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0622_P1-2

Association between ambient air pollution and otitis media in children

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Background/Aim
Many epidemiological studies are reporting positive association between ambient air pollution exposure and otitis media occurrence in children. In this study, we analysed nationally representative cohort data to evaluate the association between daily concentration of ambient air pollutants and the otitis media hospital visits among children under age 1 in six metropolitan cities of the Republic of Korea.

Methods
We used National Health Insurance Service-National Sample Cohort and analysed hospital use data of 34,503 babies until they become age 1. We divided study participants into six metropolitan cities and linked daily hospital use data to daily city level air pollution data [nitrogen dioxide (NO2), sulfur dioxide (SO2), carbon monoxide (CO), ozone (O3), and particulate matter < 10μg/m3 (PM10)]. Time-series analysis using the Poisson generalized additive model were conducted in each metropolitan city and we meta-analysed the time-series analysis results using the random effect model.

Results
There were total 5,119 otitis media hospital visits. A 10 ppb increase of O3 on lag day 3 was significantly associated with an increased risk of otitis media hospital visits [relative risk (RR), 95% confidence interval (CI): l.053, 1.005-1.103]. A 10ug/m3 increase in PM10 on lag day 0 and 2 was significantly associated with an increased risk of otitis media hospital visits [RR, 95% CI: lag 0: l.015, 1.003-1.028; lag 2: 1.017, 1.00-1.027].

Conclusions
Otitis media hospital visits of children were associated with ambient air pollution exposure. Among diverse air pollutants, O3 and PM10 were most significantly associated with otitis media hospital visits.

0622_P1-4

Indoor office environment and fractional exhaled nitric oxide (FeNO): A cross-sectional study among office workers in an academic institution, Malaysia

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Background/Aim
Although there is a number of research studied on indoor office environment and respiratory health among office workers, not much research studied on associations between indoor environment and lower airway inflammation among office workers, especially in tropical country. Fractional exhaled nitric oxide (FeNO) is known as a non-invasive biomarker of T-helper cell type 2-driven inflammation at the lower airways. In this study, we evaluated the relationships between indoor office environment and FeNO level among office workers.

Methods
A cross-sectional study of 460 office workers was carried out in an academic institution in Malaysia. Fractional exhaled nitric oxide (FeNO) was measured using a portable electrochemical detection device. Indoor room temperature and relative air humidity (RH) were measured in the offices. Dust in office was vacuumed on ALK filters, which were then sieved and weighted at the laboratory.

Results
The geometric mean of FeNO in the office workers was 15.9 ppb and the median levels of temperature, relative air humidity and amount of sieved dust in the offices were 23.9°C, 57.1% and 0.95g. Two-level logistic regression with adjustments for personal factors (age, gender, atopy, smoking status, indoor home painting and indoor home dampness), showed elevated FeNO level in the office workers was positively associated with the amount of sieved dust (adjusted OR=2.12, 95% CI=1.05-4.30, per gram) in the office. Similar trend of associations was found after adjusted for indoor office temperature (adjusted OR=2.02, 95% CI=1.04-3.92, per 1°C) and indoor office relative air humidity (adjusted OR=2.19, 95% CI=1.07–4.48, per 10%) in each model.

Conclusions
In conclusion, amount of settled dust in an office environment was a risk factor associated with FeNO level among office workers in this sutdy despite relatively low levels of dust measured in office environment.

0622_P1-6

Association between Outdoor Air Pollutants and Dry Eye Symptoms in Taiwan

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Background
With the development of economy and the impact of human activities, the problem of air pollution has become more severe than ever. Exposure to air pollutants is harmful to many organs of the body, especially the eyes that have direct contact with air pollutants. The symptoms of eye irritation by air pollutants are similar to that of dry eye disease, which is prevalent among the general public. The purpose of this research is to examine the association between air pollutants and dry eye symptoms in Taiwan.

Methods
The research is a case-crossover study. The research, based on the Longitudinal National Health Insurance Database from 2004 to 2013, selected patients diagnosed with dry eye disease, and combined with the air quality monitoring data provided by the Environmental Protection Administration. Considering the lag effect of air pollution, we used univariate and multivariate conditional logistic regression models for the data stratified by sex and age to estimate the risk of dry eye symptoms in different lag days.

Results
All air pollutants and humidity were significantly associated with dry eye symptoms in single-pollutant models. In multi-pollutant models, a 1-ppm increment in carbon monoxide concentration was significantly associated with dry eye symptoms (95% confidence interval: 1.11-1.28), and a 10-ppb increment in nitrogen dioxide concentration was significantly associated with dry eye symptoms (95% confidence interval: 1.05-1.11), and a 10% increase in humidity was negatively associated with dry eye symptoms (95% confidence interval: 0.90-0.93).

Conclusions
Our study suggests that higher concentrations of carbon monoxide and nitrogen dioxide, and lower humidity favour the occurrence of dry eye symptoms in the Taiwanese population. People should pay attention to air pollution to lower the risk of dry eye symptoms.

Keywords: Air pollutants, Dry eye symptoms, Case-crossover

0622_P1-7

The Association between $PM_{2.5}$ and Heart Rate Variability in Japan

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Background/Aim

It has been reported that a reduction of heart rate variability (HRV) is related to increased risk of cardiovascular mortality and morbidity. The previous studies suggest an inverse association between HRV and air pollution. However, they were performed in relatively small study population and only a few analysed the effect modification by sex and age. We examined the association between HRV and fine particulate matter ($PM_{2.5}$) among large population in Tokyo and Nagoya from April 2010 to March 2013. Stratified analyses by sex and age were also performed.

Methods

A total of 60,674 records of 24-hour HRV for patients aged 20-90 years old obtained from the clinics in both cities, were included in this analysis. Air pollution data were obtained from the National Institute for Environmental Studies. Linear regression was applied to examine the association of daily concentration of $PM_{2.5}$ and HRV indices [e.g., standard deviation of normal-to-normal (SDNN), SD of the average NN internals calculated over short periods (SDANN) and ultra-low frequency (ULF)]. The model was adjusted for temperature and relative humidity. We examined the lagged association (single and moving average) up to 72 hours. Parameters of HRV indices were presented as percentage change in HRV for each 1SD increase of $PM_{2.5}$. Effect modification was examined by stratified analyses of sex (male/female) and age groups of 10-year increments.

Results

Average $PM_{2.5}$ concentration in Nagoya is 16.6 $\mu g/m^3$ and in Tokyo is 14.7$\mu g/m^3$. Significant decreases in SDNN (0.56%; 95% CI: 0.14-0.97%), SDANN (0.59%; 95%CI: 0.12-1.06%) and ULF (1.17%; 95%CI: 0.26-2.07%) were associated with 1SD (8 $\mu g/m^3$) increment in 24-hr $PM_{2.5}$ in Tokyo, but not in Nagoya. The most significant changes in HRV indices were observed in female and elderly aged 60-69 years old, with some associations still apparent up to 72 hours.

Conclusions

Our study indicates that $PM_{2.5}$ exposure contributes to decreased HRV.

0622_P1-8

The association between indoor $PM_{2.5}$ and oxygen saturation among elderly in Hong Kong

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Background/Aim
Ageing population has become a remarkable demographic challenge in Hong Kong. In 2017, there were 1,221,300 old people who aged 65 or above, which accounted for 16.5% of Hong Kong population. Owing to the declined immune function and physical ability, old people were more susceptible to health effects associated with environmental exposure, particularly indoor air pollution. However, past studies on the effects of $PM_{2.5}$ on oxygen saturation (SpO_2) among elderly groups have produced inconsistent results. To address the research gap, the objective of this study was to examine the association between indoor $PM_{2.5}$ at home and the SpO_2 of healthy elderly in Hong Kong.

Methods
With a panel study design, real-time indoor $PM_{2.5}$ and SpO_2 of 19 healthy elderly were continuously measured for 2-4 days. 15-minute averages of $PM_{2.5}$ and SpO_2 were determined. Linear mixed-effects model was used to assess the association between $PM_{2.5}$ and SpO_2 by controlling the temperature, relative humidity and time-varying factors.

Results
Short-term exposure of $PM_{2.5}$ was negatively associated with acute changes in SpO_2. 0.0082% decrease of SpO_2 was significantly associated with 1 μg m^{-3} increase in 15-min average of indoor $PM_{2.5}$ (95% CI: 0.0156 to 0.0009; $p<0.05$). Most of the adverse effects occurred within two hours after $PM_{2.5}$ exposure. SpO_2 was found to be significantly associated with 15-min, 1-hour and 2-hour lagged $PM_{2.5}$ exposure. The estimated effect was stronger at lag 15-min than at lag 1-hour and 2-hour, in which 1 μg m^{-3} increase in the 15-min lagged indoor $PM_{2.5}$ exposure was associated with 0.0127% decrease in SpO_2 (95% CI: 0.0208 to 0.0047; $p<0.01$).

Conclusions
Increased $PM_{2.5}$ concentration is associated with immediate decrease in SpO_2 generally within two hours. Such an acute effect of $PM_{2.5}$ may contribute to increased potential particulate-related pulmonary vascular and/or inflammatory changes, which has public health significance on improving the indoor air quality.

0622_P1-10

Short- and Intermediate-Term Exposure to NO_2 and Mortality in 42 Chinese Counties

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Background/Aim: NO_2 is a well-established traffic emissions tracer and has been associated with many adverse health effects, including mortality. Biomarker studies have provided plausibility for different biological pathways of traffic-related air pollution at different timescales, but the impact of monthly traffic exposures on mortality has not been studied.

Methods: We obtained daily NO_2 and mortality data from 42 counties in China from 2013 to 2015. We employed county-specific Poisson regression models to investigate the relationship between daily and monthly NO_2 exposure and non-accidental, cardiovascular, and respiratory mortality, controlling for temperature, relative humidity, and long-term and seasonal trends. We then combined county-specific estimates using a random-effects meta-analysis. We further explored associations stratified by sex and assessed the sensitivity of our results to adjustment for fine particulate matter ($PM_{2.5}$).

Results: We observed a 0.43% (95%CI: 0.20, 0.66%), a 0.47% (95%CI: 0.13, 0.82%), and a 0.35% (95%CI: -0.08, 0.79%) increase in non-accidental, cardiovascular, and respiratory mortality respectively per 10 $\mu g/m^3$ increase in daily NO_2. In comparison, we observed a 2.95% (95%CI: 2.11, 3.79%), a 2.30% (95%CI: 1.26, 3.34%), and a 5.06% (95%CI: 3.05, 7.11%) increase in non-accidental, circulatory, and respiratory mortality respectively per 10 $\mu g/m^3$ increase in monthly NO_2. In the sex-stratified analysis, associations between NO_2 and mortality were larger, albeit not always significantly, in females than in males. Adjusting for $PM_{2.5}$ resulted in slightly attenuated effect estimates for daily NO_2, while effect estimates for monthly NO_2 did not change.

Conclusions: We observed higher effect estimates of intermediate-term NO_2 exposure on mortality compared to that of the short-term. Furthermore, females may be more vulnerable to the effects of NO_2 and traffic than males. As car usage continues to increase in urban areas of China, NO_2 reduction remains one of China's top priorities in the current thirteenth Five-Year Plan and the next several years.

Combined effect of prenatal exposure to PM2.5 and secondhand smoke on early neurodevelopment considering modification of GSTM1/GSTT1 polymorphism

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Background/Aim
Neurodevelopment of infants have been associated with exposure to secondhand smoke (SHS) and air pollution (AP), respectively. There have been very few previous studies of combined effect of prenatal AP and SHS exposure on early neurodevelopment. We aim to investigate the combined effect of prenatal AP and SHS exposure on neurodevelopment of infants.

Methods
We analyzed mothers and their offspring from Korean multicenter birth cohort study: Mothers and Children Environmental Health (MOCEH). We measured maternal urinary cotinine to represent SHS exposure during pregnancy. $PM_{2.5}$ (particulate matter<2.5μm in diameter) level during the entire pregnancy was modelled using the Community Multiscale Air Quality Modeling. The exposure estimations of PM2.5 of each subject were assigned in district level. Infant's mental developmental index (MDI) and psychomotor developmental index (PDI) were measured using the Bayley Scales of Infant Development at 6, 12, 24, and 36 months of age. The association between combined exposure of AP and SHS and neurodevelopment was investigated using general linear model.

Results
We found that 10 μg/m3 increase in PM2.5 was associated with a significant decrease of neurodevelopment at 6 months of age, -2.07 (95% confidence interval (CI): -3.30,-0.83) in MDI and -4.00 (95% CI: -5.49, -2.52) in PDI, respectively. The negative effect of PM2.5 was more pronounced in children whose mothers with both Glutathione S-transferases mu 1 (GSTM1) and theta 1 (GSTT1) null type, MDI [β= -3.04, 95%CI: -5.18, -0.90] and PDI [β= -4.86, 95% CI: -7.31, -2.41].

Conclusions
These findings suggest that maternal exposure to $PM_{2.5}$ during pregnancy may result in delayed neurodevelopment in early childhood along with co-exposure to SHS. The effect might be modified by genetic polymorphism.

Keywords (<5 words)
Prenatal exposure, PM2.5, Secondhand smoke, Neurodevelopment, GSTM1/GSTT1

0622_P1-12

Air pollution and children's neurodevelopment in children

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Background/Aim
Tentative conclusions of three recent systematic reviews show that the influence of air pollution has over neurodevelopment cannot be ignored and also classify the evidence for air pollutants as “moderate. We reviewed studies of ambient air pollution and neurodevelopment and particularly the association between prenatal exposure to particulates of less than 10 μm in diameter (PM10) and nitrogen dioxide (NO2) and Bayley test in children during the 24 months of Korean study.

Methods
In this review, we included studies only on ambient air pollution, and also included studies on several cognitive functioning results in adverse global intelligence quotient (IQ). In Korean birth cohort study, average exposure levels to PM10 and NO2 during the entire pregnancy were estimated using the inverse distance weighting (IDW) method. A total of 520 mother-child pairs who completed neurodevelopmental assessments using the Korean Bayley Scale of Infant Development II (K-BSID-II) more than once at ages of 6, 12 and 24 months were included

Results
Exposure to pollutants can negatively influence neurodevelopment of children, can be associated with the decrease in cognitive test outcomes such as global intelligence quotient (IQ). In a Korean birth cohort study, prenatal air pollution exposure had significant effects on MDI(Mental Development Index) and PDI(Psychomotor Development Index) at 6 months, but no significant association was found at 12 and 24 months of age.

Conclusions
The findings suggest that exposure to air pollution may result in delayed neurodevelopment in early childhood. The potential cellular mechanisms known to be responsible for CNS damage are neuroinflammation, oxidative stress, glial activation, and white matter injury.

0622_P1-14

Land use regression models for $PM_{2.5}$ based on ground-based and remote sensing estimates

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Background/Aim
Land use regression (LUR) models can be improved using remote sensing (RS) data; however, satellite data supplemented with fine-resolution land use is required. Moreover, the suitability of such applications is unclear in Asian countries. Therefore, we aimed to evaluate the predictability of LUR models for $PM_{2.5}$ based on ground-based monitoring data and RS estimates data in an urban area.
Methods
We selected Osaka and Hyogo prefecture (Japan) as the study area. We first built a ground-based model based on monitoring data obtained from all sites (LUR-All), and models based on data obtained from background sites (LUR-BS). We then entered the RS estimated $PM_{2.5}$ into the LUR-ALL and LUR-BS model, respectively. The predicted $PM_{2.5}$ concentrations from each model were compared with measured annual average $PM_{2.5}$ concentrations. We selected Suita city for visual evaluation in urban area. The RS estimated $PM_{2.5}$ data of 2013 (Surface $PM_{2.5}$ Global Estimates (V4.GL.02) 0.01° × 0.01°) was obtained from Atmospheric Composition Analysis Group.
Results
The mean concentrations of measured $PM_{2.5}$ and RS estimated $PM_{2.5}$ at the location of 105 monitoring stations were 15.9 (SD: 2.2) and 13.4 (0.6) $\mu g/m^{3,}$, and the correlation coefficient was 0.22. The LUR-All and LUR-BS models both predicted $PM_{2.5}$ moderately well: adjusted R^2 = 0.45 and 0.42, respectively, and root mean square error (RMSE) = 1.6 and 1.6 $\mu g/m^3$, respectively. When we included the RR estimated $PM_{2.5}$ data into each model, the R^2 (RMSE) of LUR-All and LUR-BS models were 0.44 (1.6 $\mu g/m^3$) and 0.42 (0.25 $\mu g/m^3$), respectively. The LUR-All model provided better visual representations of the local road conditions in the city.
Conclusions
The present study demonstrated that LUR models for $PM_{2.5}$ based on ground-data could estimate local traffic-related air pollution in an urban area. Remote sensing estimated data did not improve the ground-based LUR models in Japan.

The Application of Low-Cost PM2.5 Micro-sensors to Assess Exposures in Indoor Environments

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Background/Aim
Low-cost, easy-to-use, and reliable sensors for air pollutants are developed rapidly in recent years. These devices provide new opportunities to assess personal PM2.5 exposures with high tempo-spatial resolutions for more subjects simultaneously with longer periods of time than ever before, with affordable costs. This presentation will present a case study using low-cost PM2.5 micro-sensors in indoor environments in Taiwan to assess peak exposures of the subjects, identify indoor exposure sources, and evaluate the applicability and limitations of low-cost PM2.5 micro-sensors in exposure science and environmental epidemiology.

Methods
The integration of these low-cost PM2.5 micro-sensors were made in the laboratory of Academia Sinica, Taiwan; they were collaborative products of environmental scientists and information scientists. This sensor device also has temperature and humidity sensors to provide environmental conditions. The performance of these micro-sensors was evaluated in the laboratory and in the field with co-location comparison using GRIMM instruments. Sixteen households were recruited in Taipei metropolitan area; the low-cost PM2.5 micro-sensors were deployed in these households for one year. The stability and data transmission were evaluated during this period. The PM2.5 concentration profiles of each household were plotted. The events with PM2.5 peak levels were evaluated; responsible indoor sources were identified accordingly. In addition, the correlation of the indoor levels and the measurements from the near-by Taiwan EPA monitoring stations were assessed. The applicability of this type of micro-sensor in research was evaluated.

Results
For performance evaluation, the correlation coefficients of readings of PM2.5 micro-sensors and GRIMM instruments were all greater than 0.95. After deployment to households, some of the PM2.5 micro-sensors did not send out data regularly due to unstable wireless transmission. There were 13 micro-sensors keeping working for more than 6 months; some were up to one year. These micro-sensors provided exposure profiles of these households for more than 6 months with much lower costs than ever before. The indoor sources were identified. After discussion with the subjects, they were willing to change their behaviours to lower PM2.5 exposures from those sources. Thus, this type of low-cost PM2.5 micro-sensor can be used regularly in ordinary households to protect their health. Moreover, the correlation of hourly averages of indoor levels and measurements in nearby Taiwan EPA stations were higher than 0.8 and up to 0.92 for households without significant indoor sources.

Conclusions
This work applied newly developed low-cost PM2.5 micro-sensors in typical households and obtained indoor exposure levels for longer than 6 months with affordable costs. Thus, there is a great potential to use this type of low-cost PM2.5 micro-sensors in exposure science and environmental epidemiological studies to recognize peak exposures, identify exposure sources and provide long-term exposure profiles. The advantages and limitations of applying low-cost PM2.5 micro-sensors in research will be discussed in this presentation.

Keywords: aerosols, exposure characteristics, low-cost sensor

0622_P1-16

An approach to estimating national scale long-term concentrations of $PM_{2.5}$ for 2001-2014 in South Korea

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Background/Aim
Previous national cohort studies in Europe and North America have reported the relationship between long-term exposure to fine particulate matter air pollution and human health. However, there have been few studies in South Korea, because nationwide $PM_{2.5}$ regulatory air quality monitoring data were not available before 2015. This study aimed to evaluate an approach to predicting nationwide annual average $PM_{2.5}$ concentrations for 2001-2014 using the ratios of $PM_{2.5}$ to PM_{10}.

Methods
We used regulatory air quality monitoring data for $PM_{2.5}$ available only in Seoul for 2001-2014 and for the entire country in 2015, as well as national-scale data for PM_{10} for 2001-2015. Our approach is based on multiplication of the district-specific annual means of PM_{10} for 2001-2014 predicted by a previously-developed approach by ratios of annual average $PM_{2.5}$ to PM_{10}. Given the limited data availability to match $PM_{2.5}$ and PM_{10} data over time and space, we explored five approaches for computing ratios of $PM_{2.5}$ to PM_{10}: 1) an overall ratio based on national data in 2015; 2) a ratio for 2001-2014 in Seoul; 3) annual ratios for 2001-2014 in Seoul; 4) regional ratios in 2015; 5) regional ratios in 2015 with a spatial adjustment factor that is the ratio of each regional ratio to Seoul ratio for 2015. We validated the models using $PM_{2.5}$ data for 2011-2014 collected at 24 regulatory monitoring sties in the second largest metropolitan city in South Korea, Busan. Whereas R^2 was computed over all sites and all years, spatial R^2 was computed by using 4-year averages at each site focusing on spatial prediction ability.

