2013 Number 3 **ISIAQ NEWSLETTER** April 2013

ISIAQ Mentorship Program

ISIAQ is excited to announce the creation of a mentorship program! Dr. Brent Stephens from IIT will be serving as the program coordinator.

The mentorship program will allow students and early-career ISIAQ members to align with senior ISIAQ members, forming a mentor-mentee relationship that can strengthen the society, advance the profession, and build lifelong collaborations and friendships.

The program will provide mentees with mentorship and guidance from ISIAQ researchers outside of their home institutions, providing them with early career advice, research and publication advice, discussions about current and emerging topics in the indoor environmental science field, and an opportunity for the mentee to network with senior members.

We are currently seeking ISIAQ members who would like to volunteer as mentors for the inaugural year of the program. ISIAQ members from all disciplines are encouraged to participate. Mentors will be paired with a mentee with similar research interests for a period of a year, commencing August 2013. Mentors and their mentees will interact through e-mail correspondence and face-to-face mentorship meetings and breakfasts at ISIAQ conferences. The ISIAQ mentorship program coordinator, Dr. Brent Stephens, will work to align mentors and mentees and will pose monthly discussion topics to help start conversations among program participants.

If you would like to join this exciting new program, please log in to the ISIAQ homepage with your membership account, access the mentorship page on through the left menu and fill out your details in the form provided. For any other inquiries, please contact us at mentorship@isiaq.org with "ISIAQ Mentorship Program" in the subject line:

Sincerely, the ISIAQ Mentorship Program Committee:

Dr. Pawel Wargocki, *ISIAQ President*
Dr. Brent Stephens, *ISIAQ Mentorship Program Coordinator*
Jelle Laverge, *ISIAQ Student Representative*
Brandon Boor, *ISIAQ Student Member*

AIHA Mold Position Statement

The American Industrial Hygiene Association ® (AIHA) has released "Position Statement on Mold and Dampness in the Built Environment," which defines AIHA's stance that persistent dampness and mold damage in the non-industrial workplace, including schools and residential housing, requires prevention, management and effective remediation.

Since 1996, AIHA has been a leader in the development of information and best practices on the management of mold and dampness problems in the built environment. This information has been relied upon by officials who develop and enforce public policy on indoor environmental quality (IEQ)

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for the non-industrial workplace, including schools. AIHA has also provided accessible information for individuals to enable more informed choices.

AIHA supports efforts to ensure that individuals who perform mold investigations and remediation are properly trained in the occupational and environmental hazards in buildings for all hazards.

Qualified persons should be utilized for designing and managing mold assessments, directing others who perform initial mold assessments, writing protocols for mold remediation, and conducting post-remediation inspections. This may include Certified Industrial Hygienists (CIH) and/or Registered Occupational Hygienists (ROH) with the specific education, training, and experience in microbial contamination.

For access to the "Position Statement On Mold and Dampness in the Built Environment," please visit http://www.aiha.org/news-pubs/govtaffairs/Documents/P-Mold-03-26-13.pdf.

Exposure to flame retardant chemicals on commercial airplanes

In response to our request for news, Jack Spengler sent us a recently article published article that may be of interest to nearly all of us who are frequent flyers. Here is the information. Flame retardants (and other SVOCS) are increasingly hot topics as California considers a major revision of its extremely stringent requirements and the federal government takes more interest.

Authors: Joseph G Allen, Heather M Stapleton, Jose Vallarino, Eileen McNeely, Michael D McClean, Stuart J Harrad, Cassandra B Rauert and John D Spengler

Abstract: Flame retardant chemicals are used in materials on airplanes to slow the propagation of fire. These chemicals migrate from their source products and can be found in the dust of airplanes, creating the potential for exposure.

Methods: To characterize exposure to flame retardant chemicals in airplane dust, we collected dust samples from locations inside 19 commercial airplanes parked overnight at airport gates. In addition, hand-wipe samples were also collected from 9 flight attendants and 1 passenger who had just taken a cross-country (USA) flight. The samples were analyzed for a suite of flame retardant chemicals. To identify the possible sources for the brominated flame retardants, we used a portable XRF analyzer to quantify bromine concentrations in materials inside the airplanes.

