. Specifically, in the Healthcare, Education, Public Safety and Municipal sectors, occupational hygiene has risen to the forefront where there has been an increase in demand in knowledge, education and expertise about the role hygiene plays in controlling COVID-19 exposure and keeping workplaces safe. Some hygiene issues such as ventilation, chemical exposure from cleaning products and disinfectants, respiratory protection, enhanced cleaning protocols, and stagnant water issues as a result of dormant buildings have been identified as those requiring the most attention at this time.

To meet these increased demands and needs, PSHSA decided to focus on three main paths: 1) webinar series (provide knowledge/education), 2) risk assessment (provide expertise), and 3) chat bot (provide expertise and resources to meet increased demand). These initiatives allowed us to assist our clients in the very topics that seemed new to them and help meet our sectors’ needs during this unprecedented time.

The hygiene webinar series focused on emerging issues related to COVID-19 with a focus on relaying informa-

tion to the regular worker and not an OHS professional. Our approach was to provide the client with the general knowledge behind hygiene principles and how they can put those into place at their workplace (e.g. practice doing a hygiene focused risk assessment to identify high risk areas or work tasks for potential exposure). It started with a ventilation webinar in collaboration with Paul Bozek and was well attended. The next few webinars focused on conducting hygiene risk assessments, preventing chemical exposure from the strong disinfectant materials being used in high risk workplaces, fatigue management for essential workers, and infection prevention and control strategies during the second wave. The webinar platform allowed us to increase our reach and disseminate relevant information in a timely manner.

We were tasked with completing COVID-19 risk assessments with some of the high-risk public sector workplaces that were required to return to full operations. These risk assessments focused on identifying activities, tasks and areas of potential exposure, assessing current controls, and making recommendations for further risk reduction. With this information, clients were better informed on safe reopening practices and were able to prioritize concerns.

Throughout the pandemic, we also experienced a significant increase of in-coming live chats on our website from clients seeking guidance and information. We developed an Artificial Intelligent Powered Chatbot to improve the overall client experience by creating a system to assist clients instantly. This experience is key to ensure that the clients needs are met when they are looking for specific resources such as the COVID-19 sector specific guidelines or the Return to Work Readiness Assessment. The Chat Bot has been featured on the AWS press center and the Public Sector blog. The Chat Bot will continue to be a vital asset as we move forward to streamline client request and improve the overall process of client experience.

Occupational hygiene has always been an integral piece of workplace health and safety, but has really become top of mind during the pandemic. PSHSA has risen to the occasion by taking three main approaches through leveraging technology and expertise to meet the increased need for guidance and knowledge sharing. We need to recognize how the pandemic has changed our world of work, and look forward to where we go from here.

We are working towards identifying emerging issues related to occupational hygiene and building resources such as webinars. If you would like to know more or collaborate on a topic of your interest, please contact us at: mkhan@pshsa.ca and jsam@pshsa.ca

OHAO Updates

OHAO 2021 Board of Directors Nominations

Nominations are now open for the OHAO 2020/21 Board of Directors. There is one (1) President Elect and three (3) Director positions available. Joining the OHAO Board is a great opportunity for both personal and professional growth so if you have been thinking of getting involved now is your chance. The deadline for submission is January 22, 2021. For the details and the nomination form click [here](#) (you must be logged in to access).

Hugh Nelson Award Nominations

Nominations are now open for the 2020 Hugh Nelson Award of Excellence in Occupational Hygiene. If you know someone who has made a significant contribution to the world of occupational hygiene and is deserving of this prestigious award please make sure you nominate them. It only takes a couple of minutes to make a nomination. The deadline for nominations is January 8, 2021. For the details and nomination form click [here](#) (you must be logged in to access).

OHAO 2021 Renewals

To renew for 2021 login in to your OHAO account at www.ohao.org under the Members tab. The first option on the members dropdown is 2021 Member Renewal. Click on the button and you will be able to complete your renewal.

Note: if you joined OHAO after October 1, 2020 your 2021 membership year is included and you do not need to renew at this time. If you are an Honourary or Emeritus member you do not need to do anything at this point.