Results
In our validation, the approach 5 gave the largest overall and spatial R^2 of 0.79 and 0.84.

Conclusions
Our highly predictive approach for estimating national-scale annual-average $PM_{2.5}$ concentrations for 15 years will allow future cohort studies to investigate health effects in South Korea.

0622_P1-17

Association between ambient air pollution and in-vitro fertilization pregnancy rate in Seoul, Korea

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Introduction: Exposure to high ambient air pollution was suggested to be associated with low fertility and high early pregnancy loss in women. We aimed to investigate the association of five criteria air pollutants with biochemical pregnancy loss and intrauterine pregnancy in Seoul, Korea.

Methods: We analyzed 6,621 cycles of 4,581 patients who lived in Seoul and had underwent one or more fresh in-vitro fertilization (IVF) cycles at the Fertility Center of the Gangnam CHA Hospital for 2006-2014. To assess women's individual exposure to air pollution, we computed district-specific daily averages of five criteria air pollutants for three exposure periods based on regulatory monitoring data in Seoul. The five pollutants included particulate matter (PM_{10}), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and ozone (O_3). The four periods comprised of the start of controlled ovarian stimulation (COS) to oocyte retrieval (period 1), oocyte retrieval to embryo transfer (period 2), and embryo transfer to human chorionic gonadotropin test (period 3). Using the time-varying Cox-proportional hazards model, we estimated hazard ratios (HRs) of biochemical pregnancy loss or intrauterine pregnancy for an interquartile range (IQR) increase in each air pollutant concentration during each period after adjusting for individual characteristics.

Results: Study population underwent 1.4 IVF cycles on average and cumulative pregnancy rate was 51.3%/person. IQR increases in NO_2 and CO during the period 1 were associated with decreased probability of intrauterine pregnancy (HR = 0.93, 95% confidence interval [0.87, 0.99]; 0.94 [0.89, 1.00]). PM_{10}, NO_2, and CO during the period 3 also showed inverse associations (0.92 [0.85, 0.99]; 0.93 [0.86, 1.00]; 0.93 [0.87, 1.00]). For biochemical pregnancy loss, PM_{10} and NO_2 during the period 3 showed positive associations.

Conclusion: Our results indicated that lower intrauterine pregnancy rates in IVF cycles may be linked to ambient air pollution during COS and post-transfer period.

Keywords: Air pollution, Exposure period, In-vitro fertilization, Korea, Pregnancy

Using satellite aerosol optical depth as a measure of air quality index, and association with hospital admissions in Ho Chi Minh City, Viet Nam

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Background/Aim
Vietnam is in top 10 for worst air pollution all over the world (the Environmental Performance Index 2016), in particular in major cities like Ha Noi and Ho Chi Minh. The evidence on the impact of air pollution on health, however, is relatively sparse in Viet Nam due to the availability and update of automatic air pollutants monitoring data. This study aims to examine the possibility of using satellite aerosol optical depth (AOD) as a measure of air quality index, and explore the association between AOD and hospital admissions in Ho Chi Minh City, Viet Nam.

Methods
We collected daily hospital admissions data from January 2010 to December 2013 from two largest hospitals in Ho Chi Minh, and daily air pollutants (PM10, O3, NO2, SO2) from automatic air monitoring station in the period 2003 to 2007. Data on AOD (MODIS satellite) from 2003 to 2013 were obtained. We applied the distributed lag model to evaluate the risk of hospitalization related to AOD by age, gender and by causes.

Results
Every 0.1-unit increase in AOD associated with 0.2%, 0.4%, 0.8% increase in cardiovascular, all-cause, and respiratory hospital admissions respectively. With regard to the lag association, AOD significantly increased all-cause (0.35%, 90%CI=0.01%-0.7%), female (0.5%, 90%CI=0.1% to 0.9%), 0-64 age group (0.4%, 90%CI=0.03 to 0.7%) in lag 0; and respiratory (0.5%, 90%CI=0.02% to 1.1%) in lag 3. The association between AOD and air pollutants was relatively weak, in which O3 showed the highest correlation coefficient at 0.38, and PM10 came second with 0.26

Conclusions
AOD is significantly associated with hospital admissions in some categories, though the association between AOD and air pollutants is quite low. It would be better to improve the estimation of air quality index from AOD, using advanced statistical methods (e.g. land use regression model) in a further study.

0622_P1-21

Effects of air pollution on oxidative stress and inflammation in patients with diabetes

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Abstract

Background/Aim: The biological mechanisms linking air pollution to diabetes remain unclear. This study examined effects of short-term particulate air pollution exposures on oxidative stress, inflammation, advanced glycation end products (AGEs), and adiponectin in subjects with type 2 diabetes mellitus (DM).

Methods: We recruited a panel of 59 DM patients from a teaching hospital in the western coastal area of central Taiwan, 2012. Measurements were performed in each participant of high-sensitivity C-reactive protein (hs-CRP), Interleukin-6 (IL-6), AGEs, , adiponectin, malondaldegyde (MDA), total antioxidant status (TAS), glutathione (GSH), glutathione peroxidase (GPx), catalase (CAT), superoxide dismutase (SOD) and 8-hydroxy-2-deoxyguanosine (8-OHdG). Spatiotemporal estimation of air pollutants including particles with aerodynamic diameters less than 2.5 microm ($PM_{2.5}$) and gaseous pollutants using air-monitoring station data was performed at the centroid of each township in the study area. We used multinomial logistic regression models to associate changes in tertile of biological endpoints with individual air pollutants exposure. Averaged over 1- to 3-day periods before measurements and 2-pollutant models were analyzed.

Results: We found that the adjusted odds ratios (OR) for highest versus lowest tertile were 1.45 (95% confidence interval [95% CI], 1.11 to 1.90) for MDA of 2-day average $PM_{2.5}$. The adjusted OR for highest versus lowest tertile were 1.45 (95% confidence interval [95% CI], 1.02 to 2.04) for AGEs of 1-day average $PM_{2.5}$ and SO_2. Two-pollutant models showed increases in levels of $PM_{2.5}$, SO_2, and NOx were associated with the increase in IL-6, hs-CRP, AGEs, and MDA; and the reduction in SOD, GPx, and TAS in DM patients.

Conclusions: Short-term air pollution was associated with inflammation and oxidative stress in subjects with diabetes.

Keywords: air pollution, oxidative stress, inflammation, advanced glycation end products, diabetes

0622_P1-22

Development of accurate low-cost PM2.5 instruments and measurements in Asian countries

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The new compact, low-cost PM2.5 sensor has been developed with Panasonic Corporation. We are developing and planning many applications of the compact, low-cost and simple PM2.5 instruments. In urban areas, many instruments can be installed with high densities. Local PM2.5 sources in the urban areas can be detected with the PM2.5 instruments. Especially, the new PM2.5 instruments are suitable for the measurements in developing countries. Many developing countries suffer from serious environmental problems of extremely high PM2.5 concentrations and their health effects. The PM2.5 observations in the developing countries have difficulty to install valuable and delicate PM2.5 instruments because of many serious difficulties about space, electric supply, dust, temperature, roof leaks, insects, safety, transportation, maintenance access, standard-gas supply and so on. The new PM2.5 instruments can be installed and operated in those conditions. The PM2.5 instruments widely distributed in high PM2.5 concentration area are suitable for epidemiological studies. In this presentation, we will present the features of the compact PM2.5 instrument, and also present the new applications such as measurements in the developing countries.

Reference:

Tomoki Nakayama, Yutaka Matsumi, Keiko Kawahito & Yoshifumi Watabe (2017): Development and evaluation of a palm-sized optical PM2.5 sensor, Aerosol Science and Technology, DOI: 10.1080/02786826.2017.1375078

Indoor air quality and health
- Chemiless Town Project Phase 3 -

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Background/Aim
Adverse health effects such as sensory irritation and decline of cognitive performance due to exposure to indoor air pollutants have long been an inconclusive issue. This is because the occurrence of those symptoms depends largely on a person's sensitivity and state of mind. Therefore, further exploration of the relationship between the indoor environment and its adverse health effects using subjective and objective data is needed. In 2017, two new laboratory houses were built on the campus of Chiba University, Japan to conduct a new project called Chemiless Town Project Phase 3. The project attempts to investigate the impact of the indoor environment on physical and mental health, and to create a healthy indoor environment. Interior and exterior appearances of the two laboratory houses look the same, but the concentration of chemicals inside are different because of the differences in construction and interior materials. The project commenced in November 2017.

Methods
Approximately four hundred volunteers will be recruited and asked to evaluate indoor air using sensory perception until 2021. Evaluation is done by objective methods such as measuring brain waves and heart rate variability, amylase in saliva and subjective methods such as completing self-reported questionnaires while staying in each laboratory house for 90 minutes. At the same time, indoor air(VOCs and Aldehydes) samples of the laboratory houses will be collected and analyzed.

Results
In 2017, thirty healthy volunteers participated in the experiment. The mean of concentration of total VOCs (TVOC) of the laboratory houses was 883 and 113 μg/m^3 respectively. In objective evaluation, there was no significant relationship between TVOC, relaxation and performance. On the other hand, in the subjective evaluation, the questionnaire (Comfort of room) and TVOC showed the relationship.

Conclusions
We will conduct further research and analysis with more participants to further examine the relation between the indoor environment and its effects on health.

0622_P1-26

Effects of several humidifier disinfectants on the survival and development in zebrafish embryo/larvae

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Abstract: Humidifier disinfectants have been used to prevent the microbial growth in the water tanks of humidifier. However, sales of these products were discontinued since 2011, because dozens of children and pregnant women in Korea died by exposure to disinfectants for household humidifier. In the present study, the survival and developmental effects of 3 kinds of humidifier disinfectants (Oxy® , Vegetable, and Wiselect) were investigated using zebrafish embryo/larvae (*Danio rerio*). According to the fish embryo acute toxicity test guideline (OECD TG 236), zebrafish embryo were exposed to various concentrations of disinfectants (0.3, 0.03, 0.003, and 0.0003% (v/v) for Oxy® and Wiselect, 0.6, 0.06, 0.006, and 0.0006% (v/v) for Vegetable) for 168 h. Several endpoints including coagulation, lack of somite formation, non-tail detachment, lack of heartbeat, hatchability, time to hatch, and survival of larvae were recorded. Zebrafish exposed to the highest and second highest concentrations of the tested disinfectants showed higher mortality (over 90%), and the hatching rate was also significantly reduced in a concentration-dependent manner. In addition, developmental toxicity such as lack of somite formation was significantly increased with exposure concentration. The highest test concentration was the recommended concentration by the manufacturer, in order to prevent bacterial growth in the humidifier during practical usage. The results of this study indicate that exposure to actual use concentrations can lead to acute ecotoxicity. Further study is needed to investigate the mechanism of developmental toxicity and its effect on various aquatic organisms other than fish.

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Keywords: development; humidifier disinfectants; toxicity; zebrafish

P1-28

Follow-up of environmental trace metal exposure monitoring–cord blood lead and other concerned metals levels

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Background/Aim
Following the previous studies, which reported the cord blood lead levels of newborns in Taipei metropolitan area in 1987, 1992, 2002 and 2005, this study was carried out in the same study area to examine multiple metal concentrations in pregnant women and newborns.

Methods
The study subjects were recruited from the National Taiwan University Hospital. Information collected through questionnaire was used to examine the effects on the distributions of multiple metal levels of maternal blood and cord blood samples. Blood samples were collected for later metal determinations by inductively coupled plasma mass spectrometry (ICP-MS).

Results
The mean maternal blood levels of lead, arsenic, cadmium, chromium, manganese, zinc at the third trimester were 1.35 ± 0.73 μg/dL, 4.63 ± 2.41 μg/L, 0.9 ± 0.4 μg/L, 6.13 ± 6.11 μg/L, 51.3 ± 9.9 μg/L,
4675.1 ± 1156.5 μg/L, respectively, and in cord bloods, these levels at birth were 1.03 ± 0.42 μg/dL, 4.51
± 2.78 μg/L, 0.74 ± 0.42 μg/L, 1.72 ± 1.18 μg/L, 78.3 ± 23.3 μg/L, 2534.1 ± 1296.1 μg/L, respectively.

Discussions
The mean cord blood lead levels of newborns in Taipei metropolitan area declined from 7.48 ± 2.25 μg/dL in 1987 to 1.03 ± 0.42 μg/dL in this study. Cord blood lead levels decline sharply after leaded gasoline was banned in Taiwan in 2000. In recent years, the level is continuously decreasing, but the lowering slope has slowed down.

Conclusions
The cord blood lead levels of newborns in Taipei metropolitan area has gradually declined and was getting close to the lead levels in western countries.

0622_P1-29

Comparison of Two Wet-Bulb Globe Temperature Estimation Methods for Assessment of Heat-Related Mortality: Evidence from 47 Japanese Prefectures

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Background / Aim: The wet-bulb globe temperature (WBGT) has been widely used for the heat warning in Japan. However, since the WBGT instruments are not often readily available, it needs to be estimated from the measurements of the common meteorological variables. In this study, we tested the reliability of the WBGT estimation method used by the Australian Bureau of Meteorology (ABM) by comparing it with a proven accurate estimation method by Ono *et al*. (2014) for evaluating the heat-mortality associations in Japan.

Methods: We collected daily data on temperature, humidity, solar radiation, wind speed, water vapor pressure and all- cause mortality from 47 Japanese prefectures during 2006–2012. The meteorological data we used were the daily average ones. The data were restricted to the warm season (May–October). After deriving the WBGT estimates by using each method respectively, a quasi-Poisson model combined with a distributed lag nonlinear model (DLNM) was applied to estimate the WBGT-mortality associations in each prefecture.

Results: The correlation coefficient between the two types of WBGT estimates was around 0.95. The estimates of minimum mortality WBGT (MMW) and minimum mortality WBGT percentile (MMWP) by using two WBGT estimates were very inconsistent across prefectures. The correlation coefficient between two sets of MMWs was only 0.3.

Conclusions: We found that the WBGT estimates provided by the ABM's method is not accurate enough to express the heat-mortality associations. That may be due to its assumption of the fixed solar radiation and wind speed.

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Emergency Room visits and its Costs Claimed Associated with Extreme Temperatures in Taiwan

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Background/Aim
This study evaluated area-cause-specific emergency room visits (ERV) associated with ambient temperature, moreover, the excess costs claimed for emergency service were estimated using health insurance claim database of a representative population of one million people randomly sampled from all insured residents in Taiwan.

Methods
Distributed lag non-linear model was applied to assess the optimum temperatures for cause-specific ERV, and to estimate the cumulative relative risks (RRs) with confidence intervals of area-specific ERV of all causes (ICD9 CM all, injury and accident are excluded), infectious and parasitic diseases (ICD9 CM 001-139), diseases of the circulatory system (ICD9 CM 390-459), and symptoms (ICD9 CM 780-789). Daily costs claimed for emergency service were estimated for days with optimum temperature and days with extreme temperatures.

Results
Risks of all-cause ERV were significantly associated with ambient high temperatures (>28 ˚C), the risks elevations were particularly high in Taipei City, New Taipei City, Taoyuan City, and Taichung City, with mean excess costs of 76 thousands NTD/ day. Minor increments were observed in infectious and parasitic diseases in Taipei City and Taoyuan with mean excess costs of 8.5 thousands NTD/ day. In addition, mean excess costs of 30 thousands NTD/ day for ERV of symptoms during high temperatures days were significantly found in Taipei City, New Taipei City, and Taoyuan City. ERV of circulatory system were associated with low temperatures (<27 ˚C), mean excess costs of 0.4 thousands NTD/ day were reported in Taichung City and Kaohsiung City.

Conclusions
Risk of emergency room visits associated with ambient temperatures varied with study area and disease. Information of temperature-related excess costs claimed for emergency service is critical for adaptation planning in responding to future climate change.

0622_P1-35

Effects of maternal factors on fetal adipokine levels.

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Background/Aim
Fetuses are affected by maternal factors during pregnancy. Gestational weight gain is one of these important factors. Gestational weight gain was reported to affect cord serum adipokine levels in European people. The aim of this study was to examine the association between maternal body weight and fetal adipokine levels.

Methods
Participants of Chiba study of Mother and Child Health (C-MACH) were subjected. Of those, forty-five mother-child pairs were included in this study. Their cord serum adiponectin and leptin levels were analyzed using a latex turbidimetric immunoassay and a radioimmunoassay, respectively. Correlations between cord serum adipokine levels and maternal factors were examined using Spearman's method. Data are shown as median (IQR).

Results
Maternal age was 34.0 (31.0, 36.0) years. Pre-pregnancy body weight and body mass index were 52.0 (49.0, 56.0) kg and 20.4 (19.1, 22.2) kg/m2, respectively. Birth weight of their children was 3054 (2912, 3206) g. Adiponectin and leptin levels of cord serum were 26.2 (22.4, 34.7) μg/mL and 6.6 (4.3, 11.1) ng/mL, respectively.
Maternal pre-pregnancy body weight tended to be positively correlated with leptin levels. Maternal pre-pregnancy body mass index and gestational weight gain were not correlated with leptin levels. Adiponectin levels was not correlated with maternal pre-pregnancy body weight, body mass index, or gestational weight gain. Leptin levels and birth weight showed significant positive correlation. However, adiponectin levels did not show significant correlation with birth weight.

Conclusions
Maternal factor such as pre-pregnancy body weight is possible to affect fetal leptin levels. Further studies with large cohorts are needed in order to clarify the effects of maternal factors on fetal adipokine levels. It is also required to evaluate the association between fetal adipokine levels and child health, such as obesity.

0622_P1-37

Association between maternal gut microbiota and neonatal growth

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Background/Aim

Environmental factors during fetal period affect fetal and early childhood growth and subsequent risk of non-communicable diseases (NCDs) in adulthood. Maternal gut microbiota is one of the environmental factors, but its effect on neonatal growth is little revealed. Thus we investigated the association between maternal gut microbiota and neonatal growth.

Methods

Subjects were 50 mother-neonate pairs who were participants in Chiba study of Mother and Child Health (C-MACH: Sakurai K et al. BMJ Open 2016). Microbiome analysis was performed by 16S rRNA gene sequencing of stool samples which collected at the third trimester of pregnancy. Shannon index, a measurement of within-sample community diversity, as well as Chao 1 (estimates richness), and observed OTUs were used to evaluate the alpha-diversity. Neonatal growth (height, weight and head circumference) were converted to standard deviation score (SDS) based on Japanese growth reference curves. Spearman's correlation coefficient analysis was performed to assess the associations between maternal microbial diversity and neonatal growth. The basic models were adjusted for confounders (pre-pregnancy BMI, gestational weight gain and maternal height).

Results

There were significant positive correlations between all alpha-diversity index of maternal microbiota and neonatal head circumferences in boys but not girls [Shannon index: $r = 0.477$, $p = 0.025$; Chao 1: $r = 0.591$, $p = 0.004$, observed OTUs: $r = 0.526$, $p = 0.012$]. Chao 1 and neonatal head circumferences tended to be correlated even after adjustment for confounders.

Conclusions

Our results suggested that lower maternal microbial diversity in late pregnancy was associated with smaller neonatal head circumference in boys but not in girls. It has reported that smaller neonatal head circumference is associated with the risk of NCDs in adulthood and neural development in childhood. Our findings provide the insights that maternal gut microbiota is an important factor to sustain optimal fetal growth.

Words: 298

Risk of myocardial injury after carbon monoxide poisoning: a nationwide population-based cohort study

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Background/Aim
The heart may be affected by carbon monoxide poisoning (COP) and the objective of this study is to evaluate the risk of myocardial injury following COP.

Methods
Using a nationwide database of insurance claims in Taiwan, we conducted a population-based retrospective cohort study to identify COP patients diagnosed between 1999 and 2012. At a ratio of 3:1, we identified non-COP patients who were matched by the index date and age and compared the risk of myocardial injury between the two cohorts by time after the index dates of the COP patients, until 2013.

Results
We identified 22,258 COP patients and 66,774 non-COP patients. COP patients had an increased risk of myocardial injury, with an incidence rate ratio of 1.45 (95% confidence interval: 1.06−1.98) in comparison with the non-COP patients after adjusting for other independent predictors, including older age, male sex, and underlying comorbidity of hypertension, diabetes, and renal disease. Stratified analyses showed that the increased risk was more prominent in patients with a young age (< 34 years), female sex, and liver disease, and occurred only in the first month of follow-up.

Conclusions
COP increased the risk of myocardial injury, but the increased risk was only observed in the first month after COP, which indicated that the impact of COP on the heart was mainly acute. Patients who were younger than 34 years, female, and with liver diseases were more prone to myocardial injury after COP.

Keywords: carbon monoxide; heart; myocardial injury; poisoning

Breastfeeding duration and psychosocial behaviour of the preschool children: a pilot study

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Background/Aim
Evidence regarding whether breastfeeding affects psychosocial behaviour was limited and inconclusive. The study examined the association between breastfeeding duration and psychosocial development of the preschool children.