Results: A wide range of flame retardant compounds were detected in 100% of the dust samples collected from airplanes, including BDEs 47, 99, 153, 183 and 209, tris(1,3-dichloro-isopropyl)phosphate (TDCPP), hexabromocyclododecane (HBCD) and bis-(2-ethylhexyl)-tetrabromo-phthalate (TBPH). Airplane dust contained elevated concentrations of BDE 209 (GM: 500 ug/g; range: 2,600 ug/g) relative to other indoor environments, such as residential and commercial buildings, and the hands of participants after a cross-country flight contained elevated BDE 209 concentrations relative to the general population. TDCPP, a known carcinogen that was removed from use in children's pajamas in the 1970's although still used today in other consumer products, was detected on 100% of airplanes in concentrations similar to those found in residential and commercial locations.

Conclusion: This study adds to the limited body of knowledge regarding exposure to flame retardants on commercial aircraft, an environment long hypothesized to be at risk for maximum exposures due to strict flame retardant standards for aircraft materials. Our findings indicate that flame retardants are widely used in many airplane components and all airplane types, as expected. Most flame retardants, including TDCPP, were detected in 100% of dust samples collected from the airplanes. The concentrations of BDE 209 were elevated by orders of magnitude relative to residential and office environments.

Keywords: Flame retardants, Airplanes, Dust exposure, Hand-wipe samples

You can access and freely download the open source article at: http://www.environmentalhealthnews.org/ehs/news/2013/airliner-flame-retardants.

Free Course - Human Health and Global Environmental Change

One of the greatest challenges of our time is to address global environmental changes, such as climate change and biodiversity loss, that may harm the health of billions of people worldwide. This class will examine these changes, their causes, as well as their health consequences, and engage students in thinking about their solutions. Those who earn a passing grade will get a certificate of mastery from HarvardX.

Course instructors:
Aaron Bernstein, M.D., M.P.H., is the Associate Director of the Center for Health and the Global Environment at the Harvard School of Public Health and a pediatric hospitalist at Boston Children's Hospital.

John D. Spengler is the Director of the Center for Health and the Global Environment at the Harvard School of Public Health as well as the Akira Yamaguchi Professor of Environmental Health and Human Habitation.

The online course is free and should be worth all the effort to participate. Class starts May 15, 2013. You can register at:
https://www.edx.org/courses/HarvardX/PH278x/2013_Spring/about%20

Healthy Buildings 2015 Regional Conferences

In response to our Call for Proposal to organize the regional Healthy Buildings 2015, ISIAQ received two Letters of Interest: one from the American Industrial Hygiene Associates (US-based) and one from a conference management company in India. They were considered during the February BoD conference call. The BoD decided to reject both letters of interest.

In parallel to issuing the Call for Proposals a task group has been discussing the potential for organizing the next regional Healthy Buildings 2015 together with ASHRAE. Among the many ideas discussed was the possibility of organizing ASHRAE IAQ series together with the Healthy Buildings conferences; this has happened twice in the past. Although the concept has been considered to be attractive and the collaboration with ASHRAE a desirable one, ISIAQ BoD considered that for the interest of ISIAQ it is best to retain the Healthy Buildings brand name and the current format including the collection of membership fees through conference fees, as well as the strong influence during process of selecting the host and organization of the conference.

As a result a conference management consultant has been approached with the task to explore possible logistics of conference organization in North America. Numerous potential candidates have been identified to serve as Technical Chairperson and manage the scientific and technical aspects of the conference. One candidate has been contacted and expressed considerable interest.

In parallel the possibility of organizing regional Healthy Buildings 2015 in Europe has been discussed. Consequently the Dutch ISIAQ chapter leadership was approached. The Dutch have indicated their interest and are working on a brief proposal for consideration by the BoD. There are many merits to a European-focused HB2015 regional meeting and all of the activities within the EU that have connected the various member states of the EU.

Finally the discussions with ASHRAE have continued to find out whether they would be interested in sending in a proposal following the new concept.

As can be seen the current ISIAQ BoD has been considering different options and approaches to implement the new concept of regional Healthy Buildings conference starting in 2015; the new concept was approved by the BoD in 2009. It looks like the BoD has been successful in identifying potential organizers and the process of selecting the hosts of regional Healthy Buildings 2015 will soon come to a close. What is certain, and we can already now ensure our Members, is that regional Healthy Buildings conferences will take place in 2015 providing a meeting platform for our Members. We will see you there.

