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President's Column

Message from ISIAQ President Richard Shaughnessy

December 23, 2011

On behalf of the entire Board of Directors of the Society, I offer Season Greetings to you and yours throughout the Holidays. The Society has grown to record membership numbers so we are optimistic that based on our ongoing activities and the quality and success of last year's Indoor Air event in Austin, that you will continue to recognize and reap the rewards of your membership. Our goal in representing the Society is to provide *tangible value* to your membership (and to your profession) through our outreach efforts, Indoor Air and Healthy Building Conferences, *Indoor Air* journal, Scientific Technical Committees, newsletters, and more.

We are very excited about the upcoming Healthy Buildings Conference planned for Brisbane, Australia this summer, 2012 and extend a warm welcome to all to attend what looks to be a very lively and engaging "down under" event.

The Board of Directors will be meeting for two days in January in a "Retreat" (we prefer to think of it as a "Forward"). The purpose of our meeting is to consider long term planning issues. In preparation for that meeting, we would like to solicit input from all of our members. Please consider the following questions and send your comments and suggestions to the Secretariat where your responses will be assembled and forwarded to the Board of Directors for their consideration.

-- What can be done to improve the quantity and quality of interdisciplinary science and professional indoor air activity?

-- What can be done to strengthen the role of science in governmental decisions about indoor air?

-- What can be done to make more building operators and occupants all over the world aware of the importance of indoor air quality to health and comfort?

-- What should be the major initiatives of ISIAQ in the coming decade?

Send your comments to the Secretariat at info@ISIAQ.org. Thanks in advance for your input.

Professor Yoon Shin Kim Replaces Professor Yuguo Li on ISIAQ's Board

ISIAQ's Board of Directors has appointed Professor Yoon Shin Kim to serve the remainder of Yuguo Li's term as ISIAQ's Vice President for Research. Professor Li was elected Secretary of ISIAQ's Academy of Fellows at the Academy meeting in Austin. Professor Li will continue to serve as Chair of the STC Council

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Prof. Kim appointed to ISIAQ Board of Directors (*continued from Page 1*)

ISIAQ Vice President (Research) Yoon Shin Kim

Kim is presently a professor of environmental health and air pollution at Hanyang University, College of Medicine, Seoul, Korea since 1986. He holds two doctoral degrees of Doctor of Health Sciences in Human Ecology from University of Tokyo, Tokyo, Japan (1978) and Ph.D. in Environmental Sciences from the University of Texas School of Public Health, Houston, Texas, USA (1985).

Professor Kim's research interest is attempting more specifically to identify exposure assessment for chemical and physical characteristics of those indoor and outdoor air pollutants responsible for examining possible adverse health effects. Currently he has been involving in the Korea Ministry of Environment Project to assess the possible health impacts of indoor air pollution in buildings related to climate change phenomena. He published more 200 papers and seven books (including co-authors) in various fields. He has initiated indoor air and environmental health programs in Korea for Korean academia, governments, and industrial settings since the late 1980. Thus he contributed to setting many Korea regulations and standards of outdoor and indoor air pollution. He has been working as Co-Chairman of the Inter-Governmental Committee on Asbestos Control Policy in Korea since 2006.

He has served as an international scientific committee member in many international conferences on indoor air seminars including HB2009 (2009) and ROOMVENT (2009) and has served as an organizing committee member in many international conferences and symposiums including the 1st Korea-US Governmental Environmental Symposium (1987), Int. Symposium on RA-RM (1988-90), World Air Congress- IUAPPA (1999), Annual Int. Seminar on IAQ by the Korea Air Cleaning Association (since 2000), the 1st Asian Forum on Indoor Air Quality (2007), World Conference on Building Management (2009), and ISES-ISEE (2010) on indoor /outdoor air, environmental health, and risk assessment during last 25 years in Korea.