Methods
Eligible study participants were randomly selected from 19 kindergartens of northern Taiwan using stratified cluster sampling in 2018. We enrolled children aged five to seven years old after the informed consent from their parents. Demographic characteristics, as well as breastfeeding duration, were retrieved from main caregivers using questionnaires. The psychosocial behaviour of the children was evaluated using the parent-report Strengths and Difficulties Questionnaire (SDQ). We utilized linear regression models adjusted for potential confounders to evaluate the correlation between breastfeeding duration and SDQ total- and sub-scores.

Results
A total of 177 children had completed the investigation. The mean (SD) age of the participants was 5.9 (0.4) years old, and 51.4% of them was male. The mean (SD) SDQ scores for total difficulties, emotional problems, conduct problems, hyperactivity, peer problems, and prosocial were 11.3 (5.5), 2.2 (1.8), 2.4 (1.7), 4.4 (2.3), 2.3 (1.8), and 7.2 (2.0), respectively. Compared with those never breastfed, the SDQ scores for total difficulty decreased with longer duration of breastfeeding (adjusted coefficients [95% confidence interval] for ≤3, 3~6, 6~12, and >12 months were -0.45 [-3.54~2.65], -3.83 [-7.18~-0.48], -2.00 [-5.21~1.22], and -4.52 [-7.53~-1.52]). Furthermore, similar significant protective effects were observed for conduct problems, hyperactivity, and peer problems.

Conclusions
The findings confirmed the association between breastfeeding and later psychosocial behaviour of preschool children, and the longer the breastfeeding duration the better development.

Keywords: breastfeeding, psychosocial, preschool, Strengths and Difficulties Questionnaire

P1-40

Urinary concentration correction methods for arsenic, cadmium and mercury: A systematic review of practice-based evidence

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Abstract

Urinary biomonitoring is widely used to assess environmental chemical exposure; however, a critical knowledge gap exists in the understanding of whether and how to correct physiological variation in the water content of urine samples in environmental epidemiological studies. The aim of this systematic review is to summarize the available evidence comparing the performance of urinary concentration correction methods determining urinary levels of arsenic, cadmium, and mercury. In random spot urine samples, urine creatinine and urine specific gravity correction remain practical approaches to correct metal concentrations for urine dilution as compared to 24-h urine samples. Developing an international standardized protocol is an urgent need to facilitate exposure quantification, data comparison, and health management for environmental toxicants.

0622_P1-41

Trends of the regional burden of Lung Cancer Attributable to Indoor-Radon in Korea during 2008-2015

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Backgrounds/Aim; Lung cancer is most frequently diagnosed cancer and leading cause of death in Korea. Indoor-radon is known to contribute to risk of lung cancer. We calculated disability-adjusted life-years (DALYs) to estimate the burden of lung cancer attributable to indoor-radon during 2008-2015 in various regions and in Korea.

Methods; We used population-based data from Korean National Health Insurance and National Statistical Office, for prevalence, mortality, life expectancy, disease duration, and age at onset and death.

The burden of lung cancer were calculated using disability adjusted life years (DALYs) based on these estimated prevalence rates. Years of life lost (YLLs) were calculated from age-sex- specific estimates of mortality by lung cancer, with death by standardised lost life expectancy at each age and sex. Years lived with disability (YLDs) were calculated for non-fatal cases. The DALYs lost due to lung cancer related to Indoor-radon was calculated by applying Population Attributable Fraction models proposed at the advanced study (BEIR VI, Darby et al).

We used YLLs and YLDs to derive DALYs for lung cancer in 17 regions in Korea.

Results; Overall, between 2008 and 2015, the total DALYs remained stable from 2008 (19,136) to 2015 (18,295).

The DALYs lost due to lung cancer related to Indoor-radon consisted of approximately 4,726 to 4,519 (BEIR VI-EAC) and 3,693 to 3,531 (BEIR VI-EAD) and 2,392 to 2,286 (Darby et al) during 2008-2015 in Korea. In addition to substantial heterogeneity exists in rankings of lung cancer burden related to indoor-radon among 17 regions.

Conclusions; In Korea, the burden of lung cancer related to indoor-radon in terms of DALYs was estimated for the first time. If the future burden of lung cancer attributable to indoor-radon are to be reduced, Korea needs a nationwide Radon action plan to develop an integrated health and social care system and to promote primary and secondary prevention.

Keywords; epidemic, Lung cancer, Indoor-radon, Disability adjusted life of years (DALY), Burden of disease

0622_P1-43

Novel phthalate (DPHP) exposure markers: comprehensive screening strategy by rat model coupled with HRMS-base metabolomics approach

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Background/Aim
Phthalate is a class of chemicals widely used in life necessities. More and more new structurally similar alternative chemicals are used by manufacturers. Bis-(2-propylheptyl)phthalate (DPHP) is one of the alternative chemicals. Biomonitoring is an important issue for studying human health effects of new chemicals. High resolution mass spectrometry (HRMS) was applied to comprehensive study the species in a given biological system of interest. This study aim to develop a strategy which can efficiently filter probable DPHP biomarker signals from a complex LC-HRMS database.

Methods
An untargeted analysis was used to generate the LC-HRMS dataset of rat urine samples using UPLC coupled with Orbitrap mass spectrometer. Exposure marker candidate signals were filtered from the LC-HRMS datasets using the orthogonal partial least squares-discriminant analysis (OPLS-DA) statistical method and validated by examining dose-response relationships. The animal-model validated DPHP exposure marker candidates were applied in general Taiwan human population.

Results
There were 26,195 signals obtainted from the MS dataset generated by urine samples collected from DPHP administrated rats. After OPLS-DA analysis, 31 signals were identified as exposure marker signal candidates and validated by examining dose-response relationships in urine samples collected from rat. For the general Taiwan human population (N=51), only 8 exposure marker signal candidates can be detected in 70% subjects. Structures of 5 out of 8 exposure marker signals detected in human subjects were identified by MS/MS data and/or chemical databases (HMDB, Metlin, Pubchem, Chemspider), including mono-2-(propyl-6,7-hydroxy-heptyl)-phthalate, mono-2-(carboxymethyl) hexyl phthalate, sebacic acid, 3-hydroxysebacic acid, and 10-hydroxy capric acid. Beside, only 0 ~ 4% of the general Taiwan human population can be detected for the three DPHP exposure markers proposed in literatures and this result is similar to the general German human population.

Conclusions
The mono-2-(propyl-6,7-hydroxy-heptyl)-phthalate might be better than three known DPHP metabolites used for exposure assessment because of higher signal intensity and potential structure specificity.

Presentation preference (Select one checkbox): Poster (General Sessions)

0622_P1-45

Prenatal exposure to perfluorinated alkyl substances and childhood ADHD risk at 6 years old: the Hokkaido Study on Environment and Children's Health

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Background/Aim: Perfluorinated alkyl substances (PFASs) are ubiquitous and persistent pollutants detected in blood samples of humans. Although previous studies have suggested an association between prenatal PFASs exposure and subsequent neurodevelopment, the results are inconsistent. The aim of the present study was to investigate the association between prenatal exposure to PFASs and Attention deficit /hyperactivity disorder (ADHD) risk in children at 6 years of age.
Methods: We used the data of the follow-up study from a prospective birth cohort study, the Hokkaido Study on Environment and Children's Health, which enrolled pregnant women from 2003 to 2012 (n=20,926) in Japan. We measured the 3rd trimester maternal plasma concentrations of 11 PFASs (C6-C14). Parents completed ADHD-rating scale (ADHD-RS) when the children reached 6 years of age. We analyzed data from 947 singleton children without congenital anomaly, and who had both PFAS and ADHD-RS data. ADHD-RS scores above 20th percentile was defined as a suspected ADHD. PFAS values were log10 transformed, and logistic regression models were constructed for each PFAS separately, and adjusted by maternal age, maternal education, smoking during pregnancy, family income, child sex, parity. We also used weighted quantile sum (WQS) regression to examine the associations between exposure to a mixture of PFASs and ADHD symptoms.
Results: Eight PFASs showed detection rate over 75%. Logistic analysis showed that increased maternal PFOA was associated with reduced risk of ADHD (Odds ratio (OR)=0.31, 95% confidential interval (CI); 0.15, 0.65). In the following analysis, we found an inverse association between the WQS of PFASs and ADHD risk ($p < 0.05$). PFOA had the largest weight in the index (0.67), indicating the largest contribution to the WQS.
Conclusions: The results in the study suggested that mixture of PFASs, especially PFOA, decreased ADHD risk. It is needed to examine other neurodevelopmental aspects.

0622_P1-48

A Study on the Interaction Effect of Lung Cancer Prevalence Between Indoor Radon Level and Smoking Status in South Korea

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Background/aim: Lung cancer was the second highest cancer incidence globally and the first cause of cancer mortality in 2014. Radon is the second leading cause of lung cancer and the first leading cause of lung cancer of non-smoker. We aimed to evaluate the risk of lung cancer between indoor radon and smoking.

Method: We recruited 389 lung cancer cases and 480 controls from 2015 to 2018 in South Korea and performed logistic regression analysis to estimate the odds ratio (OR) for lung cancer associated with smoking and indoor radon. We were stratified by sex and adjusted by age, passive smoking, drinking, house type, construction year, residential floor, residential time. We determined the criteria for classification safe group that was nonsmoking and radon concentration(<100 Bq/m3) and the rest was non-safe group and estimated the OR for observing interaction indoor radon concentration and smoking.

Result: We observed an association between indoor radon and smoking. Specially in the male smoking and indoor radon interaction is higher than in the female. By male, the OR is estimated 4.25(95% CI:2.01~9.33) in smoking and 2.34 (1.04~5.42) in radon level and 4.70(2.11~10.95) in interaction. By female the OR is estimated 3.14 (0.77~12.34) in smoking and 2.52 (1.07~5.85) in radon level and 2.62(1.22~5.66) in interaction.

Conclusion: we will be expected to exhibit synergism between exposure to radon and smoking and there is statistically significant higher synergism in male but lower in female. The reason is that smoking is the influential carcinogen than radon and the female has lower smoker cases than the male. However, radon as cause of lung cancer is more affected in female than in male that South Korean female as housewife stay at home long time. The futher study will be required to collect more cases to evaluate the interaction between exposure to indoor radon and smoking .

Keyword: indoor radon, smoking, lung cancer, interaction effect

0622_P1-49

Pesticide exposure assessment in northern Thailand: Past, present, future perspectives

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Background/Aim: Pesticide exposure assessment is an essential tool to estimate their contamination and health consequences. Importation of pesticides into Thailand has been gradually increasing for decades. Though organic farming is a new trend globally, this share is still minor. In 1990s, persistent organochlorine pesticides i.e. dichlorodiphenyltrichloroethane (DDT) and their metabolites were highly detected in plasma and breast milk from those living in former malaria endemic areas in northern Thailand. Less-persistent pesticides such as organophosphates, synthetic pyrethroids and neonicotinoids have been widely used in present agriculture. Here, we aim to present exposure assessment via environmental and biological monitoring.

Methods: This presentation gathers data mostly from our studies conducted in northern Thailand. Participants included both occupational and environmental settings namely farmers, farmworkers, school children, students, and consumers. Pesticide residues in vegetables and fruits are detected by chromatographic-based methods. Pesticide exposure biomarkers in biological samples i.e. blood, urine, breast milk are analysed mostly by chromatography, and some immunoassays.

Results: The exposure to DDT in 1990s, we found the associations between concentrations of DDT and its metabolites and thyroid/sex hormones in plasma of those living in former malaria endemic areas. DDT detection was gradually decreased since its ban in 2000. Exposure to less-persistent pesticides via consumption of vegetables and fruits was the main route of exposure among non-occupational settings. Urinary dialkylphosphates (DAPs), common organophosphate metabolites, were detected with high frequency and concentrations among farmers, farmworkers, and some consumer groups with the levels greater than those reported from other country surveys i.e. NHANES for several folds.

Conclusions: Pesticide exposure assessment in northern Thailand by far inherits from the use of organophosphate pesticides greater than others. For future perspectives of pesticide exposure assessment, cooperative research work will enable to identify the contamination of new pesticides' groups using recent advanced analytical techniques.

Keywords: Pesticides; exposure assessment; environmental monitoring; biological monitoring; Thailand

0622_P1-50

Air pollution and neurodegeneration disorders: a dose-response meta-analysis

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Background/Aim

Neurodegeneration disorders is an important issue in the aging society. Epidemiological studies suggest an association between neurodegeneration disorders and long-term exposure to particulate matter (PM). However, the magnitude of the association remains unclear. The aim of the study was to examine the relationship between exposing to PM and the risk of neurodegeneration disorders.

Methods

We conducted a dose-response meta-analysis to quantify the pooled association between the incidence of neurodegeneration disorder and long-term exposure to PM. Meta-analyses were performed for Alzheimer's disease, Parkinson's disease, cognitive impairment, multiple sclerosis and amyotrophic lateral sclerosis, and for PM_{10} and $PM_{2.5}$. Studies published between 1971 and 2017 were collected by searching the database of PubMed, EMBASE, CNKI, Wangfang Data and Web of Science Core collection. Data from observation studies were pooled for meta-analysis with random effect models.

Results

We identified 16 studies, including a total of 17,115,357 subjects. There was a positive association between PM and the risk of neurodegeneration disorders. The pooled odds ratio (OR) were 1.07 (95% CI: 1.02—1.12) for $PM_{2.5}$, and 1.01 (95% CI: 0.96—1.06) for PM_{10}. Among these observation studies, six studies were available to perform the dose-response analyses. Every 10 $\mu g/m^3$ increase in PM_{10} was associated with an increased risk of neurodegeneration disorders with a RR of 2.68 (95% CI: 0.35—20.43) in cohort studies.

Conclusions

The study supports the hypothesis that exposure to PM may increase the risk of neurodegeneration disorders, also provides the evidence of concentration response. Further research for air pollution and neurodegeneration disorders are necessary to confirm these associations.

0622_P1-51

Assessment of ambient-generated exposure to fine particles ($PM_{2.5}$) using sulfur as a tracer for adults in Hong Kong

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Background/Aim
Epidemiological studies have revealed associations between health effects and outdoor air pollution, the contribution of outdoor pollution to human exposure must be assessed.

Methods
We conducted 24-h personal monitoring from thirteen adult subjects (ages 19-57) in Hong Kong for studies of the ambient-generated exposure to $PM_{2.5}$. Ambient $PM_{2.5}$ measurements were conducted simultaneously from seven ambient monitoring stations. All samples were subject to $PM_{2.5}$ mass by gravimetry and 19 elements (Na to Pb) were analyzed using X-Ray Fluorescence.

Results
We found significant higher subject-specific personal-ambient correlations for sulfur ($r_s = 0.92$, $p < 0.001$) as compared to $PM_{2.5}$ mass ($r_s = 0.79$, $p < 0.001$) and other elements ($0.06 < r_s < 0.86$). Mixed-effects models based on personal vs. ambient sulfur regressions yielded an average exposure factor (F_{pex}) of 0.73 ± 0.03, supports the use of sulfur as a surrogate to estimate ambient-generated exposure to $PM_{2.5}$ (E_a). E_a accounts for 41-82% and 57-73% of personal $PM_{2.5}$ exposures by subject and by season, respectively. Ambient concentrations were highly correlated with E_a ($R^2_\beta = 0.90$, $p < 0.001$) than total personal exposure ($R^2_\beta = 0.58$, $p < 0.01$). Calibration coefficient of 0.78 (95% confidential interval, CI: 0.72-0.84), suggested an attenuation bias of 22% in estimating $PM_{2.5}$ health effects using ambient central monitoring station measurements.

Conclusions
This study reports for the first time the estimate of ambient-generated exposure in Hong Kong. In good agreement with previous findings, sulfur can be used as a trace for the studies of $PM_{2.5}$ of ambient origin. Calibration coefficients were less than 1, indicating attenuated health effects when using ambient $PM_{2.5}$ as the surrogate for true exposures. This study also highlights the importance of E_{na} (18-59%) of total personal exposure. Therefore, it is important to treat E_a and E_{na} as independent predictors of $PM_{2.5}$-related health effects.

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0622_P1-52

Feasibility of Positive Matrix Factorization for 3-Layer Simulation with Vertical Variation

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Background/Aim:

Air quality monitoring systems have been regarded as an indicator of wellness of city development. With chemically-speciated data collected, receptor models such as positive matrix factorization (PMF) can be used to retrieve types of pollution sources and their contributions to receptor sites. In highly-populated cities, residents live and work in different heights. Source contributions to pollution exposure site may vary by heights. In this study, multi-layer scenarios were simulated to evaluate the feasibility of applying PMF models on solving multi-layer data

Methods:

Multiple sets with three elevations which had similar temporal variation and assigned vertical variation were simulated. Different levels of sampling errors and vertical variation scenarios were tested. Pseudo-135-sample data sets were constructed by three simulated subsets. The PMF models were applied to these data sets to retrieve the hidden sources.

Results:

The basic settings were nine sources, 55 species, three sampling height with 45 samples from each. Stabilities between 45-sample and 135-sample single-layer data was compared in advance. As sampling error increased from 0 to 40 %, minimum true vs. predicted correlation of time series of 45-sample input reduced from 0.999 to 0.55, accompanied by mixed sources. On the other hand, the correlation only decreased from 0.999 to 0.82 with 135 samples.

When 3-layer scenarios were implemented, more stable outputs were solved than based on the 45-sample data set. The common feature was that if a certain species had its contribution highly concentrated in a single factor, the calculated contribution may dropped by 30-40 % as the sampling error rose. However, the solutions were still interpretable with 40 percent errors, which is generally regarded as the lowest limit of sampling quality.

Conclusion:

Overall, this study provides the supportive evidence for PMF in processing multi-layer sampling data.

0622_P1-54

Dietary health risk assessment of heavy metals in drinking water, surface water and fish on communities in bauxite mining areas of Felda Bukit Goh and Kuantan Port Flat, Kuantan.

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Background: The mining of bauxite ore in Kuantan, Pahang has been going since early 2013. Chemical analyses showed that, bauxite ore contains radionuclides including heavy metals which can pose great threat to human and environmental health. The continuing degradation of water quality caused by uncontrolled bauxite mining would have a major impact on the aquatic biodiversity that polluted waterways support. **Objective:** (1) To determine and compare the concentration of selected heavy metals (Al, As, Cd, Cr, Ni and Pb) in water and fish, (2) To evaluate the possible risk of consuming fish and water to human health. **Methodology:** This study was conducted in three different residential area; Felda Bukit Goh, Jalan Besar Bukit Goh and Kuantan Port Flat. A total of 162 respondents were interviewed using self- construct questionnaire. For environmental sampling, 79 sample of drinking water, 6 sample of water from water treatment plant, and 4 types of fish were analyzed. All of these samples were analyzed using Inductively Coupled Plasma–Mass Spectrometry (ICP-MS). **Result and Discussion:** Result indicated that there was a significant difference in the aluminum, nickel and chromium concentrations between the river water around the bauxite mining activities in Kuantan and also significant difference in the concentrations of cadmium between the four types of fish. For dietary health risk assessment on exposure doses from ingestion of water and fish, showed no risk of non-carcinogenic adverse health effect since the hazard quotient (HQ) for all heavy metals were <1. There was no carcinogenic health risk for heavy metals (arsenic, cadmium, chromium, nickel, and lead) since the LCR was lower than 10^{-4}. The LCR lower than 10^{-4} was regarded as acceptable. **Conclusion:** As far as bauxite mining activity is concerned, apparently the presence of heavy metals levels in water was not alarming.

Key Words: Bauxite Mining, Heavy Metals, Dietary Health Risk Assessment

0622_P1-55

Association between Food Environment and Food Safety Perceptions Among a Cohort of Adolescents in Kunming, China

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Background/Aim:
Food safety is an emerging concern in fast changing Chinese urban food environments. Adolescents are at a crucial age for rapid growth and developing lifelong dietary behaviors which may impact their health in older age. This study aimed to assess adolescents' perceived food safety of different types of food establishments and food contaminants, and whether these concerns were associated with them eating out.

Methods:
318 adolescents (43% male, 57% female) aged 16-18 were recruited from two local high schools in urban Kunming, China in 2015. Participants were asked to complete a 20-question survey that was composed of 5-point Likert scale on their perceptions regarding the safety of various food establishments (street food, Western-style fast food, and supermarkets, etc.) and food contaminants (food additives and pesticides). Participants' sociodemographic information and the number of times they ate out during the past week were also collected. Their body mass index (BMI) was calculated using their weights and heights measured by trained study assistants.

Results:
More than 82% of the participants perceived street food and small restaurants as being unsafe, whereas 77% and 90% perceived Western-style fast food and large-size restaurants or supermarkets as being safe, respectively. Approximately 94% of the participants were concerned about additives and pesticides in food, and 42% reported experiencing food poisoning in the past month. There were no statistically significant differences in food safety perceptions in terms of participants' BMI; however, significant differences in food safety perceptions between males and females were observed. No significant relationship was found between food safety perceptions and the number of times participants ate out.