Indoor Air, Volume 23, Number 3 (June 2013)
Abstracts

Nicola Carslaw, Abigail Hathway, Louise Fletcher, Jacqueline Hamilton, Trevor Ingham and Catherine Noakes - Chemical versus biological contamination indoors: trade-offs versus win–win opportunities for improving indoor air quality

We recently held a workshop that brought together, perhaps for the first time, researchers in the fields of atmospheric and indoor air chemistry, infection control engineering, building physics, and environmental microbiology. As separate groups of scientists, we tend to focus on discipline-specific problems. Indoor air chemists are largely concerned with chemical reactions indoors and the resulting products and then trying to identify those that may be harmful to health. Members of the indoor biological community, on the other hand, are interested in airborne microorganisms and often work at the frontline of pathogen control. For instance, they may be trying to eliminate infectious agents from a hospital environment, where compromised immunities make some occupants much more susceptible to infection.

S. Weichenthal, G. Mallach, R. Kulka, A. Black, A. Wheeler, H. You, M. St-Jean, R. Kwiatkowski and D. Sharp - A randomized double-blind crossover study of indoor air filtration and acute changes in cardiorespiratory health in a First Nations community

Abstract Few studies have examined indoor air quality in First Nations communities and its impact on cardiorespiratory health. To address this need, we conducted a crossover study on a First Nations reserve in Manitoba, Canada, including 37 residents in 20 homes. Each home received an electrostatic air filter and a placebo filter for 1 week in random order, and lung function, blood pressure, and endothelial function measures were collected at the beginning and end of each week. Indoor air pollutants were monitored throughout the study period. Indoor $PM_{2.5}$ decreased substantially during air filter weeks relative to placebo (mean difference: 37 $\mu g/m^3$, 95% CI: 10, 64) but remained approximately five times greater than outdoor concentrations owing to a high prevalence of indoor smoking. On average, air filter use was associated with a 217-ml (95% CI: 23, 410) increase in forced expiratory volume in 1 s, a 7.9-mm Hg (95% CI: −17, 0.82) decrease in systolic blood pressure, and a 4.5-mm Hg (95% CI: −11, 2.4) decrease in diastolic blood pressure. Consistent inverse associations were also observed between indoor $PM_{2.5}$ and lung function. In general, our findings suggest that reducing indoor $PM_{2.5}$ may contribute to improved lung function in First Nations communities.

Practical Implication Indoor air quality is known to contribute to adverse cardiorespiratory health, but few studies have examined indoor air quality in First Nations communities. Our findings suggest that indoor $PM_{2.5}$ may contribute to reduced lung function and that portable air filters may help to alleviate these effects by effectively reducing indoor levels of particulate matter.

A. Polidori, P. M. Fine, V. White and P. S. Kwon - Pilot study of high-performance air filtration for classroom applications

Abstract A study was conducted to investigate the effectiveness of three air purification systems in reducing the exposure of children to air contaminants inside nine classrooms of three Southern California schools. Continuous and integrated measurements were conducted to monitor the indoor and outdoor concentrations of ultrafine particles (UFPs), fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}, respectively), black carbon (BC), and volatile organic compounds. An heating, ventilating, and air conditioning (HVAC)-based high-performance panel filter (HP-PF), a register-based air purifier (RS), and a stand-alone air cleaning system (SA) were tested alone and in different combinations for their ability to remove the monitored pollutants. The combination of a RS and a HP-PF was the most effective solution for lowering the indoor concentrations of BC, UFPs, and $PM_{2.5}$, with study average reductions between 87% and 96%. When using the HP-PF alone, reductions close to 90% were also achieved. In all cases, air quality conditions were improved substantially with respect to the corresponding baseline (preexisting) conditions. Data on the performance of the gas-absorbing media included in the RS and SA unit were inconclusive, and their effectiveness, lifetime, costs, and benefits must be further assessed before conclusions and recommendations can be made.