He has served many domestic and foreign professional activities, such as, a Honorary President (now), Founder and Former President of the Korean Society of Indoor Environment (KOSIE/www.kosie.or.kr), and Former President of the Korean Society of Atmospheric Environment (KOSAE), Senior Advisor, Korea Aerosol Society (2004-present) and Korea Society for Health Information and Statistics (2004-present), Vice President of the Korean Environmental Health Association (1989-2003), International Councilor Member of the International Society of Exposure Analysis (1991-2004), Advisory Member of WHO International EMF Project (1996-2000), WHO International Radon Project (2007-2008), and many other memberships. Prof. Kim has been a member of ISIAQ and has attended the Indoor Air 'xx conference series since 1984 (Stockholm). Also he is a Fellow of the ISIAQ Academy of Fellows since 2011.

He was awarded a Prominent Academia-Industry Professorship from Hanyang University (2010, 2011), a Korea Government Order (2008) from the Korea Ministry of Environment (KMOE), Achievement Award from the Korea Ministry of Education and Science (KMOES), International Environmental Award (2006) from Joint Newspapers of Chosun (Korea) and Mainichi (Japan), Presidential Award (2003) on contribution to Environmental Conservation from the KMOE and a Seoul Mayor Award (2002) on contribution to Air Environmental Technology from the Seoul Metropolitan Government.

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Abstracts

Richard Corsi - Let's celebrate our accomplishments and harness the power of our diversity

'It is not our differences that divide us. It is our inability to recognize, accept, and celebrate those differences'. Audre Lorde (1934–1992).

Although Lorde did not have indoor air quality (or environmental) scientists in mind when she penned those words, it behooves us to recognize, accept, and celebrate our differences. What fuels our community is that we are not a monolith. We are engineers, epidemiologists, biologists, chemists, medical doctors, sociologists, toxicologists, physicists, policy makers, industrial hygienists, and more. We gain from multidisciplinary collaboration such that our whole is greater than the sum of our parts. We do research grounded in fundamental scientific principles. But we also mine past data to empirically determine trends and associations, e.g., between environmental stressors and health effects. We identify health and comfort problems caused by inadequate indoor environments, assess the physical, chemical, and biological root causes of those problems, engineer solutions, and help to derive policies that positively affect lives.

Y. Li and P. V. Nielsen - CFD and ventilation research

Abstract There has been a rapid growth of scientific literature on the application of computational fluid dynamics (CFD) in the research of ventilation and indoor air science. With a 1000–10,000 times increase in computer hardware capability in the past 20 years, CFD has become an integral part of scientific research and engineering development of complex air distribution and ventilation systems in buildings. This review discusses the major and specific challenges of CFD in terms of turbulence modelling, numerical approximation, and boundary conditions relevant to building ventilation. We emphasize the growing need for CFD verification and validation, suggest ongoing needs for analytical and experimental methods to support the numerical solutions, and discuss the growing capacity of CFD in opening up new research areas. We suggest that CFD has not become a replacement for experiment and theoretical analysis in ventilation research, rather it has become an increasingly important partner.

Practical Implications We believe that an effective scientific approach for ventilation studies is still to combine experiments, theory, and CFD. We argue that CFD verification and validation are becoming more crucial than ever as more complex ventilation problems are solved. It is anticipated that ventilation problems at the city scale will be tackled by CFD in the next 10 years.

G. Smedje, M. Mattsson and R. Wålinder - Comparing mixing and displacement ventilation in classrooms: pupils' perception and health

Abstract Several studies have found that indoor air quality (IAQ) in schools is often poor and may affect the health of the pupils. Building ventilation is a means to reduce pollutants indoors, but different designs should be evaluated for their effectiveness in different environments. In a field experiment performed at four classrooms in one school building, air was supplied either in the mixing or in the displacement mode, and we collected information on exposures, pupils' perception of IAQ and climate, and health symptoms and performed clinical examinations. The room temperature, relative humidity, concentration of CO_2, and cat allergen were measured at the breathing height and were similar during each ventilation mode. The children perceived IAQ were similar in the two ventilation regimes, and there were few differences in symptom reports or clinical parameters. However, the pupils reported more eye symptoms during displacement ventilation.

Practical Implications Both mixing and displacement ventilation may be appropriate in school classrooms as long as the overall design, ventilation rates, and maintenance of systems are satisfactory.