Conclusions:
Findings indicated that food safety concerns related to certain types of food establishment were prevalent among the cohort, and a high proportion of adolescents experienced food poisoning. Thus, better food safety inspection and population surveillance and education are needed.

P1-57

Voice Disorders among Teachers in Taiwan

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Background/Aim
Previous studies reported that teachers were at higher risk of voice disorders, but few of them based on clinical diagnosis, especially in Taiwan. Our study tried to estimate the incidence and risks of voice disorders among teachers in Taiwan.

Methods
We conducted a retrospective cohort study by using the Taiwan Longitudinal Health Insurance Database 2000, which randomly sampled a million members from the National Health Insurance Research Database in 2000. We selected private school teachers under 35 years old began their career between 2000 and 2010 as observation cohort. People with other occupations were selected as comparison cohort. We identified those who were diagnosed as having voice disorders using related ICD-9-CM codes from 2000 to 2010 as patients. We used chi-square tests to evaluate the differences between teachers and the comparison in demographic characteristics. We used multiple logistic regression model to estimate the odds ratio of voice disorders. We used log-rank test and Cox proportional hazard regression model for survival analysis.

Results
Totally 609 teachers from private colleges and 508 teachers from private high schools were included in our cohort study. There were 188,145 people from all the other occupations as the comparison cohort. The incidence rate of voice disorders was 27.3 per 1000-person-year in high school teachers and 13.4 in college teachers, which were higher than other occupations (8.6). After adjusting for age, gender, income, work duration, sinusitis and laryngitis history, the adjusted hazard ratio of voice disorders was 1.6 (95% confidence interval: 1.4-1.8) for private school teachers when compared to other occupations. For teachers in private high or elementary school, 50% of them had voice disorders in first three years.

Conclusions
Teachers in private school had higher risk of getting voice disorders than other occupations in Taiwan.

Keywords：Voice disorders, Teachers, Taiwan

Plantar fasciitis in physicians and nurses: a Taiwan nationwide population-based study

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Background/Aim
Physicians and nurses in Taiwan have heavy workload and long working hours, which may contribute to plantar fasciitis. However, the risk of plantar fasciitis in physicians and nurses is unclear, and therefore, we conducted this study to delineate this issue.

Methods
We conducted a nationwide population-based study by identifying 26,024 physicians and 127,455 nurses and an identical number of subjects for comparison (general population) via the National Health Insurance Research Database. The risk of plantar fasciitis was compared between physicians and general population, between nurses and general population, and between physicians and nurses. We also compared the risk of plantar fasciitis among physician subgroups.

Results
The risk of plantar fasciitis was lower among physicians (odds ratio [OR]: 0.660; 95% confidence interval [CI]: 0.622–0.699) but higher among nurses (OR: 1.035; 95% CI: 1.011–1.059) compared with that in the general population. Nurses also had a higher risk than the physicians after adjusting for age and sex (adjusted odds ratio [AOR]: 1.541; 95% CI: 1.399–1.701). Physician subspecialties of orthopedics (AOR: 1.404; 95% CI: 1.008–1.955) and physical medicine and rehabilitation (AOR: 1.547; 95% CI: 1.208–1.981) showed a higher risk. In terms of sex, the risk of plantar fasciitis was higher among female physicians than that among male physicians.

Conclusions
This study showed that nurses, physician specialties of orthopedics and physical medicine and rehabilitation, and female physicians had a higher risk of plantar fasciitis. Further studies are warranted to validate our results and clarify the underlying mechanisms.

Keywords: plantar fasciitis; occupation; physician; nurse

0622_P1-60

Investigation of stress at work and health status for high-tech workers in Taiwan

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Background/Aim
The working style and frequency of shifts in high-tech industries may have a potential impact on health. This study, based on literature review, explores the relationships among demographics, stress of workers and health status for high-tech workers, moreover, estimates the possibilities of stress of workers and health in shift.

Methods
This study recruited 100 cases for administrative workers and 100 cases for shift workers aged from 25 to 60 years old (74 male and 126 female) from a high-tech factory in Northern Taiwan. Questionnaires such as the Stress Scale of Institute of Labor Occupational Safety and Health and 36-Item Short Form Survey (SF-36) were conducted to 200 cases to differentiate stress level (critical cut point is 60 points) and health status (critical cut point is 70 points). Statistical analyses were analysed matching cases' sex and age, such as descriptive statistics, generalized linear models, Pearson correlation analysis, paired T test and decision tree analysis.

Results
This study found that the stress levels of the workers were normal (81%) and the vitality (53.8 points) and mental health (61 points) scored poorly. In addition, paired T tests report the stress levels of the workers (82% vs 80%, p=0.1399), health status with body ache (68% vs 56%, p=0.0212) and role limitation due to emotional problems (77% vs 59%, p=0.0305) of shift workers were worsen than those non-shift workers. Generalized linear models show the stress levels of the workers ($p<0.001$) is a significant factor in association with mental health.

Conclusions
Workplace stress were mostly affected by health status. The study suggests that improvement of occupational health services are recommended for shift workers, moreover, the questionnaire can be simplified to improve its accuracy. Increased the study case numbers to improve the accuracy of questionnaire for health surveys are also recommended.

0622_P1-61

Effects of protective measures on urinary concentrations of MDA and 8-OHdG in agricultural workers in South Korea

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Abstract
Pesticides increase the yield and quality of agricultural products by protecting crop against pests. However, these chemicals are biologically active and can adversely affect the health when humans are exposed for extended periods. Oxidative stress and DNA damage have been proposed as mechanisms linking pesticide exposure to health effects. In the present study, we determined the levels of malondialdehyde (MDA) and 8-hydroxy-2'-deoxyguanosine (8-OHdG) in urine samples collected from agricultural workers in two provinces of Korea (n=60). An extensive questionnaire was developed to gather information on demographic characteristics of the participants and the details of protective measures. The influence of wearing personal protective equipment (PPE) and performing protective behaviours on the levels of these two biomarkers was also evaluated. The median urinary levels of MDA and 8-OHdG were 9.37 nmol/mg creatinine and 19.06 ng/mg creatinine. The levels of MDA and 8-OHdG were higher in male farmers. Farmers wearing greater numbers of PPE and performing more protective behaviours had significantly lower levels of MDA. Greater numbers of protective behaviours were significantly associated with lower levels of 8-OHdG. The results suggest that pesticide exposure could induce oxidative stress and DNA damage in agricultural workers, and wearing more numbers of personal protective equipment and performing protective behaviors could significantly reduce the levels of MDA and 8-OHdG.

Key words
Pesticide; Malondialdehyde; 8-hydroxy-2′-deoxyguanosine; Personal Protective Equipment; Protective behaviour

Topic: Occupational health

Title: Risk of TB in Healthcare Professionals: a Nationwide Population-based Cohort Study in Taiwan

Running title: Risk of TB in healthcare professionals

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Key words: Healthcare professionals, Occupational health, TB;

0622_P1-62

Risk of TB in healthcare professionals

Abstract

Objective

Previous epidemiologic studies had demonstrated that there was a higher risk of TB development among the healthcare professionals (HCPs). However, the evidence of these studies was relative weak because of small sample size, shorter follow-up period, and inadequate control selection.

In this current study, we conducted a population-based cohort study by using the nation-scale database to examine the risk of TB between HCPs and the general population. Further stratification analyses between different types of HCPs were also conducted.

Methods

We used the nationwide claims database of Taiwan to retrieve the longitudinal cohort information of all registered patients (>23.03 million residents, 99.2% of the entire population, and included whole HCPs) from 1996 to 2011. Patients with the history of TB infection before the index date, HIV infection, aged <20 years or >100 years were excluded from this study.

From the original database, we conducted the propensity score-matching with age, gender, comorbidities, and the index year to reduce selection bias, and finally a total of 189,447 and 1,487,658 HCPs and non-HCPs were included for further analyses. **(Figure 1)** The main study outcome was defined as the hospitalization for intra-pulmonary TB infection (extra-pulmonary TB cases were excluded from this study because of much few cases and the database limitation).

The Cox proportional hazards regression model was conducted to evaluate the hazard ratio (HR) with 95% confidence interval (95% CI) of TB infection between HCPs and non- HCPs. The Kaplan-Meier analysis with log-rank test was also conducted to examine the incidence of TB infection between (1) HCPs / non-HCPS and (2) subgroups of different HCPs, such as physicians, dentists, nurses, and other HCPs (including pharmacist, nutritionist, and social worker…etc.)

Result

In the Cox regression model, the HCPs had an increased adjusted HR to have TB infection compared with the non-HCPs after adjusting for potential confounding factors (adjusted HR = 8.09, 95% CI = 6.99-9.36, *P*<.0001). Remarkably, the physicians had the highest adjusted HR to get TB infection (adjusted HR = 10.58, 95% CI = 7.09-15.79, *P*<.0001). But it was interesting that the dentists did not have an increased risk of TB infection as we thought, even that they were frequently exposed to the expiration air particles or droplets from the patients (adjusted HR = 2.64, 95% CI = 0.83-8.41, *P*=0.1007). **(Table 1)**

In the Kaplain-Meier analysis with log-rank test, the HCPs had an obviously increased incidence to have TB infection compared with the non-HCPs during the median follow-up of 7.00 and 6,97 years, respectively (log-rank test, *P*<.000). Furthermore, the physicians, nurses, and other HCPs had gradually higher incidence of TB infection compared with the dentists as time goes by (log-rank test, *P* = 0.0003). (Figure 2 and Figure 3)

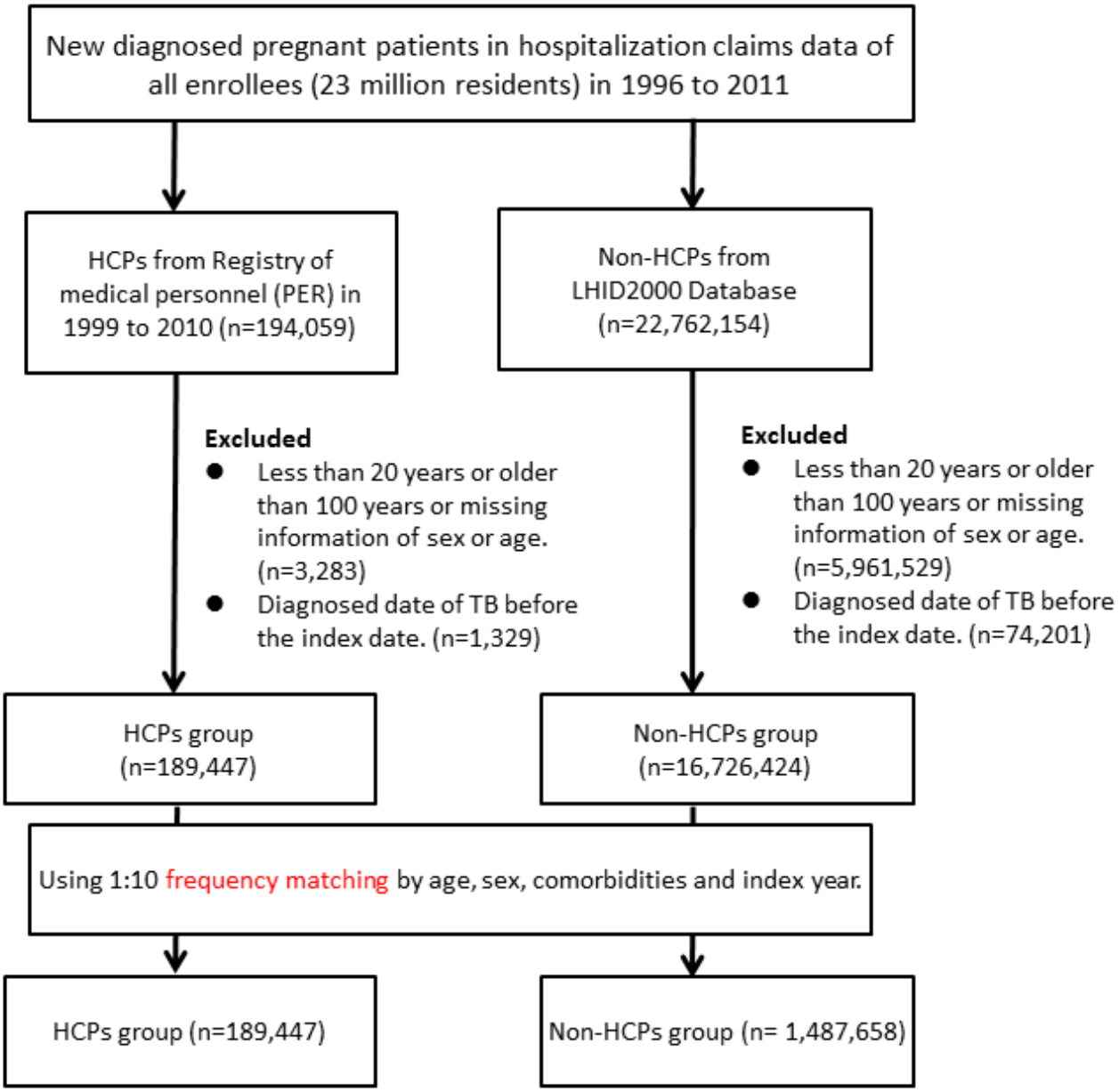
Conclusion

The HCPs have a greater risk of developing TB infections in Taiwan, especially the physicians and nurses. Surprisingly, there was no increased risk of TB infection in the dentists. Our findings emphasize the importance of renewing the policies designed to promote self-protection procedures among the HCPs through the education and training enforcement.

0622_P1-62

Risk of TB in healthcare professionals

Figure 1 **Selection process of the study and comparison cohorts.**



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Risk of TB in healthcare professionals

Table 1 **Cox model with hazard ratios and 95% confidence intervals of TB associated with HCPs**

Variable	TB no. (n=743)	Crude*			Adjusted†		
		HR	(95%CI)	p-value	HR	(95%CI)	p-value
Health care givers (HCPs)							
No	351	1.00	reference		1.00	reference	
Yes	**392**	**8.91**	**(7.72-10.29)**	**<.0001**	**8.09**	**(6.99-9.36)**	**<.0001**
Physicians (ref=non-HCPs)	**42**	**11.54**	**(8.38-15.89)**	**<.0001**	**10.58**	**(7.09-15.79)**	**<.0001**
Dentists (ref=non-HCPs)	3	2.96	(0.95-9.23)	0.0611	2.64	(0.83-8.41)	0.1007
Nurses (ref=non-HCPs)	291	9.63	(8.24-11.25)	<.0001	7.66	(6.52-9.01)	<.0001
Other HCPs (ref=non-HCPs)	56	6.13	(4.62-8.13)	<.0001	5.89	(4.39-7.90)	<.0001
Gender							
Female	643	1.00	reference		1.00	reference	
Male	100	0.66	(0.53-0.81)	<.0001	0.62	(0.49-0.78)	<.0001
Age							
20-29 years	628	1.00	reference		1.00	reference	
30-64 years	96	0.37	(0.3-0.46)	<.0001	0.42	(0.34-0.53)	<.0001
65-100 years	19	9.57	(6.06-15.11)	<.0001	11.78	(6.49-21.37)	<.0001
Comorbidities (ref=non-)							
Cerebral vascular disease	1	2.34	(0.33-16.58)	0.3937	0.41	(0.05-3.13)	0.3878
Ischemic heart disease	5	9.97	(4.14-24)	<.0001	2.22	(0.78-6.37)	0.136
COPD	6	12.06	(5.4-26.89)	<.0001	4.44	(1.83-10.74)	0.001
Chronic liver disease	7	4.41	(2.09-9.27)	<.0001	2.83	(1.3-6.13)	0.0084
Chronic kidney disease	13	22.26	(12.87-38.5)	<.0001	11.96	(6.46-22.15)	<.0001
Hypertension	10	7.64	(4.09-14.27)	<.0001	0.82	(0.33-2.06)	0.6702
DM	9	12.8	(6.63-24.7)	<.0001	4.06	(1.73-9.57)	0.0013
Hyperlipidemia	6	12.27	(5.49-27.4)	<.0001	2.18	(0.82-5.79)	0.1172
Cancer	4	2.44	(0.91-6.51)	0.0754	1.42	(0.49-4.13)	0.5161

Adjusted HR†: adjusted for HCPs, age, gender, insurance premium, urbanization level, and baseline comorbidities.

Figure 2 **Cumulative incidence rate of TB between the HCPs and non-HCPs.**

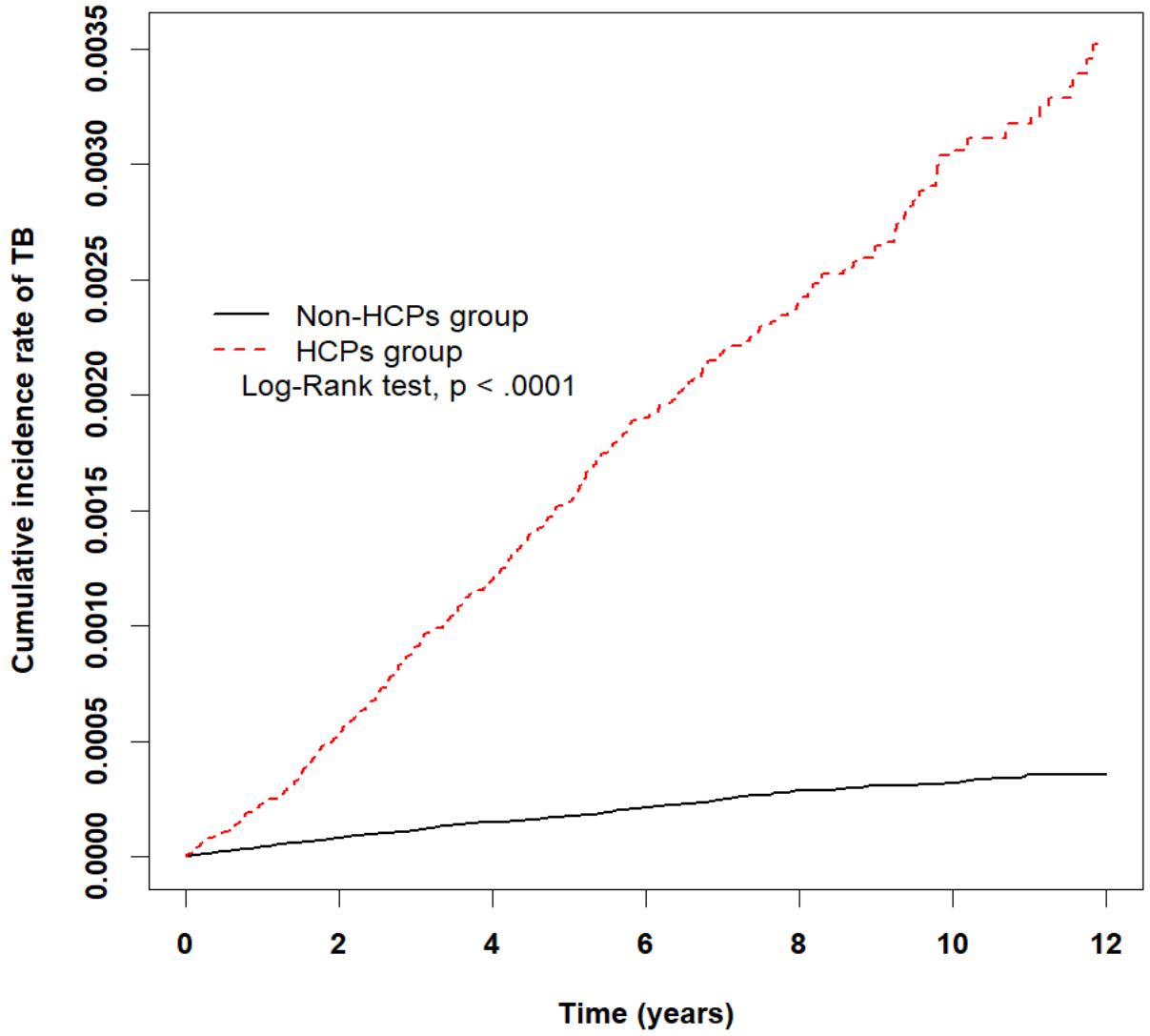
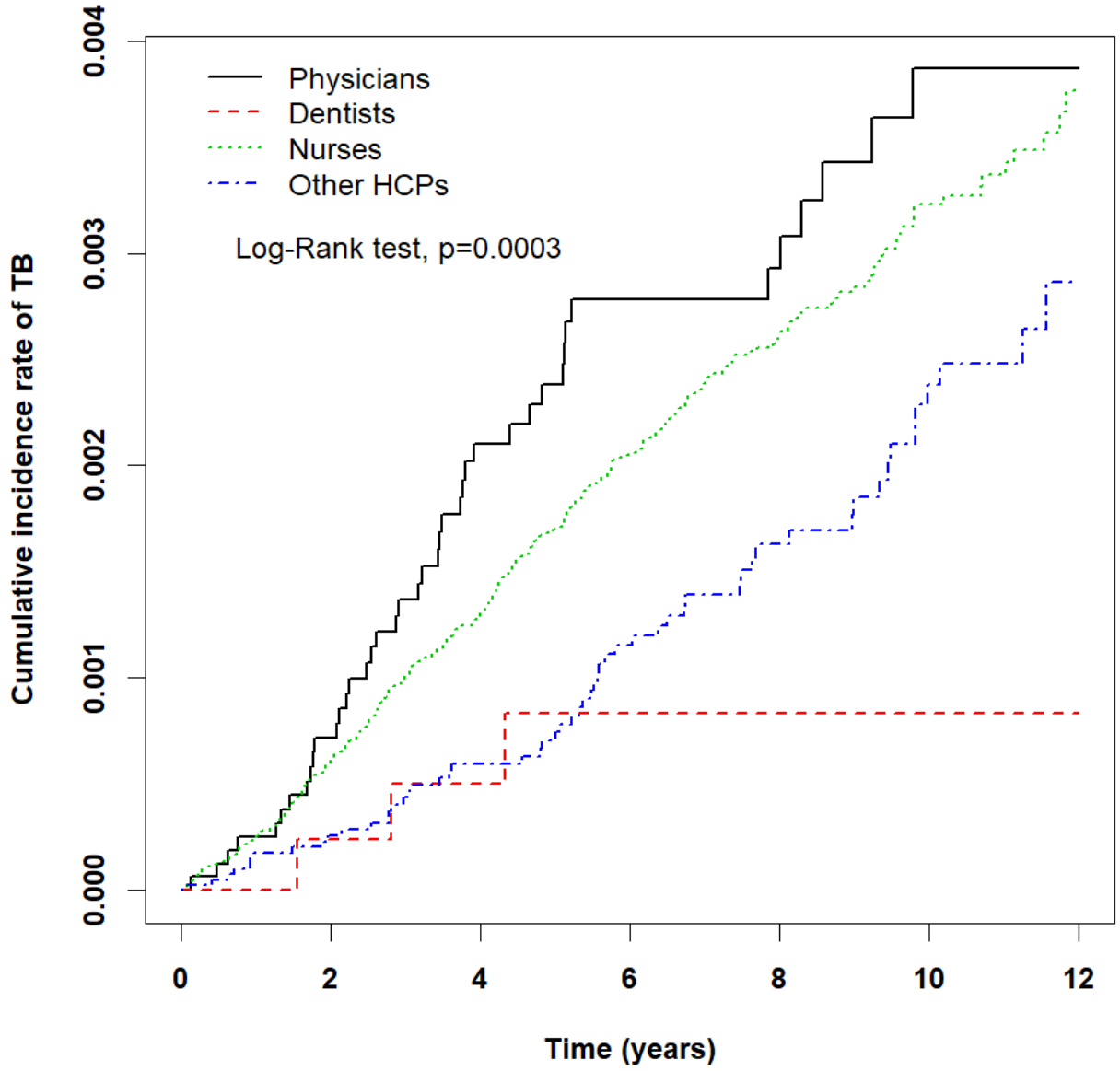