Practical Implication The installation of effective air filtration devices in classrooms may be an important mitigation measure to help reduce the exposure of school children to indoor pollutants of outdoor origin including ultrafine particles and diesel particulate matter, especially at schools located near highly trafficked freeways, refineries, and other important sources of air toxics.

M. C. McCarthy, J. F. Ludwig, S. G. Brown, D. L. Vaughn and P. T. Roberts - Filtration effectiveness of HVAC systems at near-roadway schools

Abstract Concern for the exposure of children attending schools located near busy roadways to toxic, traffic-related air pollutants has raised questions regarding the environmental benefits of advanced heating, ventilation, and air-conditioning (HVAC) filtration systems for near-road pollution. Levels of black carbon and gaseous pollutants were measured at three indoor classroom sites and at seven outdoor monitoring sites at Las Vegas schools. Initial HVAC filtration systems effected a 31–66% reduction in black carbon particle concentrations inside three schools compared with ambient air concentrations. After improved filtration systems were installed, black carbon particle concentrations were reduced by 74–97% inside three classrooms relative to ambient air concentrations. Average black carbon particle concentrations inside the schools with improved filtration systems were lower than typical ambient Las Vegas concentrations by 49–96%. Gaseous pollutants were higher indoors than outdoors. The higher indoor concentrations most likely originated at least partially from indoor sources, which were not targeted as part of this intervention.

Practical Implications Recent literature has demonstrated adverse health effects in subjects exposed to ambient air near major roadways. Current smart growth planning and infill development often require that buildings such as schools are built near major roadways. Improving the filtration systems of a school's HVAC system was shown to decrease children's exposure to near-roadway diesel particulate matter. However, reducing exposure to the gas-phase air toxics, which primarily originated from indoor sources, may require multiple filter passes on recirculated air.

L. Casas, C. Tischer, I. M. Wouters, M. Valkonen, U. Gehring, G. Doekes, M. Torrent, J. Pekkanen, R. Garcia-Esteban, A. Hyvärinen, J. Heinrich and J. Sunyer - Endotoxin, extracellular polysaccharides, and β(1-3)-glucan concentrations in dust and their determinants in four European birth cohorts: results from the HITEA project

Abstract Early-life exposure to microbial agents may play a protective role in asthma and allergies development. Geographical differences in the prevalence of these diseases exist, but the differences in early-life indoor microbial agent levels and their determinants have been hardly studied. We aimed to describe the early-life levels of endotoxin, extracellular polysaccharides (EPS), and β(1-3)-glucans in living room dust of four geographically spread European birth cohorts (LISA in Germany, PIAMA in the Netherlands, INMA in Spain, and LUKAS2 in Finland) and to assess their determinants. A total of 1572 dust samples from living rooms of participants were analyzed for endotoxin, Penicillium/Aspergillus EPS, and β(1-3)-glucans. Information on potential determinants was obtained through questionnaires. Concentrations of endotoxin, EPS, and β(1-3)-glucans were different across cohorts. Concentrations of endotoxin and EPS were respectively lower and higher in INMA than in other cohorts, while glucans were higher in LUKAS2. Season of sampling, dog ownership, dampness, and the number of people living at home were significantly associated with concentrations of at least one microbial agent, with heterogeneity of effect estimates of the determinants across cohorts. In conclusion, both early-life microbial exposure levels and exposure determinants differ across cohorts derived from diverse European countries.

Practical Implications This study adds evidence of variability in the levels of indoor endotoxin, extracellular polysaccharide, and β(1-3)-glucans across four geographically spread European regions. Furthermore, we observed heterogeneity across regions in the effect of exposure determinants. We hypothesize that the variations observed in our study may play a role in the differences in asthma and allergies prevalences across countries.

D. R. Ownby, E. L. Peterson, G. Wegienka, K. J. Woodcroft, C. Nicholas, E. Zoratti and C. C. Johnson - Are cats and dogs the major source of endotoxin in homes?