X. Zhang, Z. Zhao, T. Nordquist and D. Norback - The prevalence and incidence of sick building syndrome in Chinese pupils in relation to the school environment: a two-year follow-up study

Abstract There are few incidence studies on sick building syndrome (SBS). We studied two-year change of SBS in Chinese pupils in relation to parental asthma/allergy (heredity), own atopy, classroom temperature, relative humidity (RH), absolute humidity (AH), crowdedness, CO_2, NO_2, and SO_2. A total of 1993 participated at baseline, and 1143 stayed in the same classrooms after two years. The prevalence of mucosal and general symptoms was 33% and 28% at baseline and increased during follow-up ($P < 0.001$). Twenty-seven percent reported at least one symptom improved when away from school. Heredity and own atopy were predictors of SBS at baseline and incidence of SBS. At baseline, SO_2 was associated with general symptoms (OR = 1.10 per 100 μg/m^3), mucosal symptoms (OR = 1.12 per 100 μg/m^3), and skin symptoms (OR = 1.16 per 100 μg/m^3). NO_2 was associated with mucosal symptoms (OR = 1.13 per 10 μg/m^3), and symptoms improved when away from school (OR = 1.13 per 10 μg/m^3). Temperature, RH, AH, and CO_2 were negatively associated with prevalence of SBS. Incidence or remission of SBS was not related to any exposure, except a negative association between SO_2 and new skin symptoms. In conclusion, heredity and atopy are related to incidence and prevalence of SBS, but the role of the measured exposures for SBS is more unclear.

Practical Implications We found high levels of CO_2 indicating inadequate ventilation and high levels of SO_2 and NO_2, both indoors and outdoors. All schools had natural ventilation, only. Relying on window opening as a tool for ventilation in China is difficult because increased ventilation will decrease the level of CO_2 but increase the level of NO_2 and SO_2 indoors. Prevalence studies of sick building syndrome (SBS) might not be conclusive for causal relationships, and more longitudinal studies on SBS are needed both in China and other parts of the world. The concept of mechanical ventilation and air filtration should be introduced in the schools, and when planning new schools, locations close to heavily trafficked roads should be avoided.

B.-F. Hwang, I.-P. Liu and T.-P. Huang - Molds, parental atopy and pediatric incident asthma

Abstract To assess the independent and joint effects of parental atopy and exposure to molds on the development of asthma in childhood, the authors conducted a cohort-based, incident case–control study in 2008. The case group consisted of 188 children with new asthma, and the control group (n = 376) was matched one to two for age and sex. The outcome of interest was the development of asthma during the study period. The studied determinants were parental atopy and three indicators of exposure including histories of water damage, presence of visible molds, and perceived mold odor in the home at baseline in 2002. In conditional logistic regression adjusting for confounding, parental atopy [adjusted odds ratio (aOR) 3.29, 95% CI 2.19–4.94] and the presence of mold odor (aOR 2.09, 95% CI 1.30–3.37) and visible mold (aOR 1.76, 95% CI 1.18–2.62) were independent determinants of incident asthma, and apparent interaction in additive scale was observed. Our finding suggests that the interaction between parental atopy and molds may play a role in the development of asthma in children.

Practical Implications Our study strengthens the evidence for the roles of indoor dampness problem and parental atopy as determinants of asthma in children. Furthermore, the interaction between parental atopy and exposure to molds suggests a role for the development of childhood asthma, i.e., the children whose parents had atopic disease and molds exposure are more susceptible to develop asthma.

J. Baumgartner, J. J. Schauer, M. Ezzati, L. Lu, C. Cheng, J. Patz and L. E. Bautista - Patterns and predictors of personal exposure to indoor air pollution from biomass combustion among women and children in rural China

Abstract Indoor air pollution (IAP) from domestic biomass combustion is an important health risk factor, yet direct measurements of personal IAP exposure are scarce. We measured 24-h integrated gravimetric exposure to particles <2.5 μm in aerodynamic diameter (particulate matter, $PM_{2.5}$) in 280 adult women and 240 children in rural Yunnan, China. We also measured indoor $PM_{2.5}$ concentrations in a random sample of 44 kitchens. The geometric mean winter $PM_{2.5}$ exposure among adult women was twice that of summer exposure [117 μg/m^3 (95% CI: 107, 128) vs. 55 μg/m^3 (95% CI: 49, 62)]. Children's geometric mean exposure in summer was 53 μg/m^3 (95% CI: 46,

61). Indoor $PM_{2.5}$ concentrations were moderately correlated with women's personal exposure (r = 0.58), but not for children. Ventilation during cooking, cookstove maintenance, and kitchen structure were significant predictors of personal $PM_{2.5}$ exposure among women primarily cooking with biomass. These findings can be used to develop exposure assessment models for future epidemiologic research and inform interventions and policies aimed at reducing IAP exposure.