Figure 3 **Cumulative incidence rate of TB between the physicians, dentists, nurses, and other HCPs.**



0622_P1-63

Estimation of occupational exposure population in South Korea

It is important to know the number of workers exposed to health hazards in workplace in order to prepare and evaluate national plans for worker safety and health. This study was carried out in order to estimate the number of employees exposed to health hazards and the number of workplace hiring them by industry type (Korean standard industrial classification), size of industry, and their locations. The size of workplace was grouped into less than 5 employees, more than 50 employees, and between those two groups.
There are not many studies that tried to estimate the exposure prevalence from domestic and foreign literature surveys, and it was difficult to find reliable data in Korea, and data on workplace with less than 5 employees and non - manufacturing industries were especially rare.
In the analysis of questionnaires conducted by the Ministry of Employment and Labor, 46,694 workplace (30.7%) surveyed the 150,655 workplace of the manufacturing industry with more than five employees in 2016. Based on the questionnaire results among the 96,295 workplace for which the workplace environment was not monitored the percentage of the workplace exposed to one or more regulated chemical substances was 17.5%. Assuming that unresponsive workplace showed the same exposure distribution, estimated target workplace are 16,852. If the number of workplace that have already been monitored and the number of workplace that are estimated to be exposed to health hazards are added, it will make 63,146 (workplace). It is estimated that 41.9% of the total manufacturing industry needs to be monitored for health hazards.
In the Delphi survey showed that the exposure prevalence of the manufacturing and non-manufacturing industry are 54.5% and 16.6%, respectively, when counting the number of workplace, not the number of employees. When grouped by the size of industry into less than 5, more than 5 and less than 50, more than 50, the exposure prevalence of manufacturing industry were 46.3%, 65.3%, and 76.1% respectively. The exposure prevalence of non-manufacturing industry were 15.1%, 19.5%, and 31.8%, respectively.
The implementation rate (IR) of workplace monitoring was estimated as 50.0% for the manufacturing industry with more than 5 employees. IR decreases 27.3% and 2.9%, respectively, for manufacturing industry and non-manufacturing industry if industry with less than 5 employees is included. IR for all industry with any size was estimated as 13.3%.

0622_P1-64

Biomarkers of Blood Glucose Control in Taiwanese Shipyard Workers Exposed to Welding Fumes---A 3-Year Follow-Up.

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Abstract

Background and Aim

Ship building and repairing consist intensive welding processes that generate welding fumes contain several heavy metals such as chromium (Cr), Manganese (Mn), Cobalt (Co), Nickel (Ni), Copper (Cu), Zinc (Zn) and Cadmium (Cd). Insulin resistance and insulin has been regarded as an underlying mechanism of type 2 diabetes mellitus (T2DM) result in high glucose level. Epidemiological studies suggest exposed to fine particles and heavy metals increased morbidity and mortality of T2DM. Thus, we aimed to investigate biomarkers of blood glucose control in shipyard workers exposed to welding fumes.

Methods

We conduct a study cohort and recruit participants from a large ship building company in Taiwan in 2014, and followed-up yearly. 71 full attended males were enrolled into statistical analysis, including 39 welders and 32 workers who passively exposed to welding fumes. All participants were requested wore a $PM_{2.5}$ air sampling module during their working hours, donate their urine for heavy metals analysis and fasting blood for glucose, Insulin, HbA1c and advanced glycation end-products (AGEs) analysis.

Results

After generalized estimating equation (GEE) analysis adjusted for covariates including exposed group, attended year, interaction of exposed group and attended year, age, body mass index and urinary creatinine, log transformed urinary zinc and cadmium were found a positive relationship to HOMA-IR in log scale (Zn: β=0.242, 95%CI: 0.094-0.390, p=0.001; Cd: β=0.244; 95%CI: 0.062-0.425, p=0.008). Moreover, log transformed urinary zinc and cadmium were found a positive relationship to insulin in log scale (Zn: β=0.200, 95%CI: 0.068-0.332, p=0.003; Cd: β=0.200; 95%CI: 0.035-0.366, p=0.018). Furthermore, log transformed urinary zinc and cadmium were found a positive relationship to glucose in log scale (Zn: β=0.036, 95%CI: 0.009-0.063, p=0.010; Cd: β=0.049; 95%CI: 0.018-0.080, p=0.002). Otherwise, log transformed chromium were found a positive relationship to plasma AGEs in log scale (Cr: β=0.215, 95%CI: 0.055-0.374, p=0.008).

Conclusion

After 3 year followed-up and observed 71 participants (213 person-times), urinary zinc and cadmium were found related to increased fasting blood glucose and insulin, and also resulted in elevated insulin resistance. Moreover, urinary chromium were found related to increased plasma AGEs.

Key Words: Welding, Urine Heavy Metals, Insulin Resistance, AGEs.

0622_P1-66

Lipidomics of carcinogenic pollutants exposures from petrochemical industries.

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Background/Aim
Petrochemical industries emit carcinogenic pollutants that could induce common complex diseases, warranting a systemic evaluation of exposures and health impacts on nearby communities.

Methods
We applied a serum lipidomics approach to identify multiple pollutants exposure-induced deregulations in lipid profiles that could contribute to disease onset. 106 children (aged 9-15) and 146 elderly (aged >55) subjects were selected from a cohort of 3,230 residents near a petrochemical complex in Taiwan. Subjects were defined as high or low exposure groups according to distance from their home locations to the main emission points of the complex, and urine exposure biomarkers concentrations. Individual exposure levels including urine heavy metals and PAHs exposure biomarker 1-hydroxypyrene (1-OHP) were measured using ICP-MS and HPLC, respectively. Serum lipidomics were analyzed using UPLC-qTOF.

Results
Significantly increased urine concentrations of 1-OHP, vanadium, arsenic, strontium, cadmium, and thallium were found in high exposure groups compared to low exposure groups for both children and elderly study subjects. Lipid profiles showed clear separation between high and low exposure groups for both children and elderly subjects. 45 and 54 exposure-related lipids were identified in children and elderly age groups, respectively, including 6 classes of lipids: cerebrosides, ceramides, lysophosphatidylcholines, phosphatidylcholines, phosphatidylinositols, and sphingomyelins. In elderly subjects, exposure-related lipids were mostly upregulated (61.11%), while the trend was less obvious in children subjects (28.89%). Increased serum levels of ceramides and lysophosphatidylcholines have been associated with cancer formation and progression.

Conclusions
Our results demonstrate how a mixture of carcinogenic pollutants emitted from petrochemical industrial sources increased internal exposures in nearby populations in a distance-to-source-related manner, and disrupt internal lipid levels that could lead to disease onset in vulnerable populations.

Keywords
Petrochemical industry, lipidomics, heavy metals, polycyclic aromatic hydrocarbons

0622_P1-67

Association between heavy metal levels in urine, chronic kidney disease in residents of Dacheng and Zhutang township north to no 6 naphtha cracking complex

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Background/Aim
The No. 6 Naphtha Cracking Complex in Yunlin County is the largest petrochemical complex in central Taiwan. Previous studies show that residents living in Dacheng township, in Changhua County, which have higher urinary metal levels than residents who live in Yunlin County. This study investigates whether the heavy metals exposure from the petrochemical complex associated with alterations in estimated chronic kidney disease (CKD) among residents living in Dacheng and Zhutang township of Changhua County.

Methods
After excluded the duplicate subjects, there were 1,934 residents that were living in Dacheng and Zhutang townships.Their specimens had been detected for urinary metals and analyzed by ICP-MS. The study area was divided into three study zones to compare their health status and exposure, including Taisi village which is a village of Dacheng township, other villages of Dacheng township and Zhutang township. Two CKD indicators were as potential outcomes of exposure: (1) eGFR calculated through the equations of Chronic Kidney Disease Epidemiology Collaboration; (2) CKD defined as eGFR lower than 60 ml/min/1.73m^2.

Results
Our study subjects included 45% males and an average age of 58.71 years old. Their urinary nickel, vanadium, chromium and arsenic levels averaged at 7.83, 0.69, 2.53, 100.99 μg/g creatinine. Their overall mean eGFR was 73.73 ml/min/1.73m^2 with 19% of them lower than 60 ml/min/1.73m^2 , to which defined as probable CKD. For 1-fold increase in urinary nickel, vanadium and chromium levels, their eGFR significantly decreased by 0.75, 0.58 and 0.79 mL/min/1.73m^2, respectively; and for 1-fold increase in nickel and chromium levels, the odds ratio of CKD was significantly increased by 1.175, 1.145, respectively.Comparison of three zones, the mean heavy metals levels were significantly higher in Taisi village; and the mean eGFR was significantly lower in Taisi village.

Conclusions
Taisi village had the highest adults' urinary metal levels, compared to other two areas. Urinary metal levels increased as the distance to the petrochemical complex decrease. Distance to Complex and increased urinary metal levels were associated with decreased eGFR and increased odds ratio of chronic kidney disease.

0622_P1-70

DETERMINATION OF HEAVY METALS CONCENTRATION IN HAIR BY INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY (ICP-MS)

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Heavy metals are non-biodegradable pollutants in environment that can enter our bodies through different routes and accumulated in the body. Hair analysis is increasing in studies due to the advantage of results of any homeostatic mechanisms unlike blood sample. The aim of this study was to develop an analytical method to determine the concentration of nickel (Ni), arsenic (As), cadmium (Cd) and lead (Pb) in hair sample by ICP-MS. The analysis was performed using ICP-MS ELAN 9000 (Perkin Elmer) that equipped with a Meinhard concentric quartz nebulizer, cyclonic spray chamber, nickel sampler and skimmer cones. The validation of each element was done using human hair Certified Reference Material (CRM), USA. Spike recovery of these elements was done by using CRM and the values were within 85% to 115% for validation. The linear calibration curves were established using concentration of 5, 10, 20, 50, 70 and 100 ppb of each element with good linearity (r^2>0.999). The lowest limits of detection for Ni, As, Cd and Pb were 2.75 x 10^{-7} µg/g, 1.877 x 10^{-6} µg/g, 5.74 x 10^{-8} µg/g and 1 x 10^{-8} µg/g. The results prove that ICP-MS can provide better sensitivity and the detection limit can be achieved down to 1 x 10^{-8} µg/g. This approach offers the advantages of simplicity and ease of use as no pre-analytical steps such as digestion or extraction. In conclusion, ICP-MS can offer the capability to performed sub part per billion levels of multi-elements measurement. Hence this study demonstrated that ICP-MS can be effectively used for determination of heavy metal (Ni, As, Cd and Pb) in human hair.

Keywords: heavy metal, hair, ICP-MS

Passive sampling of dust in homes of schoolchildren for Derp1 allergen measurement in Taiwan

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ABSTRACT

House dust mite (HDM) is a major perennial indoor allergen source and probably the most important cause of allergic rhinitis and allergic asthma. Studies of indoor allergen exposures are often limited by the cost and logistics of home dust collection. Sample sizes are thus constrained. Therefore, subject-collected dust sampling appears to be a practical option for epidemiologic and clinical studies in measuring environmental allergen exposure. In this study, we evaluated the feasibility of having participants collect their own dust samples from desktops, bookcases or cabinets in the living room and bedroom.

A HDM survey of healthy, asthmatic, and allergic rhinitis schoolchildren was conducted. The children were enrolled from nationwide elementary schools between March 2016 and May 2017 after answering questionnaires of respiratory illness and symptoms. House dust was collected in the homes. Dust samples were analyzed for allergen content with ELISA for Der p 1. From 20 elementary schools, 334 students aged 6–12 years were selected as candidates for the study. Among their homes, the average Der p1 was 0.23 μg per gram of dust (range from 0-2.5 μg per gram of dust). The dust mite levels from desk, bookshelf, and cabinets were negatively associated with parental education and positively associated with dehumidifier use. Among children with asthma, home der p1 concentrations were higher than those without. We conclude that home collection using passive method of sampling in surfaces can be an alternative to active sampling.

0622_P1-72

The effectiveness of Asian dust now-cast/for-cast intervention among mothers of wheezing children in Japan: A randomized controlled trial

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Objective
Numerous studies have reported associations between particulate matter 2.5 micrometers (PM2.5) and respiratory morbidity/mortality. Asian-dust exposure is also associated with an increased risk of asthma hospitalization. We evaluated the effectiveness of a service that provides now-cast/fore-cast information about PM2.5/Asian-dust to mothers of wheezing-infants through their mobile phones in a timely manner.

Participants and Procedures
Participants included 479 infants from 4 prefectures in Japan. They were randomized to an intervention group and a waitlist control group. The intervention group had now-cast/fore-cast information about particulate matter (Asian dust and PM2.5) timely delivered to their smartphones. The primary endpoint was unscheduled clinic visits, which was estimated as an odds ratio by logistic regression. Other air pollution levels, meteorological factors, and influenza prevalence were taken into account as possible confounders.

Results
During the study period, PM2.5 levels were consistently low (never exceeded 35μg/m3), and some small to moderate Asian-dust events were observed. The incidence of unscheduled clinic visits was 2.21% (584 visits/total of 20,589 days) for the intervention group and 2.25% (600 visits/total of 26,619 days) for the waitlist control group, with no statistically significant difference between groups. However, for the incidence on Asian dust days, the odds ratio for unscheduled clinic visits for the intervention group compared to the waitlist control group was 0.30 (95%CI 0.09-0.97).

Conclusions
In this study of the effectiveness of a service that provided now-cast/fore-cast information about PM2.5 and Asian dust among mothers of wheezing children in Japan, a reduced risk for unscheduled clinic visits on Asian dust days was demonstrated. However, the primary hypothesis that the serviced group is less likely to have unscheduled clinic visits compared with the waitlist-control group during the study period was not achieved.

Evaluation of the Land Use Regression Model developed for Nitrogen Dioxide in Yokohama, Japan

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Introduction:
Land Use regression (LUR) model is one of the standard methods for exposure assessment in air pollution epidemiologic studies. In 2016, we developed a LUR model for nitrogen dioxide (NO2) in Yokohama, Japan based on the annual mean of NO2 concentrations from April 2005 to March 2006, but we found that it should be necessary to check whether the predicted values at the unmeasured areas are correct or not. This paper presents the results of validation study of the developed LUR model, and discusses the applicability of the model to air pollution epidemiologic study in Japan.

Methods:
We originally used NO2 data measured at twenty-nine monitoring stations for development of the LUR model. In this study, we newly gained the NO2 concentrations from *Yokohama City Air Pollution Investigation Report No. 46* published by Yokohama City Environmental Creation Bureau, and they were measured at 112 sites other than monitoring sites by using Ogawa badge for NOx over six two-month sampling periods. We used NO2 data at 50 sites with exact longitude and latitude information for this study. We compared the measured NO2 concentration with the concentration predicted by the developed LUR model for each site.

Results:
The correlation coefficient between the observed and predicted values was 0.64. The most underpredicted site (0.015 ppm below) was public facilities in the coastal area of Yokohama. This site is a wharf wedged between the north and south industrial areas. The most overpredicted site (0.007 ppm above) was the forested area located in the south of Yokohama City.

Conclusions:
Our study suggests the developed LUR model can be useful for air pollution epidemiologic studies with some zone size in Yokohama, excluding industrial areas and public facilities areas.

0623_P2-2

Comparison of exposure assessment methods for fine particulate matter in young adults in Taipei

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Background/Aim

Increased studies have confirmed that the plausible biological mechanisms that link $PM_{2.5}$ (Particulate matter with an aerodynamic diameter below 2.5 μm) exposure to acute or chronic health effects. There are many different assessment methods for the exposure to $PM_{2.5}$, such as personal sampling, environmental sampling, monitoring station data and model estimation (including Inverse Distance Weighting [IDW] or Land Use Regression [LUR]). Personal sampling is the most direct assessment methods but labour intensive, expensive and limited for its use in large epidemiological study. Monitoring station data could not be closely related to the actual exposure of individuals. Model estimation is an emerging assessment method which combines the data of monitoring stations and geographical factors. It is a convenient and efficient method of exposure assessment. However, limited information exists regarding the correlation among personal sampling, air monitoring stations, and model estimation. Therefore, we compared different exposure assessment methods for $PM_{2.5}$ from a longitudinal study among healthy young adults.

Methods

We recruited 81 healthy and non-smoking students from 2 areas (Neihu, Xinzhuang in Taipei). All collection procedures were repeated twice after a two-month follow-up period. We used personal samplers to collect 24 hours $PM_{2.5}$ samples. Hourly levels of ambient $PM_{2.5}$ was measured from monitoring stations. Moreover, we use the software (ArcGIS. version 10.2) for IDW and LUR model estimation.

Results

In general, all methods of $PM_{2.5}$ concentrations were higher during winter than spring and summer in Xinzhuang. $PM_{2.5}$ levels were higher in Xinzhuang than Neihu in winter.

In spearman correlation analysis, monitoring stations data was the highest related to personal sampling (R^2=0.662, p<0.001) in winter. But model estimation of IDW was the highest related to personal sampling (R^2=0.419, p<0.001) in spring. Moreover, both IDW and LUR model were higher related to personal sampling (R^2=0.559, p<0.001; R^2=0.531, p<0.001) than monitoring stations data (R^2=0.519, p<0.001) in summer.

Conclusions

Model estimation (including Inverse Distance Weighting, Land Use Regression) may provide a promising way to estimate the exposure to $PM_{2.5}$ in repeated measurements analyses. Additional analyses are needed to explore the relation between health effect and model estimation of exposure to $PM_{2.5}$.

Manganese (Mn) Level in Blood and the Risk of Alzheimer disease (AD); A Case-Control Study

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Background/Aim
Manganese (Mn) is known as a potential environmental neurotoxin substance. Epidemiological studies have found the evidence of an association between manganese exposure neurodegenerative disorders. Most of the studies emphasize the association between manganese and Alzheimer's disease(AD). However, it is still unclear whether serum Mn level might effect on cognitive disorders including mild cognitive impairment. Thus, this study focused on finding out the association between serum manganese level and amnestic mild cognitive impairment (aMCI) or Alzheimer's disease (AD)

Methods
A matched case-control study was conducted. 136 aMCI patients and 191 Alzheimer's disease patients were recruited from a university-based hospital from 2014 to 2017. Participants (N=1957) were older than 60 years and were from community based cohorts in Seoul, Incheon, Ganghwa and Wonju, South Korea. Four healthy controls for each aMCI (N=123) patients and AD patients (n=136) were randomly selected using age and sex matching method. Serum manganese level was analyzed from the collected blood samples. Conditional logistic regression was used, adjusting for education level, BMI, total cholesterol, triglyceride, high-density lipoprotein cholesterol, smoking and drinking.