Abstract Previous studies have suggested that exposure to cats and dogs during early childhood reduces the risk of allergic disease, possibly by increasing home endotoxin exposure. This study asked the question of whether cats and dogs are the dominant influence on dust endotoxin concentrations in homes after considering other variables reportedly associated with endotoxin. The presence of cats or dogs in homes, household and home characteristics, and dust endotoxin concentrations from 5 locations were assessed in 966 urban and suburban homes. Whether considered together as pets or as cats and dogs separately, the presence of cats and dogs significantly contributed to living room and bedroom floor endotoxin concentrations, but not to bed endotoxin concentrations. However, the two variables consistently related to endotoxin in all home sites were the home occupant density (occupants/room) and cleanliness of the home. Our data suggest that reducing occupant density and improving home cleanliness would reduce home endotoxin concentrations more than removing pet cats or dogs from the home.

Ownby et al (*continued from previous page*)
Practical Implications Many studies have shown that early childhood exposure to indoor cats or dogs is associated with a reduced risk of later allergic disease and asthma. An important question is whether alteration in allergic risk associated with cat and dog exposure results from increased endotoxin exposure or from some other associated exposure. Our findings show that cats and dogs are not the dominant source of endotoxin in homes; rather, the density of human occupation and poor cleaning contribute more consistently to higher home endotoxin concentrations especially in the beds.

L. Ernstgård, D. Norbäck, T. Nordquist, G. Wieslander, R. Wålinder and G. Johanson - Acute effects of exposure to vapors of 3-methyl-1-butanol in humans

Abstract The secondary alcohol 3-methyl-1-butanol (3MB, isoamyl alcohol) is used, for example, as a solvent in a variety of applications and as a fragrance ingredient. It is also one of the microbial volatile organic compounds (MVOCs) found in indoor air. There are little data on acute effects. The aim of the study was to assess the acute effects of 3MB in humans. Thirty healthy volunteers (16 men and 14 women) were exposed in random order to 1 mg/m^3 3MB or clean air for 2 h at controlled conditions. Ratings with visual analogue scales revealed slightly increased perceptions of eye irritation ($P = 0.048$, Wilcoxon) and smell ($P < 0.0001$) compared with control exposure. The other ratings were not significantly affected (irritation in nose and throat, dyspnea, headache, fatigue, dizziness, nausea, and intoxication). No significant exposure-related effects were found in blinking frequency, tear film break-up time, vital staining of the eye, nasal lavage biomarkers, lung function, and nasal swelling. In conclusion, this study suggests that 3MB is not a causative factor for health effects in damp and moldy buildings.

Practical Implications 3-Methyl-1-butanol (3MB) is one of the most commonly reported MVOCs in damp and moldy buildings and in occupational settings related to agriculture and composting. Our study revealed no irritation effects at 1 mg/m^3, a concentration higher than typically found in damp and moldy buildings. Our study thus suggests that 3MB is not a causative factor for health effects in damp and moldy buildings.

T. van Hooff, B. Blocken and G. J. F. van Heijst - On the suitability of steady RANS CFD for forced mixing ventilation at transitional slot Reynolds numbers

Abstract Accurate prediction of ventilation flow is of primary importance for designing a healthy, comfortable, and energy-efficient indoor environment. Since the 1970s, the use of computational fluid dynamics (CFD) has increased tremendously, and nowadays, it is one of the primary methods to assess ventilation flow in buildings. The most commonly used numerical approach consists of solving the steady Reynolds-averaged Navier–Stokes (RANS) equations with a turbulence model to provide closure. This article presents a detailed validation study of steady RANS for isothermal forced mixing ventilation of a cubical enclosure driven by a transitional wall jet. The validation is performed using particle image velocimetry (PIV) measurements for slot Reynolds numbers of 1000 and 2500. Results obtained with the renormalization group (RNG) k-ε model, a low-Reynolds k-ε model, the shear stress transport (SST) k-ω model, and a Reynolds stress model (RSM) are compared with detailed experimental data. In general, the RNG k-ε model shows the weakest performance, whereas the low-Re k-ε model shows the best agreement with the measurements. In addition, the influence of the turbulence model on the predicted air exchange efficiency in the cubical enclosure is analyzed, indicating differences up to 44% for this particular case.