Practical Implications Our results suggest that reducing overall PM pollution exposure in this population may be best achieved by reducing winter exposure. Behavioral interventions such as increasing ventilation during cooking or encouraging stove cleaning and maintenance may help achieve these reductions.

A. Cattaneo, C. Peruzzo, G. Garramone, P. Urso, R. Ruggeri, P. Carrer and D. M. Cavallo - Airborne particulate matter and gaseous air pollutants in residential structures in Lodi province, Italy

Abstract The province of Lodi is located in northern Italy on the Po River plain, where high background levels of air pollutants are prevalent. Lodi province is characterized by intensive agriculture, notably animal husbandry. This paper assesses indoor levels of selected airborne pollutants in 60 homes in the province, with special attention to size-fractionated particulate matter (PM). Indoor $PM_{2.5}$ concentrations are frequently higher than current guidelines. PM_{10} and nitrogen dioxide also exceed the respective guideline recommendations in some cases, noting that 24-h nitrogen dioxide levels were compared with an annual limit value. All other studied pollutant levels are below current international guidelines. Among indoor PM size fractions, $PM_{0.5}$ is predominant in terms of mass concentrations corresponding to 57% of PM_{10} in summer and 71% in winter. A strong seasonal trend is observed for all studied pollutants, with higher levels in winter corresponding to changes in ambient concentrations. The seasonal variation in PM_{10} is largely due to $PM_{0.5}$ increase from summer to winter. Summer indoor PM levels are mainly from indoor-generated particles, while particles of outdoor origin represent the main contribution to winter indoor PM levels. On average, indoor concentrations of coarse PM are mostly constituted by indoor-generated particles.

Practical Implications This study presents a comparison between measured indoor concentrations in the study area and indoor air quality guideline criteria. Accordingly, particulate matter (PM) and NO_2 are identified as key pollutants that may pose health concerns. It is also found that indoor PM in residential units is mainly constituted by particles with aerodynamic diameters <0.5 μm, especially in winter. Risk mitigation strategies should be focused on the reduction in indoor levels of NO_2 and ultrafine and fine particles, both infiltrated from outdoors and generated by indoor sources.

I. Masuck, C. Hutzler, O. Jann and A. Luch - Inhalation exposure of children to fragrances present in scented toys

Abstract When utilized in the perfuming of children's toys, fragrances capable of inducing contact allergy in human skin may also become bioavailable to children via the inhalation route. The aim of this study was to determine the area-specific emission rates of 24 fragrances from a plasticized PVC reference material that was meant to mimic a real plastic toy. This material was introduced into an emission chamber for 28 days at handling conditions or at worst-case conditions. As a result, fragrances can be separated into three categories according to their emission rates ranging from 0.0041 to 16.2 $mg/m^2 \times h$, i.e., highly volatile, semivolatile, and low-volatile compounds. Compounds of the first and second categories were monitored with decreasing emission rates. Substances of the third category were detected with increasing emission rates over time. Further, higher temperatures led to higher emission rates. The emission concentration of fragrances from four real scented toys varied between 1.10 and 107 $\mu g/m^3$ at day 1 in the test chamber. Therefore, short-term inhalation exposure to fragrances originating from toys was in the range of 0.53–2700 ng/kg BW/d for the children of age 1 and older. Long-term exposure to these fragrances was calculated in the range of 2.2–220 ng/kg BW/d.