Results
The geometric means of manganese level in the blood was 10.52μg/L (95%CI 9.67, 11.45) in AD patients and was 9.88μg/L (95%CI 9.67, 10.10) in control group. The geometric means of manganese level was 9.90μg/L (95%CI 9.40, 10.42) in aMCI group and 9.77μg/L (95%CI 9.55, 9.99) in its control group. The odds ratios was 3.36 (1.33-8.46) for AD and 1.32 (0.53-3.28) for aMCI.

Conclusions
Manganese level in blood was positively associated with the risk of AD, but the association with aMCI was not statistically significant.

Association between Exposure to $PM_{2.5}$ Air Pollution and biomarkers of Coronary Artery Disease

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Background/Aim
Numerous epidemiology studies have reported the association between ambient fine particulate matter ($PM_{2.5}$) and coronary artery disease (CAD). $PM_{2.5}$ exposure may change miRNA expression through inflammatory, oxidative stress and endothelial function pathways to influence the development of CAD. However, there are few studies have investigated the association between $PM_{2.5}$ and specific miRNA expression of CAD, the underlying mechanisms are still unclear.

Methods
We recruited 52 healthy adults and draw their blood sample when they go to health examination between September 2016 to September 2017 in Taiwan. We also collected the information of demographic, lifestyle and family history by structured questionnaire. We applied an inverse distance weighting approach to calculate an average exposure parameter for ambient $PM_{2.5}$. The levels of miRNAs expression were measured by qRT-PCR. We used linear regression models adjusted with confounding factors to estimate the association between different $PM_{2.5}$ moving average exposure time windows and the level of miRNA expression.

Results
We found negative association between $PM_{2.5}$ and miR-18a-5p, miR-21-5p, miR-31-5p and miR-320b among different exposure time windows. In the 3-day window, $PM_{2.5}$ exposures per 10 $\mu g/m^3$ increased were the strongest associated with decreased 0.23% (95% CI: -0.38, -0.07) for miR-18-5p, 0.36% (95% CI:-0.62, -0.11) for miR-21-5p, 0.16% (95% CI:-0.2, -0.13) for miR-31a-5p and 0.46% (95% CI:-0.74, -0.18) for miR-320b, respectively. No significant associations were observed for miR-181b-5p, miR-30a-5p, miR-328-3p, and miR-370-3p.

Conclusions
Our results suggest that $PM_{2.5}$ is associated with the level of miR-21-5p, miR-31-5p and miR-320b expression which may play an important role in biological mechanism between $PM_{2.5}$ and CAD.

0623_P2-9

Air pollution exposure and cognitive function in Taiwanese older adults: a longitudinal study

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Background/Aim
Longitudinal studies concerning the relations of exposure to air pollution and neuropsychiatric disorders including cognitive impairment among older adults were limited.This study aims to investigate the relations of short-term and long-term exposure to ambient air pollution (such as PM_{10} and O_3) and cognitive function in community free-living elderly population.

Methods
Participants were recruited by a multiple-wave nationwide survey of “Taiwan Longitudinal Study on Aging” from 1996-2007 (n=2241). Cognitive function was assessed by the Short Portable Mental Status Questionnaire (SPMSQ). Ambient levels of air pollution including daily concentrations of PM_{10} and O_3 from the air quality monitoring stations based on the administrative zone of participants’ residence were estimated for 1993-2007. Generalize linear mixed models were used to examine these associations adjusted for covariates.

Results
We found that long-term exposure to PM_{10} and O_3 were significantly associated with cognitive impairment (OR=1.09, 95% CI: 1.00, 1.19 for each 10 μg/m3 increment in PM_{10} exposure; OR=1.90, 95% CI: 1.39, 2.59 for each 10 ppb increment in O_3 exposure). The joint effect of exposure to PM_{10} and O_3 was associated with cognitive impairment ($P < 0.001$).

Conclusions
Co-exposure to ambient PM_{10} and O_3 could fasten the risk of cognitive impairment among older adults in Taiwan.

Factors influencing peak expiratory flow and fractional exhaled nitric oxide among Malaysian secondary school students

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Background/Aim
There have been many studies on the exposure to indoor and outdoor air pollutants and respiratory health. However, there are still few studies among students in tropical countries such as Malaysia. A cross sectional study was conducted to evaluate the influence of climate, outdoor air pollutants (SO_2, NO_2, O_3, CO and PM10), home environment and students' history of allergy and respiratory symptoms, on peak expiratory flow (PEF) and fractional exhaled nitric oxide (FeNO), a biomarker of airway inflammation.

Methods
A total of 487 students participated and their PEF and FeNO were measured between April and June of 2014 in Melaka and Putrajaya, Malaysia. Multivariate analyses were applied to investigate the associations between climatic factors, outdoor air pollutants and PEF and FeNO, adjusted for gender, BMI, smoking history and parental asthma or allergy.

Results
Pollen allergy (adj. b = 17.32, 95% CI: 2.04 - 32.60) and ozone exposure during 3 days before health tests (adj. b = −23.59, 95% CI: −39.23 - −7.96) were significantly associated with PEF levels, with p=0.026 and 0.003, respectively. Cat allergy (adj. b = 1.36, 95% CI: 1.05 - 1.75), wheeze (adj. b = 1.32, 95% CI: 1.01 - 1.71) and doctor-diagnosed asthma (adj. b = 1.36, 95% CI: 1.06-1.75) were significantly associated with FeNO levels, with p=0.019, 0.043 and 0.017, respectively.

Conclusions
Student's PEF was associated with pollen allergy and outdoor ozone. Meanwhile, student's FeNO was associated with respiratory symptoms and cat allergy.

Trend of daily air pollution and hospital admission in Kuala Lumpur Malaysia

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Background/Aim

The worsening air pollution has showed significant association with the hospitalization of cardiovascular and respiratory diseases. Days of the week have significantly more influence towards the trend of hospitalization whilst its relationship with air pollution is unclear

Methods

A time series study to identify the pattern based on the days of the week of the ambient air pollutants and the hospitalization and to examine the relationship was conducted. Daily hospitalisations of cardiovascular and respiratory diseases in a teaching hospital in Kuala Lumpur from 2010 to 2015 and daily concentrations of PM10, CO, NO2, SO2, and O3 were obtained for this study. Generalised Additive Model (GAM) model based on Poisson regression was performed.

Results
The results showed that cardiovascular and respiratory cases have lower hospitalisation on the weekend. CO, NO2 and SO2 have higher concentration on weekdays, however, ozone has higher concentration on weekends whereas PM10 have no certain trend. Based on the day of a week, cardiovascular hospitalisation shared the same highest peak on Tuesday with PM10. NO2, SO2 and CO. Respiratory also has higher peak on Tuesday although it is not the highest peak of the week. Higher concentration of CO, NO2 and SO2 on weekday could be attributed by due to higher traffic density. The ozone weekend effect (OWE) could lower the ozone concentration on weekend. For PM10, no definite pattern over the days of the week was seen.

Conclusions
The air pollution in Kuala Lumpur contributes to the increase of cardiovascular and respiratory hospitalisations and their risks will be estimated.

Keywords: air pollution, trend of days, cardiovascular and respiratory hospitalizations, Kuala Lumpur

0623_P2-12

Prenatal Exposure to Outdoor Air Pollution and Child Behavioral Problems in Japan

Background/Aim

Recent studies suggest positive associations between prenatal exposure to ambient air pollution and neurodevelopment of children, but evidence on the adverse effects of exposure to air pollution on child neurobehavioral development remains limited. We thus examined associations between prenatal exposure to outdoor air pollution and child behavioral developments, using data from a nationwide population-based longitudinal survey in Japan, where participants were recruited in 2001 and are continuously followed.

Methods

Suspended particulate matter (SPM), nitrogen dioxide, and sulfur dioxide concentrations during the 9 months before birth were obtained at municipality level and assigned to those participants born in the corresponding municipality. We analyzed data from singleton births with linked pollution data available (e.g., N=33,911 for SPM). We used responses to survey questions about behavioral problems at ages 2.5, 5.5, and 8 years. We conducted multilevel logistic regression analysis, adjusting for individual and municipality-level variables.

Results

Air pollution exposure during gestation was positively associated with risk for behavioral development problems. Specifically, air pollution was associated with verbal and fine motor development at age 2.5 years, with behaviors related to inhibition and impulsivity at 5.5 years, and with behaviors related to attention and delinquent or aggressive behavior at 8 years. In the fully-adjusted models, for example, odds ratios following one-interquartile-range increase in nitrogen dioxide were 1.24 (95% confidence interval: 1.07, 1.43) for inability to compose a two-phrase sentence at age 2.5, 1.10 (1.01, 1.21) for inability to focus on one task at age 5.5, and 1.09 (1.03, 1.15) for failure to pay attention when crossing a street at age 8.

Conclusions

Prenatal exposure to outdoor air pollution was associated with behavioral problems at age 2.5, 5.5, and 8 years in a nationally representative sample in Japan.

0623_P2-14

Association between personal PM2.5 exposure and markers of lipid peroxidation was confirmed in mixed model with a proper interaction term

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ABSTRACT

Background: Several epidemiological studies have reported associations between PM2.5 and oxidation, pulmonary and cardiovascular biomarkers of inflammation. However, environemtal epidemiological studies seldom considered appropriate components for repeated model to examined the persistent effect of PM2.5 exposure. Therefore, this study was examine the relations between personal PM2.5 exposure and markers of inflammation and oxidation by Linear Mixed-model (LMM) with different interaction term.

Methods: We conducted a panel study with three sampling time points (baseline, two months follow-up, and four months follow-up) among 68 healthy non-smoking young adults from 3 different areas (Area A [residential and commercial area], Area B [industrial area] and Area C [scientific park]). All participants were collected personal exposure to PM2.5, blood pressure, lung function, HRV, and inflammatory markers including WBC counts, plasma hs-CRP, fibrinogen, and vascular cell adhesion molecule-1 (VCAM-1). We used LMM was as follows: $Y_{it} = \alpha_0 + \alpha_1 Time_{it} + \beta_0 Z_{km} + \beta_1 Z_{km} Time_{it} + \gamma X_{i0} + \varepsilon_{km} + \varepsilon_i + \varepsilon_{it}$, where Z_{km}, where Zkm used four PM2.5 counting methods: (1) personal PM2.5 concentrations; (2) average personal PM2.5 concentrations at three sampling times; (3) average personal PM2.5 concentrations with area under the curve during 120days; (4) average personal PM2.5 concentrations during 120days (>35μg/m3 vs. ≤35μg/m3).

Results: The average PM2.5 concentrations was 37.3 μg/m3 for personal sampling and 31.6 μg/m3 for nearest air quality monitoring station. Among them, the personal PM2.5 concentrations in B zone was significant highest than A and C zone. After adjustment for age, gender, smoking habits, sampling zones, height, weight, temperature, and relative humidity, we found that the urinary N7-MeG/creatinine was significantly decreased with PM2.5 exposure concentrations, and urinary HEL/creatinine was significantly increased with PM2.5 exposure concentrations by time, regardless of which PM2.5 exposure models were used.

Conclusion: This study found that the cumulative PM2.5 exposure increased HEL of lipid oxidation marker, by LMM model with a proper interaction term.

Effect of spatial outliers on the regression modelling of air pollutant concentrations: A case study in Japan

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Background/Aim
Land use regression (LUR) or regression kriging have been widely used to estimate spatial distribution of air pollutants especially in health studies. The quality of observations is crucial to these methods because they are completely dependent on observations. When monitoring data contain biases or uncertainties, estimated map will not be reliable. The aim of this study is to examine the effect of spatial outliers on the estimation of air pollutant concentrations using regression methods and gain some insight into how to deal with observations that may include spatial outliers.

Methods
We applied the spatial outlier detection method based on kriging, which is widely used in soil science, to observations of $PM_{2.5}$ and NO_2 obtained from the regulatory monitoring network in Japan. The spatial distributions of annual means were modelled both by LUR and regression kriging using the datasets with and without the detected outliers respectively and the obtained results were compared to examine the effect of spatial outliers.

Results
Some observations in midrange were detected as outliers because dissimilarity of observations in neighbourhood was evaluated in kriging framework. In case of $PM_{2.5}$, spatial outliers increase RMSE by 17% and decrease r^2 by 0.07 for LUR model, and increase RMSE by 40% and decrease r^2 by 0.15 for the predictions by regression kriging. In case of NO_2, spatial outliers increase RMSE by 3% and decrease r^2 by 0.01 for LUR model, and increase RMSE by 19% and decrease r2 by 0.06 for the predictions using regression kriging. The discrepancy of the effect might be due to the difference in the characteristics of $PM_{2.5}$ and NO_2.

Conclusions
Our study demonstrated that the spatial outlier detection method is an effective procedure for air pollutant data and should be applied to it when observation-based prediction methods are used to generate concentration maps.

0623_P2-16

Determination of source and toxicity assessment on organic and inorganic extracts of PM 2.5 in Klang Valley region, Malaysia

Background/Aim

Evidences suggests that both elemental carbon (EC) and secondary inorganic aerosols are associated with adverse health effects. The pathogenicity of particulate matter (PM) is determined by their size, composition, origin, solubility and their ability to produce reactive oxygen species. PM2.5 can penetrate into the lung, irritate and corrode the alveolar wall, and consequently impair lung function. Previous study indicates that PM 2.5 emitted from coal combustion cause decrease in viability, increase global DNA methylation, and cause oxidative DNA damage at cellular level. This study aims to determine the source and assess the genotoxicity of organic and inorganic extracts of PM 2.5.

Methods

Three PM 2.5 samples will be collected from each of three different sampling stations. First station is located near a coal fired power plant (stationary source), followed by a station in Kuala Lumpur (mobile source) and any other local area that is affected by haze. Samples will be sonicated in dichloromethane (DCM) for organic extraction and in Ultrapure Water (UPW) for water soluble extracts. Acid digestion will also be conducted for inorganic extraction. Extracts will be analysed for composition analysis through ICP-MS for inorganic and water-soluble extracts and GC-MS for organic extracts. Principal Component Analysis (PCA) and Positive Matrix Factorisation (PMF) will be conducted to analyse the source of organic and inorganic pollutants residing within PM 2.5. Water soluble extracts and organic extracts from PM 2.5 will be exposed to V79 cells to assess its cytotoxicity in MTT Assay and genotoxicity in Alkaline Comet Assay with and without the influence of metabolic activation, S9. Physiological Based Biokinetic (PBBK) model will be conducted to specify the toxicity mechanism.

Results and Discussions

This study is still in early stages. All air samples will be analysed soon. Methodologies are also subjected to change accordingly.

P2-18

Associations of Particulate Air Pollution with Pleural Effusion Contained Metals in Patients with Lung Cancer

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Background
Epidemiology reports air pollution associated with lung cancer; however, interactions between the lungs and inhaled air pollution remain unclear.

Objective
The objective of this study is to investigate the effects of air pollution on metal concentrations of pleural effusion in lung cancer.

Methods
Pleural effusion samples were collected from patients with lung cancer and congestive heart failure (served as the control group) in a hospital in New Taipei City (Taiwan). Air pollution data was obtained from the Taiwan EPA air quality network for 1-year exposure ($PM_{2.5}$, aerodynamic diameter < 2.5μm). Inductively coupled plasma mass spectrometry (ICP-MS) was used to determine 14 metal elements (Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Mo, Ag, Sn and Pb) in pleural effusion. Regression analyses were used to examine the associations.

Results
There were 55 lung cancer and 27 congestive heart failure patients recruited in this study, whom had been done thoracentesis for pleural effusion drainage. The 1-y averages $PM_{2.5}$ were 24.90 $\mu g/m^3$ for lung cancer and 24.82 $\mu g/m^3$ for congestive heart failure. Exposure of $PM_{2.5}$ had a 1.05 fold higher odds ratio (95% CI = 0.84 ~ 1.24, $p = 0.74$) for lung cancer compared with congestive heart failure. An increase in 1 $\mu g/m^3$ $PM_{2.5}$ was associated with a decrease of 0.24 ng/mL of Al (95% CI = - 46.04 ~ - 2.18, $p < 0.05$) and an increase of 0.22 ng/mL of Sn (95% CI = 0.01~ 0.21, $p < 0.05$) in pleural effusion in lung cancer.

Conclusions
We observe the associations between $PM_{2.5}$ and metals of pleural effusion in lung cancer. The pleural effusion contained metals could be biomarkers for environmental lung cancer.

0623_P2-19

Disentangling the heatwave and $PM_{2.5}$ effects on outpatient cardiovascular and respiratory visits in Japan

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Background/Aim

Particulate matter with aerodynamic size of less than 2.5 micrometer in diameter ($PM_{2.5}$) has been observed to have adverse effects on human health. Complementing these exposure studies are meteorological studies which probe the adverse effects of temperature on health; some focusing on meteorological events, such as heatwaves (HW). A combination of both exposure and meteorological studies has resulted to a rich literature, which explored the interaction of temperature on $PM_{2.5}$-health association. However, only few studies have examined the effects of HW on $PM_{2.5}$-health association.

Methods

In order to elucidate these HW effects, we utilized the outpatient cardiovascular and respiratory data of 21 Japanese cities, from 2012-2017, together with the same period of environmental data. HW events were operationalized as days with temperature beyond 95th percentile, lasting for 2 days. Immediate delayed effects for $PM_{2.5}$ were set until Lag 3. Sensitivity analyses were also carried out with different HW definitions of duration (>4 days) and temperature intensities (97th and 98th).

Results

City-specific estimates were estimated, which were then pooled for the meta-analysis. Across-city average mean $PM_{2.5}$ was 14.5 µg/m3, with mean temperature at 23.9ºC, and a total of 909 HW days. Pooled HW effects were generally higher than the pooled delayed effects (at Lag 1) of $PM_{2.5}$ on either of the outpatient visits. However, pooled HW risks were particularly higher than the independent pooled $PM_{2.5}$ risks among outpatient cardiovascular visits than respiratory visits. Sensitivity analysis indicated that the changing intensities and duration have no significant impact on the HW risks.

Conclusions

Though there was no definite risk attribution in the city-specific analysis, some cities having significant HW effects, while others exhibiting none, it is noteworthy that the pooled HW effects were generally higher than that of the pooled $PM_{2.5}$ effects, particularly for cardiovascular visits. These results can be utilized for relevant healthcare management strategies.

Association between $PM_{2.5}$ chemical constituents and respiratory functions of asthmatic children in Nagasaki, Japan

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Background/Aim
Previous studies have estimated different levels of health risks attributable to $PM_{2.5}$ exposure, differently characterized by the chemical constituents depending on a location. We examined the association between $PM_{2.5}$ chemical constituents and respiratory functions of asthmatic children in Nagasaki, the westernmost mainland in Japan.

Methods
We collected daily peak expiratory flow (PEF; L/min) levels of asthmatic children during 2014–2015 spring (March to May). The PEF was self-measured as a form of diary twice a day (morning and evening). We also measured daily $PM_{2.5}$ total mass and its 23 chemical constituents. We fitted a linear mixed effect model to examine a short-term association between the $PM_{2.5}$ chemical constituents and the PEF levels, adjusting for sex, baseline age, year, ambient temperature, relative humidity, Asian dust event, and time (date). We incorporated a random intercept into the model to consider the variability between subjects. A delayed effect was examined using the $PM_{2.5}$ exposure of the previous day and an average over multiple days. All analyses were conducted separately for the morning and evening PEFs.

Results
A total of 19 children enrolled (mean age=7.6) measured the PEFs with an average of 213.0 (SD=52.3) and 220.2 (SD=52.8) L/min in the morning and evening, respectively. The mean concentration of $PM_{2.5}$ total mass was 19.1 (SD=11.2) $\mu g/m^3$. We found that higher sulfate and ammonium concentrations in the previous day were associated with lower levels of the evening PEFs ($p<0.05$). The estimated change in the PEF levels were -1.64 L/min (95% CI= -3.05, -0.22) and -1.75 L/min (95% CI= -3.17, -0.32) per an interquartile range (IQR) increase in sulfate (2.12 $\mu g/m^3$) and ammonium (1.17 $\mu g/m^3$), respectively. There was no evidence of the association for other chemical constituents and total mass.

Conclusions
Our preliminary results showed that some of the chemical constituents (sulfate and ammonium) were associated with the reduction of respiratory functions in the asthmatic children.

0623_P2-21

Fine particulate matter exposure and incidence of ischemic stroke in Taiwan

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Abstract

Background/Aim: We aimed to investigate the association of short-term and long-term exposure to fine particulate matter ($PM_{2.5}$) with the incidence of ischemic stroke in Taiwan.