Practical Implications This article presents a detailed numerical study of isothermal forced mixing ventilation driven by a low-velocity (transitional) wall jet using steady computational fluid dynamics (CFD) simulations. It is shown that the numerically obtained room airflow patterns are highly dependent on the chosen turbulence model and large differences with experimentally obtained velocity fields can be present. The renormalization group (RNG) k-ε model, which is commonly used for room airflow modeling, shows the largest deviations from the measured velocities, indicating the care that must be taken when selecting a turbulence model for room airflow prediction. As a result of the different predictions of the flow pattern in the room, large differences are present between the predicted air exchange efficiency obtained with the four tested turbulence models, which can be as high as 44%.

A. K. Melikov, M. A. Skwarczynski, J. Kaczmarczyk and J. Zabecky - Use of personalized ventilation for improving health, comfort, and performance at high room temperature and humidity

Abstract The effect of personalized ventilation (PV) on people's health, comfort, and performance in a warm and humid environment (26 and 28°C at 70% relative humidity) was studied and compared with their responses in a comfortable environment (23°C and 40% relative humidity). Thirty subjects participated in five 4-h experiments in a climate chamber. Under the conditions with PV, the subjects were able to control the rate and direction of the supplied personalized flow of clean air. Subjective responses were collected through questionnaires. During all exposures, the subjects were occupied with tasks used to assess their performance. Objective measures of tear film stability, concentration of stress biomarkers in saliva, and eye blinking rate were taken. Using PV significantly improved the perceived air quality (PAQ) and thermal sensation and decreased the intensity of Sick Building Syndrome (SBS) symptoms to those prevailing in a comfortable room environment without PV. Self-estimated and objectively measured performance was improved. Increasing the temperature and relative humidity, but not the use of PV, significantly decreased tear film quality and the concentration of salivary alpha-amylase, indicating lower mental arousal and alertness. The use of PV improved tear film stability as compared to that in a warm environment without PV.

Practical Implications In practice, the supply of clean, cool, and less humid air by PV at each workstation will make it possible to raise room temperatures above the upper comfortable limit suggested in the present standards without adversely affecting the occupants' health [Sick Building Syndrome (SBS) symptoms], comfort (thermal and perceived air quality), and performance. This may lead to energy savings.

THIS SPACE IS AVAILABLE FOR **YOUR** NEWS IN THE NEXT ISSUE OF THE NEWSLETTER – TELL YOUR COLLEAGUES ABOUT ARTICLES YOU HAVE HAD PUBLISHED, GRANTS YOU HAVE RECEIVED, NATIONAL OR INTERNATIONAL NEWS OF INTEREST TO THE ISIAQ COMMUNITY. PLEASE SEND US YOUR NEWS ITEM, LESS THAN 300 WORDS IN LENGTH.

THANK YOU IN ADVANCE

About ISIAQ

With more than 800 members from more than 45 countries, ISIAQ is an international, independent, multidisciplinary, scientific, non-profit organization whose purpose is to support the creation of healthy, comfortable and productive indoor environments. We strongly believe this is achievable by advancing the science and technology of indoor air quality and climate as it relates to indoor environmental design, construction, operation and maintenance, air quality measurement and health sciences.

As a Society, our major role is to facilitate international and interdisciplinary communication and information exchange by publishing and fostering publication on indoor air quality and climate. We organize, sponsor and support initiatives such as meetings, conferences, and seminars on indoor air quality and climate; and we develop, adapt and maintain guidelines for the improvement of indoor air quality and climate.

ISIAQ's journal, *Indoor Air*, published six times per year, is the most respected and widely-cited source of scientific information relevant to building scientists and professionals. Our two major international conferences -- the Indoor Air 'xx and the Healthy Buildings 'xx conference series -- set the standard for high quality scientific information and its application to making healthy buildings. We also cooperate with government and other agencies and societies with interests in the indoor environment and climate.

To find out more about us, visit our website: http://isiaq.org

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Corporate Memberships are available

If your organization is involved in indoor air science, policy, or practice, a corporate membership in ISIAQ will place you in the limelight with the international indoor air community.

- ISIAQ reaches more than 45 countries around the world.
- ISIAQ's conferences, considered the most important in the field, have been attended by more than 4,000 individuals.
- The official Society journal, *Indoor Air*, is respected by scientists and policy-makers as the most reliable way to keep up with the latest scientific findings in the field.

To learn more about the benefits of corporate membership in ISIAQ, visit the membership page on our web site and click on the corporate membership link.

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