Practical Implications Besides household products and cosmetics, fragrances can be found in toys for children. Some fragrances are known contact allergens in the skin, but there is a lack of information on their effects in the human respiratory tract. Here, we analyzed and categorized fragrances present in a plasticized PVC reference

material according to their emission profiles and volatility. We also demonstrate that volatile fragrances are being emitted from real toys and thus may get inhaled under consumer conditions to different extents.

W. A. Esposito, G. L. Chew, J. C. Correa, S. N. Chillrud, R. L. Miller and P. L. Kinney - Quantitative measurement of airborne cockroach allergen in New York City apartments

Abstract We designed and tested a sampling and analysis system for quantitative measurement of airborne cockroach allergen with sufficient sensitivity for residential exposure assessment. Integrated 1-week airborne particle samples were collected at 10–15 LPM in 19 New York City apartments in which an asthmatic child who was allergic to cockroach allergen resided. Four simultaneous air samples were collected in each home: at heights of 0.3 and 1 m in the child's bedroom and in the kitchen. Extracts of air samples were analyzed by ELISA for the cockroach allergen Bla g2, modified by amplifying the colorimetric signal generated via use of AMPLI-Q detection system (DAKO Corporation, Carpinteria, CA, USA). Settled dust samples were quantified by conventional ELISA. Of the homes where cockroach allergen was detected in settled dust, Bla g2 also was detected in 87% and 93% of air samples in the bedroom and kitchen, respectively. Airborne Bla g2 levels were highly correlated within and between the bedroom and kitchen locations ($P < 0.001$). Expressed as picogram per cubic meter, the room average geometric mean for Bla g2 concentrations was 1.9 pg/m^3 (95% CI 0.63, 4.57) and 3.8 pg/m^3 (95% CI 1.35, 9.25) in bedrooms and kitchens, respectively. This method offers an attractive supplement to settled dust sampling for cockroach allergen exposure health studies.

Practical Implications Until now, cockroach allergen exposures have usually been assessed by collection and analysis of settled dust, on the assumption that airborne cockroach allergen cannot be reliably measured. In this study, a sensitive and quantitative method for measuring indoor airborne exposures to cockroach allergens involving a 7-day integrated total suspended particulate (TSP) sample collected at approximately 10–15 l/min was developed. Investigators are now empowered with an alternative exposure assessment method to supplement their studies and the understanding of allergen aerodynamics in the homes of children with asthma. We report airborne cockroach allergen in apartments, suggesting an ongoing burden of inhalation exposure.

N. Yamamoto, D. G. Shendell and J. Peccia - Assessing allergenic fungi in house dust by floor wipe sampling and quantitative PCR

Abstract In the present study, we modified an existing surface wipe sampling method for lead and other heavy metals to create a protocol to collect fungi in floor dust followed by real-time quantitative PCR (qPCR)-based detection. We desired minimal inconvenience for participants in residential indoor environmental quality and health studies. Accuracy, precision, and method detection limits (MDLs) were investigated. Overall, MDLs ranged from 0.6 to 25 cell/cm^2 on sampled floors. Overall measurement precisions expressed as the coefficient of variation because of sample processing and qPCR ranged 6–63%. Median and maximum fungal concentrations in house dust in study homes in Visalia, Tulare County, California, were 110 and 2500 cell/cm^2, respectively, with universal fungal primers (allergenic and nonallergenic species). The field study indicated samplings in multiple seasons were necessary to characterize representative whole-year fungal concentrations in residential microenvironments. This was because significant temporal variations were observed within study homes. Combined field and laboratory results suggested this modified new wipe sampling method, in conjunction with growth-independent qPCR, shows potential to improve human exposure and health studies for fungal pathogens and allergens in dust in homes of susceptible, vulnerable population subgroups.

Practical Implications Fungi are ubiquitous in indoor and outdoor environments, and many fungi are known to cause allergic reactions and exacerbate asthma attacks. This study established—by modifying an existing—a wipe sampling method to collect fungi in floor dust followed by real-time quantitative PCR (qPCR)-based detection methodologies. Results from this combined laboratory and field assessment suggested the methodology's potential to inform larger human exposure studies for fungal pathogens and allergens in house dust as well as epidemiologic studies of children with asthma and older adults with chronic respiratory diseases.

About ISIAQ

With more than 900 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 40 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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