Methods: Patients with the main diagnosis of ICD-9-CM (diagnosis codes: 433 and 434) who were hospitalized for their first ischemic stroke between January 1, 1996 to December 31, 2013 were retrieved from the 2005 Longitudinal Health Insurance Database (LHID). We performed a 1:2 case-control match using propensity score matching (PSM) analysis. Variables including gender, age, comorbid conditions, year, and degree of urbanization were controlled. Comorbid conditions were defined using the Deyo modification of the Charlson Comorbidity Index (CCI). $PM_{2.5}$ data and environmental factors were obtained from the air-monitoring stations. Spatiotemporal estimation was performed. We used multiple logistic models to estimate the effects of $PM_{2.5}$. The models were adjusted for season, temperature, and relative humidity in the corresponding study period.

Results: Over a follow-up of 8 years, we ascertained 30,105 patients, with 1:2 ratio in ischemic stroke group and non-stroke group after PSM. The characteristics between two groups were well balance in the aspect of gender, age, CCI, degree of urbanization and year. There were significant short-term and long-term relationships between $PM_{2.5}$ and ischemic stroke. The period before index date 2-3 days and 5-12 months moving averages of IQR increases in $PM_{2.5}$ were significantly associated with ischemic stroke (OR:1.04, 95% CI: 1.002-1.08; OR:1.07, 95% CI:1.003-1.13). The estimates for ischemic stroke were higher in middle-aged participants (55-65 years), participants living in middle-sized cities, women, and winter season.

Conclusion: There were significant short-term and long-term relationships between $PM_{2.5}$ and incidence of ischemic stroke in Taiwan.

Keywords: particulate matter, incidence, ischemic stroke, Taiwan

Development of accurate compact PM2.5 sensor and personal exposure instrument

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We have developed a new palmtop-sized optical PM2.5 sensor in cooperation with Panasonic Corporation. For accurate measurement of PM2.5 mass concentrations, the sensor is designed to be able to estimate particle sizes from the distributions of light scattering intensities from single particles and to detect small particles with diameter as small as 0.3 um by reducing background noise. The performance of the sensor is evaluated based on laboratory and field tests. The validation of the compact PM2.5 sensors was performed by simultaneous measurements with large beta-attenuation monitor (BAM) instruments in several places in Japan and Asian countries. Good correlation factors were obtained (R^2 = 0.8 - 0.9) in those laboratory and field tests. Even when the PM2.5 concentrations were high than 1000 ug m^{-3} in New Delhi, India, good correlation factors were obtained.

We have also developed a personal exposure instrument for PM2.5. The instrument consists of the PM2.5 sensor and a smartphone. The measured PM2.5 and GPS position data are automatically transmitted to a cloud server via the smartphone. Since the instrument is compact and light-weighted, it can be carried about all day long. The personal exposure instrument which is accurate in the wide range of PM2.5 concentration is suitable for epidemiological studies. In this presentation, we will present new applications of the PM2.5 sensor and personal exposure instrument.

Reference:

Tomoki Nakayama, Yutaka Matsumi, Keiko Kawahito & Yoshifumi Watabe (2017): Development and evaluation of a palm-sized optical PM2.5 sensor, Aerosol Science and Technology, DOI: 10.1080/02786826.2017.1375078

Sources of exposure to airborne viruses and the associated microbial community in a daycare setting

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Background/Aim
The microbiome of the built environment has become a recent focus of research, motivated by the quest to advance understanding of microbial ecology and human health**.** We are specifically interested in the airborne microbiome because people are constantly exposed to it through inhalation. While numerous studies have characterized the airborne bacterial and fungal microbiomes in the built environment, far fewer have focused on the viral microbiome. Herein we address this significant knowledge gap by describing the airborne viral microbiome of a daycare center, where numerous young children are exposed for a large fraction of the day.

Methods
Using a metagenomics approach and custom-built bioinformatics pipeline, we identified the seasonality of the airborne DNA and RNA virome of a daycare center from samples collected on heating, ventilation, and air conditioning (HVAC) filters every two weeks over the course of a year.

Results
We found that season and human occupancy had a strong influence on the airborne viral community composition. Our analysis demonstrated that human-associated viruses were more abundant during the winter season while plant-associated viruses were more abundant in the summer season. We found that DNA viruses typically showed the lowest alpha diversity in winter and highest in the spring/summer; however, RNA viruses showed an opposite trend. Further, we identified eight potential sources of viruses in indoor air: humans; pets; plants; plumbing systems; HVAC systems; mold; dust resuspension; and the outdoor environment.

Conclusions
Children attending daycare centers are exposed to a slew of microbes in air from a variety of sources. Through a more complete understanding of the airborne microbiome and sources of bioaerosols, biologists, engineers, and architects can work together to optimize the microbiome of the built environment to improve human health.

Source apportionment of $PM_{2.5}$ in an urban tertiary care hospital in the Philippines

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Background/Aim
Indoor air quality is a huge concern as people spend about 90% of their time indoors, where concentrations of some pollutants are 2-5 times higher than those found outdoors. The aims of this study were to identify and to apportion the possible sources of indoor $PM_{2.5}$ in an urban tertiary care hospital in the Philippines.

Methods
We conducted from two naturally-ventilated wards (NVWs) and two mechanically-ventilated intensive care units (MVICUs) a multi-week sampling in October-December 2013 and March-April 2014, and analyzed 231 indoor $PM_{2.5}$ samples by X–ray fluorescence. We applied source apportionment analysis with a receptor model, Positive Matrix Factorization (PMF) to classify possible contributors of indoor $PM_{2.5}$.

Results
PMF resulted in six physically interpretable sources. From the NVWs, sodium and chloride sources (11.48%), sulfur sources (36.09%), road dust (13.35%), soil dust (30.47%), and biomass burning (8.60%) were identified. Conversely, sodium and chloride sources (8.78%), sulfur sources (59.32%), soil dust (12.55%), and biomass burning (19.35%) were identified from the MVICUs. More sources were documented for NVWs compared to MVICUs. All the identified sources could be attributed to outdoor sources except for the sodium and chloride source. Furthermore, soil dust and sea salt sources were the only natural sources while the other identified sources were anthropogenic in origin. Seasonal variation was not established due to limited sampling period.

Conclusions
The findings highlight the contribution of anthropogenic outdoor pollutants to indoor $PM_{2.5}$. Engineering controls such as reinforcing the ventilation systems against outdoor pollutants should be implemented. Potential indoor sources of pollutants may be addressed by administrative measures.

0623_P2-29

Simulation study for the effect of periodic missing patterns on the $PM_{2.5}$–related mortality estimation

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Background/Aim

Although a periodic missing in $PM_{2.5}$ measurement occurred by the measuring cycle, many previous studies have estimated the association between $PM_{2.5}$ and mortality using the missing data without any further methodological considerations. Thus, results caused by the periodic missing patterns should be studied in-depth.

Methods

Our research examined weather the statistical properties of the association between particulate matter ($PM_{2.5}$) and mortality are affected by the periodic missing patterns through a simulation study; Five missing scenarios were used: 1) 1 out of 2 days missing, 2) 2 out of 3 days missing, 3) 3 out of 4 days missing, 4) 4 out of 5 days missing, and 5) 5 out of 6 days missing.

Results

We observed that the periodic missing patterns increased bias and mean squared error in the PM_{25}-mortality association, compared to the estimates from the complete data.

Conclusions

The results of this simulation study may suggest that the periodic measurements of $PM_{2.5}$ can lead to invalid results with respect to the bias in the point estimation of the $PM_{2.5}$-mortality association.

0623_P2-30

Attributable deaths caused by temperature and air pollution under RCP scenarios in Korea

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Background/Aim
Future temperatures are predicted under 4 types of Representative Concentration Pathway (RCP) scenarios. Especially, heat extremes, defined as 95% temperature, are known as risk factor of human health. In this study, we assessed the number of excess deaths caused by heat extremes under RCP 8.5 and 4.5 scenarios. Also, we estimated the differences of temperature-attributable deaths by considering PM_{10}.

Methods
We collected baseline (2003-2012) data on daily temperature and mortality in 230 districts. We used DLNM methods in 7 major cities, and then pooled through meta-analysis to find stable relative risk. Future mortality was estimated based on IIASA medium-variant population data, using the proportion of deaths to population in 2010 data. We divided the future period into the beginning (2026-2035), the middle (2046-2055), and the late (2076-2085) to calculate mean number of attributable deaths.

Results
The mean number of attributable deaths was 456.9 in baseline period when considering temperature. Although population based on IIASA was in decline, the number of attributable deaths were increased because of the increasing frequency of heat extremes and high relative risk in high temperature. There were 1704.9 and 1360.9 deaths in the beginning and 5321.5 and 13824.6 in late period under RCP4.5 and RCP 8.5 respectively. However, when we considered the model with temperature and PM_{10}, the attributable deaths were decreased.

Conclusions
Considering both temperature and air pollution, the number of future attributable deaths could be different. Therefore, it is important to consider the air pollution effect when estimating the future deaths.

0623_P2-32

Assessing effect modification of excess winter death by causes of death and individual characteristics in Zhejiang Province, China: a multi-community case-only analysis

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Background/Aim
Excess Winter Deaths (EWD) is a metric commonly used to quantify the additional mortality burden observed during winter months compared to other months of the year. This measure has rarely been quantified for Chinese populations, despite the varied climatic and socio-economic conditions present. Furthermore, the large populations involved allow for robust assessment of modification of the EWD value by cause-of-death and individual characteristics.

Methods
Graphical and statistical analysis of 398,529 deaths between January 2010 and December 2013 in Zhejiang Province, China, which has a mainly subtropical monsoon climate and four distinct seasons. Death data were collected from the Chinese National Disease Surveillance System. We used a Cosinor model to model seasonal patterns for specific causes. A case-only analysis of deaths in winter compared with other seasons was used to assess effect modification by individual characteristics, namely age, sex, education level, ethnicity, and place of death.

Results
Deaths peaked in winter and overall mortality was around 30% higher in winter than summer. Although diseases of the respiratory and circulatory systems were highly seasonal, surprisingly we observed that deaths from mental and behavioral disorders exhibited even greater fluctuation. EWD was particularly pronounced among males, those older than 60 and those without education. Also particularly common in winter were deaths in the emergency room, at home, on the way to hospital, and in nursing homes/family wards. Seasonality was least pronounced in deaths occurring outside of the city.

Conclusions
We observed that EWD is high in some previously unreported groups. Such knowledge can be used to anticipate the particularly high winter mortality rate expected for specific causes of disease and vulnerable population groups in China. This new information can facilitate the targeting of necessary preventive measures to those at greatest risk in order to mitigate current and future burdens of wintertime deaths.

0623_P2-33

Effects of dietary patterns and other factors on reports of maternal low energy among pregnant women in Chiba

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Background/Aim

According to the Developmental Origins of Health and Disease (DOHaD) theory, poor maternal nutritional status during pregnancy affects fetal development and may lead to increased risk of diseases in adulthood. The food questionnaire is used for assessing pregnant women's nutritional status. However, there are some studies focusing on underestimation of food intake. We aimed to identify potential factors for underreporting among pregnant women from Chiba of the Japan Environment and Children's Study (JECS).

Methods

We analyzed 4,611 participants' data from the Food Frequency Questionnaire (FFQ) and basic characteristics. Low Energy Reporters (LER, n=3,139) were selected based on the ratio of energy intake to estimated basal metabolic rate (BMR) and Goldberg's cut-off points. Those who gained less than 7 kg were defined as Small Eaters (SE, n=542), the others as Underreporting Eaters (UE, n=2,416). We conducted principal component analysis on LER (n=2,958) and categorized them into three groups of dietary patterns by cluster analysis. We studied the effects of dietary patterns, socio-economic status, and other factors on SE and UE.

Results

There were significant differences in age, pre-pregnancy BMI, and BMR between SE and UE. LER were categorized into different food intake groups, such as Low-vegetable, Prudent and Grain-based groups. SE's food intake was more Grain-based than that of UE, and UE's food intake was more Low-vegetable than SE food intake (p=0.012). Based on the results of logistic regression analysis, there were no significant differences in family income, education level, job status, and the previous gravidity between these two groups.

Conclusions

These findings point out that younger women who are pregnant tend to have unbalanced food intake, and they are less interested in their daily nutritional status. Nutritional guidance programs are necessary to ensure appropriate weight control in this group.

0623_P2-34

Effects of Blood lead levels for pre- and postnatal periods on autistic behaviors at 5 years of age.

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<Background>

Autism Spectrum Disorders is a syndrome with multiple causes and different mechanisms leading to abnormal development. Only a few longitudinal studies have investigated the association between prenatal and early childhood lead level exposure and autistic behaviors. We examined the effect of lead exposure on the autistic behaviors in children at 5 years to identify the sensitive time window of exposure considering potential gender difference.

<Method>

A total of 1,751 pregnant women and children participated in the prospective birth cohort study, Mothers and Children's Health (MOCEH) study since 2006. Lead level was measured at early and late pregnancy in maternal blood, in cord blood, and in children's blood at 2 years, 3 years, and 5 years of age. A total of 458 children at 5 years were assessed for behavior by using the Social Responsiveness Scale (SRS). The association between blood lead level at each time window and autistic behaviors was examined using generalized linear model adjusted for maternal age at pregnancy, maternal educational level, household income, residential area, and parity.

<Results>

Lead level at late pregnancy was significantly associated increasing risk of autistic behaviors in boys while lead levels in child's blood did not show associations: for 1 ug/dL increase of lead in late pregnancy maternal blood, score of Total - SRS increased by 3.26(95% CI: 1.19, 5.32) in boys, in which the interaction effect of gender was significant (p-interaction: 0.02). However, the blood lead levels at any time did not show a significant association with autistic behaviors in girls. However, the blood lead levels at any time did not show a significant association with autistic behaviors in girls.

<Conclusion>

Lead toxicity on children's autistic behavior at 5 years showed susceptible exposure time windows of late fetal period in boys. Lead exposure did not associate with autistic behavior in girls.

<Acknowledgement>

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0623_P2-35

Evaluating the potential mediating role of arsenic in the relationship between maternal diet and birth outcomes in rural Bangladesh

Epidemiological evidence suggested arsenic exposure during pregnancy might reduce birth weight of the infant. As diet alone can be a significant source of arsenic exposure, arsenic may indirectly affect infant growth by mediating the effect of maternal diet on birth weight (BW). This study utilized a large prospective birth cohort of 1057 eligible pregnant women in Bangladesh to explore the relationship between diet, arsenic exposure and birth outcomes, including BW, gestational age at birth (GA), and gestational weight gain (GWG), using a causal mediation analysis. Total energy and macronutrient intakes were calculated using data self-reported by a validated semi-quantitative food-frequency questionnaire. Arsenic exposure level was estimated by maternal toenail arsenic concentration. Effect estimates for exposure-mediator, exposure-outcome, and mediator-outcome relationships were calculated using multiple linear regressions and mediation analyses, which employed a counterfactual approach, were performed. Analyses were performed both with and without energy-adjustment. Multiple linear regression showed total energy intake was not significantly associated with toenail arsenic nor BW, in contrast, when decomposing diet intake into macronutrients and using other birth outcomes, higher absolute and energy-adjusted protein, fat and fiber intakes were associated with higher toenail arsenic and lower GA and GWG, while higher absolute and energy-adjusted carbohydrate intake was associated with lower toenail arsenic and greater GA and GWG. After adjusting for total energy, no significant natural indirect effects was observed by toenail arsenic level in the relationship between maternal diet and birth outcomes.

Increased risk for hypothyroidism associated with carbon monoxide poisoning: a nationwide cohort study

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Background/Aim
Carbon monoxide poisoning (COP) may cause injuries to the central nervous and endocrine systems, which might increase the risk of developing hypothyroidism.

Methods
We wanted to evaluate the association between COP and the risk of developing hypothyroidism because epidemiological data on this potential association are limited. We conducted a nationwide population-based cohort study using the Nationwide Poisoning Database and identified 24,328 COP subjects diagnosed between 1999 and 2012. By matching the index date and age, we selected 72,984 non-COP controls for comparison. Subjects with thyroid diseases and malignancy before 1999 were excluded. We followed up the two groups of subjects until 2013 and compared the risk of developing hypothyroidism.

Results
COP subjects had a significantly higher risk for hypothyroidism than non-COP controls (adjusted hazard ratio [AHR]: 3.83; 95% confidence interval [CI]: 3.16–4.66) after adjusting for age, sex, underlying comorbidities, and monthly income, and the AHR was particular higher in subjects with diabetes mellitus, hyperlipidemia, and mental disorder. The increased risk was highest in the first month after COP (AHR: 40.95; 95% CI: 5.40–310.62), and the impact remained significant even after 4 years.

Conclusions
In conclusion, COP was associated with an increased risk for hypothyroidism. Further studies regarding the underlying mechanisms are warranted.

Keywords: brain; carbon monoxide poisoning; endocrine; hypothalamus; hypothyroidism; pituitary; thyroid.

0623_P2-40

Indoor PM2.5 concentrations in Gers, Mongolia

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Background

The residents of a ger, a traditional house type in Mongolia, use coal for cooking and heating. Coal combustion in Ger area is one of the main sources of ambient and indoor air pollution in Ulaanbaatar, Mongolia. Many development assistance programs supported to installation of an improved stove for energy efficiency. The aim of our study was to characterize indoor $PM_{2.5}$ concentrations of ger by stove type in winter.

Methods

The study sample consisted of 60 Gers within Chingeltei district, Ulaanbaatar, Mongolia. Indoor particle number concentration in each ger was measured by light scattering monitor (Dylos) for 24 hours from Jan to Feb 2016. Twenty-nine gers had traditional stove and 31 gers had the improved stoves. The particle number concentration was converted to mass concentration using a calibration equation.

Results

Average 24 hour $PM_{2.5}$ concentrations were 257.5 ± 204.4 μg/m^3 in gers with improved stove and 203.9 ± 195.1 μg/m^3 in Gers with traditional stove. Daily profile with thirty minute averages of $PM_{2.5}$ concentrations showed concentration increase in the early morning and the highest concentration at noon. Temperature in gers was slightly higher than the recommended level in winter. Residential indoor PM2.5 concentrations in gers were not different by placement of improved stove.

Conclusion

Installation of improved stove was not associated with lower indoor PM25 concentration in gers. Effective control measures should be evaluated before implementation of the control measures in field

0623_P2-42

Characterization of exposure to humidifier disinfectants and health effects in Korea

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Background/Aim
Health effect such as lung disease caused by chemical substances (PHMG, PGH, CMIT/MIT) used in humidifier disinfectants occurred in Korea. Ministry of Environment of Korea (ME) has started to accept damage request for victims. ME has conducted environment exposure assessment for victims to evaluate lung disease and causal relationship by exposure to humidifier disinfectant, and organized the Expert Judgment Committee, and conducted a comprehensive judgment. The purpose of this study was to evaluate the exposure grade by scoring exposure characteristics recorded in survey and to compare relationships between exposure characteristics and comprehensive exposure results.

Methods
We assessed the characterization of exposure to humidifier disinfectants for victims using questionnaire survey, and classified the exposure into 5 grades such as definite, probable, possible, indeterminate and unlikely. Relationships between exposure characteristics such as ingredient of product, use amount, and use characteristics and health effects were conducted for 1,009 victims in 2017. The seven categories recorded in survey such as daily using time, cumulative time, using time during sleep, distance from respiratory organ, spraying direction, concentration in the air, exposure level of humidifier disinfectants were scored and exposure levels were graded.

Results
In the scored exposure grade, the definite, probable, possible, indeterminate grade were 158 persons (15.7%), 341 persons (33.8%), 362 persons (35.8%), 148 persons (14.7%), respectively. On the other hand, the final judgments with exposure grades and medical diagnosis were 40 persons (4%), 36 persons (3.6%), 63 persons (6.2%), 25 persons (12.5%), 845 persons (83.7%) in definite, probable, possible, indeterminate, unlikely grades, respectively.

Conclusions
There were differences between scored exposure grades and final judgements. It can be explained that the record of the questionnaire on past exposures may be uncertain due to recall bias or psychological effects. If the various health effects data of the humidifier disinfectant victims are analyzed, the users of similar conditions of the humidifier use characteristics might be grouped to inspect the health effect based on the exposure assessment results.

Keywords: Humidifier disinfectant, environment exposure assessment, Health effect assessment

Method suggestion of exposure assessment for children and housewives using time-activity pattern and indoor air concentration

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Background/Aim
Children and housewives may be affected by house indoor air quality since they spend most of their day at home. Although Ministry of Environment of Korea provides air pollutant concentration data through ambient fixed monitoring system, it could be different from actual exposure concentration because it has limitations such as distance and indoor environments. The purposes of this study were to estimate the concentrations of indoor air pollutants (IAPs) such as PM_{10}, NO_2, O_3, and to assess exposures to IAPs in house considering sources of IAPs and house residential time of housewives and children by analyzing time-activity patterns.

Methods
To estimate IAP concentrations, we applied the atmospheric dispersion model and indoor air quality model to air pollutant concentration from ambient fixed monitoring system. The indoor-to-outdoor (I/O) ratio was applied to O_3 without indoor sources, and indoor sources generated by human activities were considered for PM_{10} and NO_2. And the concentrations of PM_{10}, O_3, NO_2 were measured in houses with sensor instruments and gold standards. In addition, housewives and children were required to record their weekly time-activity diary to estimate indoor sources and amount of IAPs and to analyze the spending time in houses. The exposures to IAPs were assessed based on indoor IAP concentrations and time-activity pattern.

Results
The housewives and children were found to spend most of their times at home. The concentration of PM_{10} was increased by cooking, cleaning and activities of children. And indoor NO_2 concentration was increased by cooking with usage of gas range.

Conclusions
Children and housewives might be more likely to be affected by house indoor air quality than other sub-population groups because they spent most of their times at home. We estimated the concentrations of IAPs considering atmospheric dispersion model, indoor air quality model, indoor source, and I/O ratio, and assessed IAPs exposures of housewives and children by analyzing exposure time through time-activity pattern. These results will be expected to provide basis for preparing guidelines for prevention of diseases caused by house IAPs.

keywords: housewives, children, exposure assessment, indoor air quality, time-activity pattern

Study on the developmental stage-specific characteristics of infant exposure to phthalates

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Abstract:

Background: Phthalate pollution is becoming to be one of the most important environmental health issues. Because of fast growth and organ development, infant is believed to be most vulnerable to environmental pollutants. The developmental stage-specific physiological behaviors, metabolic mechanisms and capacities have not yet been characterized clearly till now.

Methods: The goal of this study to investigate infants' developmental stage-specific exposure to phthalates and the metabolic capacity. A prospective early life maternal-children cohort (n=150) were recruited from the Maternal and Child Health and Family Planning Service Center, Daishan, China, from March 2012 to December 2014. After babies being born, the urine samples from different development stages (0-6 month) were collected by the commercial disposable diapers and released by calcium chloride with the help of their mothers. Ten phthalate metabolites, including free and total concentrations of metabolites (free plus conjugated), were measured respectively by using HPLC-ESI-MS/MS combined with stable isotope dilution method. We assess statistically the profiles of phthalate exposure for each of the development stages, i.e., the newborn, 14-days, 28-days, 42-days, 3-months and 6-months, respectively.

Results: We found that there were significant variations in infant phthalate's body burden and biotransformation including hydroxylation, oxidation and glucuronidation in different developmental stages (0-6 months). The body burden of pollutants and the ability of metabolizing PAEs gradually increases with the growth and development of infants and young children.

Conclusion: Infants' developmental stage-specific metabolism of phthalates was characterized by time-series biomonitoring. Finally, the study would contribute to some basic knowledge of infant exposure risk to phthalates, and could refine the infant cohort risk assessment.

Keywords: Phthalate exposure; Infant population; metabolism

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Cumulative Risk Assessment of Phthalates in the Taiwanese Adult Population before the 2011 DEHP Food Scandal: Results from the Nutrition and Health Survey in Taiwan (NAHSIT) 1993-1996 and 2005-2008

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Background/Aim
Phthalates (PAEs) which may have potential adverse health effects are widely used in industrial and daily products. However, there is little information about the exposure levels of PAEs in general population before the 2011 DEHP (di-2-ethylhexyl phthalate) food scandal in Taiwan.
Using health risk assessment indicators, including daily intake (DI), hazard quotient (HQ) and hazard index (HI), to investigate the distribution and trends of PAEs and cumulative risk of Taiwanese adults.

Methods
We selected 402 and 459 adults by stratified random sampling from the Nutrition and Health Survey in Taiwan (NAHSIT) 1993-1996 and 2005-2008, respectively. We calculated the DI of 5 PAEs, including Dimethyl phthalate (DMP), Diethyl phthalate (DEP), Dibutyl phthalate (DBP), Benzyl butyl phthalate (BBP) and DEHP, and chose the reference dose (RfD) of U.S. Food and Drug Administration (FDA) as an acceptable exposure reference value to compute the HQ and HI.

Results
The DI and HQ of DMP, DBP and DEHP in 2005-2008 were lower than those in 1993-1996 ($P<0.0001$, $P=0.047$ and $P=0.001$, respectively), BBP was higher than that in 1993-1996 ($p<0.0001$). The DI and HQ of DMP, DBP, BBP and DEHP in men were significantly lower than those in 1993-1996 ($P <0.0001$, $P =0.002$, $P =0.0003$ and $P =0.003$, respectively) The DI and HQ of DMP in women were significantly lower than those in 1993-1996 ($p= 0.0003$), but the DI and HQ of BBP were significantly higher than those in 1993-1996 ($P<0.0001$). In addition, the proportion of HI > 1 was decreased from 11.9% in 1993-1996 to 7.6% in 2005-2008, and the highest proportion of HI > 1 was in the 19-40 years group (80% and 61.54%, respectively).

Conclusions
The levels of exposure to DEHP, DMP and DBP gradually declined from 1993-1996 to 2005-2008. Efforts to reducing exposure to environmental phthalates are needed to improve public health.

0623_P2-48

Determination of skin adhesion rate of children's modeling clay for exposure assessment in Korea

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Background/Aim
Children are more vulnerable for chemical exposure. Children's behavioral characteristics and different usage patterns of children's goods make exposure and risk assessment more challenging. Accurately measuring the usage patterns of children's goods is important to conduct realistic exposure assessments and to manage risk of children's goods. Since it was easy to adhere children's modeingl clay to skins, accurate exposure assessment needed skin adhesion rate. The purpose of this study was to determinate skin adhesion rate of children's modeling clay for exposure assessment.

Methods
Children's modeling clays were classified into 9 categories as PVA clay, starch-based clay, foam clay, rubber clay, oil clay, muddy clay, terra clay, paper clay, slime. A total of 29 children's clay goods was selected. Clays were placed in food dryer for 48 hours at 72℃. Gravimetric difference of clays were determined for measuring moisture content(%). Hardness of clays was measured using OO type shore hardness tester. A total of 5 young adults (age 20-29) handled the modeling clay for 3 minutes. Clays' gravimetric differences were determined and used to estimate the amount of skin adhesion(g/min). Skin adhesion rate(g/min/cm^2) was estimated by measuring each individual's palm surface area(cm^2).

Results
Twenty five of the 29 children's modeling clay products were adhesive to skins. Four products of foam and rubber clay were not adhered to skin. For the 25 products, the average skin adhesion rate was $5.5x10^{-4} \pm 4.0x10^{-4}$ g/min/cm^2. The highest skin adhesion rate was $1.1x10^{-3} \pm 2.8x10^{-4}$ g/min/cm^2 for paper clay. The lowest skin adhesion rate was 4.6x10-5 ± $1.1x10^{-4}$ g/min/cm^2 for oil clay. The skin adhesion rate was increased with increase of moisture content.

Conclusions
The study determined skin adhesion rate of children's modeling clay to skin. These exposure factor are useful as input data for exposure and risk assessments and setting safety guidelines to protect children's health.

0623_P2-49

Pesticides exposure measurements using urine samples from infants and toddlers

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Background/Aim

Exposure measurement is necessary for risk assessment. Biological monitoring (BM) using urine reveals overall exposure of individual study participants to pesticides coming from all sources and via all pathways. However, urine sampling in infants and toddlers before toilet training in epidemiological studies is challenging. This is why reports regarding their exposure levels to insecticides were limited. This presentation introduces our BM methods using disposable diapers and the urinary concentrations of insecticide metabolites in Japanese infants and toddlers.

Methods

We established the urine extraction method from diapers using acetone and applied the method to a birth cohort study called Japan Environment and Children's Study (JECS). We recruited the diapered participants of Aichi Regional subcohort of JECS when they became1.5 and 3 years old between June 2015 and September 2017. Six urinary dialkylphosphates (DAPs) and creatinine (Cr) were analyzed by ultra-performance liquid chromatography with tandem mass spectrometry.

Results

Six hundred ninety-one children were enrolled both at 1.5 and 3 years. The median concentrations (nmol/g Cr) of the urinary total dimethylalkylphosphates (∑DMAP), total diethylalkylphosphates (∑DEAP), and total DAPs (∑DAP) were 157.6, 54.7, and 249.2 in 1.5-year-old children and 177.1, 67.5, and 258.1 in 3-year-old children, respectively. Reproducibility of exposure categories at both ages classified using quartile DAP concentrations was poor. The medians of ∑DAP concentrations in each season (nmol/g Cr) at 1.5 and 3 years old were 199.4 and 213.2 for spring, 235.5 and 270.6 for summer, 340.5 and 506.1 for fall, and 239.6 and 257.3 for winter, respectively. The concentrations in fall at both ages were higher than those in other seasons (p<0.05 except for a difference between fall and winter at 1.5 years old).

Conclusions

The OP exposure levels in Japanese young children were revealed. Seasons contributed to the levels.

0623_P2-50

PM2.5 Exposure Assessment for Aged Subjects in an Large-scale Epidemiological Study with Micro-sensors and Exposure Modelling

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Background/Aim
Better estimates of exposure levels provide more accurate results on damage coefficients of exposure-health relationships in epidemiological studies. Most of the current epidemiological studies using ambient levels as surrogates for PM2.5 exposure are underestimating actual exposure levels due to various close-by PM2.5 exposure sources in daily activities, especially in Asia. The actual PM2.5 exposure levels can be assessed with micro-sensors; in combination of exposure modelling, more accurate exposure estimates can be obtained for large-scale epidemiological studies. This presentation showcases an example of using PM2.5 micro-sensors, time-activity diaries, and exposure modelling to estimate PM2.5 exposures for a large-scale epidemiological study in Taiwan which aims at evaluating the health impacts of PM2.5.

Methods
There were four steps in this work. First, a PM2.5 exposure model was established (based on USEPA Air Pollution Exposure Model (APEX)) and modified considering important PM2.5 exposure sources in Taiwan. The culture specific sources were included such as emissions from motorcycle, incense-burning and cooking. Measurements from PM2.5 micro-sensors and GRIMM provided exposure increments due to these important sources in Taiwan. The second step is to validate this exposure model, with actual exposure measurements from an independent personal monitoring campaign with 63 subjects in four locations in Taiwan. A time-activity diary (TAD) designed in an earlier work for understanding exposure characteristics of the aged subjects in Taiwan was used. Ambient PM2.5 levels from Taiwan EPA, weather conditions from Central Weather Bureau (CWB) and TADs were important inputs of the exposure model. After the model validation, the third step is to simulate PM2.5 levels of the aged subjects in a nationwide large-scale epidemiological study which applied the same TAD. There were 1728 subjects from 5 different hospitals in Taiwan. Simulation of PM2.5 exposure of these aged subjects were conducted for 24 hours based on their TADs and observations from Taiwan EPA and CWB near the subjects. The fourth step is to evaluate the exposure characteristics of those aged subjects.

Results
Readings from micro-sensors were evaluated against GRIMM instruments to obtain their correction factors. Exposure increments due to important exposure sources in Taiwan obtained with micro-sensors and GRIMM were used to modify this PM2.5 exposure model. For validation, the model results comparing to actual measurements had correlation coefficient 0.7, mean fractional bias 0.07, and mean fractional error 0.42. This indicated that the model performance met the evaluation criteria of Taiwan EPA. For simulation of 1728 subjects from 5 hospitals, PM2.5 exposure levels of subjects ranged from 20-90+$\mu g/m^3$. The exposure levels of subjects in Chiayi and Kaohisung were higher than the subjects in other locations. Moreover, there were differences among different seasons. Whether such seasonal differences are due to seasonal effects or different exposure behaviors among subjects need to be evaluated further. The highest exposure occurred in the winter of 2015 in Chiayi, PM2.5 levels could reach up to 90+ $\mu g/m^3$. The major exposure sources were vehicle emission, cooking fume, and incense-burning. Male subjects had higher percentages of time experiencing vehicle emission while female had higher percentages of time experiencing cooking fume and incense-burning emission in all five locations.

Conclusions
This work estimated personal PM2.5 exposure levels using a combination of micro-sensors, TADs, and a modified and validated exposure model for a large-scale epidemiological study. This exposure sensing and simulation provides a close-to-reality PM2.5 exposure with less manpower and resources than personal exposure assessment with personal monitors. The exposure estimates of the exposure modeling and exposure behaviors collected by TADs can provide valuable inputs for epidemiological investigations, health risk assessments, health-oriented pollution reduction strategies and health promotion tactics.

Keywords: aerosols, exposure simulation, low-cost sensor

0623_P2-51

Interaction between Dioxin Exposure and Smoking in the relation to Diabetes

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Background/Aim: Diabetes is considered to be a multifactorial syndrome and is affected by genetic factors, environmental exposure and dietary intake. Dioxin may binds to aryl hydrocarbon receptor (AhR), which plays an important role in dioxin toxicity. Previous studies have been found association between dioxin exposure and diabetes. Smoking is also important to diabetes. Due to smoking may cause insulin resistance and decreased insulin secretion, which associated with diabetes. The interaction between dioxin exposure and smoking has not been investigated yet. Our study was to investigate the independent and joint effects of smoking and dioxin exposure on the risk of diabetes.

Methods: We conducted a cross-sectional study of 282 participants living in Central Taiwan.The dioxin data were measured by chromatography/mass spectrometry (HRGC/HRMS). Participants completed a detailed questionnaire, including smoking habits and demographic factors. We performed logistic regression models to evaluate the risk for diabetes and applied the additive scale to estimate interaction.

Result: We analyzed the data with dioxins level presented as quartiles. We classified dioxins level into four groups: reference group (<25th), low exposure group (25th to <50th), middle exposure group (50th to <75th) and high exposure group (≥75th). After adjusting for confounding, we found that middle exposure group of 1,2,3,7,8-PeCDF (aOR=3.18; 95% CI=1.13-8.93), PCDDs (aOR=4.00; 95% CI=1.20-13.30), OCDD (aOR=3.10; 95% CI=1.10-8.76) and PCDD/Fs (aOR=4.40; 95% CI=1.32-14.69) had higher risk for diabetes compared with the reference group. Moreover, the OR of diabetes in smoking group was 2.32 (95%CI=1.15-4.69) compared to non-smoking group. Additive interactions between dioxin (PCDD/Fs) exposure and smoking on the risk of diabetes was found (S=2.19 [95%CI:0.48, 10.08]).

Conclusions: Our study suggests that specific dioxin (1,2,3,7,8-PeCDF, PCDDs, OCDD and PCDD/Fs) and smoking may increase the prevalence of diabetes. We further provide new evidence of the synergism effects of smoking and dioxins exposure on the risk of diabetes.

0623_P2-52

Prevalence of idiopathic environmental intolerance attributed to electromagnetic fields in recipients of magnetic resonance imaging examinations

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Background/Aim: Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF), previously known as the electromagnetic hypersensitivity syndrome (EHS), is defined as a set of symptoms perceived by individuals when they are exposed to electromagnetic fields (EMF). In recent years, the use of magnetic resonance imaging (MRI) examinations has increased, and the EMF from MRI scanners are the strongest that the general population may encounter. MRI scanners form images with a strong magnet, a gradient coil, and a radio frequency coil. These three components produce three types of EMF: a static magnetic field, a varying electromagnetic field, and radio frequency. Previous studies have been conducted on symptoms associated with the EMF from MRI, but almost all of them aimed at occupational exposure among medical staff. As the examinees are a much larger population, we conducted a study on the symptoms experienced by MRI recipients to identify associated factors.

Methods: We conducted a hospital-based study and recruited participants who were between 20 to 79 years of age at a medical center in Taiwan. The MRI facility was a Philip Achieva 1.5T MRI scanner. All participants were volunteers among examinees who were arranged to receive MRI examination. We used a standard questionnaire to collect data on demographic characteristics and symptoms before the MRI examination. The same questionnaire of symptoms was administered again immediately after the MRI examination. We excluded candidates who were arranged to receive a brain MRI or who had history of brain lesions, seizures, psychiatric problems, or claustrophobia.

Results: We recruited 200 candidates, who all completed the questionnaires. We excluded 9 who reported having diplopia, which is not a typical symptom of IEI-EMF and thus was used to identify over-reporting. Of the 191 participants included in the analyses, 37 (19.4%) had symptoms during the MRI examination that were not perceived before the examination ($p<0.001$ for the Mc'Nemar test). The five most common symptoms which appeared only after the MRI examination were dizziness (17, 9.2%), ear discomfort (16, 8.9%), anxiety (11, 6.1%), palpitation (10, 5.4%), and poor attention (7, 3.7%). Of the 10 participants with self-reported IEI-EMF, 9 reported symptoms after the MRI examination, with an OR of 22.92. The risk factors for new-emerging symptoms after the MRI examination included self-reported IEI-EMF history (OR=22.9, 95% confidence interval [CI]: 2.83-185.7, $P<0.001$), having symptoms before the MRI examination (OR=7.52, 95% CI: 3.28-17.3, $P<0.001$), and perception of EMF during the MRI examination (OR= 3.59, 95% CI: 1.70-7.60, $P=0.001$).

Conclusions: We found the prevalence of self-reported IEI-EMF was 5.2%, and the participants reported more symptoms after the MRI examination. However, symptoms were infrequently reported by participants without IEI-EMF. Further studies are needed to clarify whether the symptoms are caused by the EMF produced by the MRI scanner.

Key Word: Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF), hypersensitivity syndrome (EHS), magnetic resonance imaging (MRI)

P2-53

Useful Biomarkers to Determine the Hepatotoxicity of N, N-dimethylformamide (DMF)-exposed Workers

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Background/Aim:

N, N-dimethylformamide (DMF) is useful in the manufacture of fibers and films, and as a booster solvent in printing and adhesive formulations. In this study, we would like to investigate various biomarkers of liver disease in workers exposed to DMF, and to assess the dose-response relationships among the biomarkers and DMF exposure. We also would like to use liver sonogram as diagnostic golden standard of liver diseases, and to find out the most sensitive or specific biomarkers in detecting DMF-related liver diseases with a view to have earlier interventions in the future.

Methods:

We designed a cross-sectional study, and recruited 107 DMF-exposed workers, and 111 controls workers in 2013. DMF-exposed workers were further divided into high and low exposure groups according to exposure frequency. We performed walk-through survey of the workplace, and reviewed the personal record. Clinical survey of workers including questionnaires, physical examinations, liver sonogram, blood tests and urine tests were collected. Multivariate regression models were built to confirm the relationship among exposure status and biologic markers of liver disease after adjusting for confounding factors.

Results:

Significantly higher average urine N-methylformamide (NMF) level was observed in high and low DMF exposure groups than controls. A significant dose response relationship was also observed. The workers with liver sonogram determined chronic liver disease were significantly elder, more male, higher body weight, more seniority, and with higher urine NMF level than controls. In the regression model, a significant association was observed between hepatitis status and Alpha2-macroglobulin (MG2) abnormality; high DMF exposure and Human Cartilage Glycoprotein-39 (GP39) abnormality. There was a significantly negative association between high, low DMF exposure and matrix metalloproteinase 2 (MMP2) abnormality; between high exposure, hepatitis status and Haptoglobin abnormality after

adjusting for others. ALT, GGT and Haptoglobin of FibroTest panel had significant association with chronic liver disease. ALT of Ashtest panel and AST, ALT, MMP2 of AshTest+ panel had significant association with fatty liver. ALT of Nashtest panel and AST, ALT, MMP2 of NashTest+ panel had significant association with fatty liver. ALT, sugar of SteatoTest panel and ALT, sugar, MMP2 of SteatoTest+ panel had significant association with fatty liver.

Conclusion:

In the current study, we found that liver functions abnormality (AST, ALT, GGT, Haptoglobin, GP39, MMP2) could be found in DMF-exposed workers. The results also indicated that a significant abnormality of GGT and matrix metalloproteinase 2 after low DMF exposure, which suggested that GGT and matrix metalloproteinase 2 are more sensitive markers to detect DMF induced hepatoxicity.

Keywords:

Dimethylformamide; Hepatoxicity; Biomarkers.

Probabilistic health risk assessment on imported bovine gelatin product from BSE-occurred countries for Taiwanese consumer.

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Background/Aim
Mad cow disease (Bovine spongiform encephalopathy, BSE) has caused considerable commercial and economic impact in many countries in the past decade. Although good management measures are implemented internationally, there still have food safety concerns regarding bovine-derived products (bovine gelatin). In addition, because of imported food products account for a large proportion of Taiwan's food market, the health risks of imported food by Taiwanese consumers need further study. The aim was to quantitatively assess Variant Creutzfeldt-Jakob Disease (vCJD) risk of imported bovine gelatin from BSE-occurred countries for Taiwanese consumer with probabilistic approach.

Methods
Importing countries take the United States as an example, with reference to the prevalence rate of BSE, the number of BSE cattle, and the productivity of bovine gelatin used as the model parameters. In addition, the acidification can reduce the infection rate factor of $1.0 \times 10^{-4.5}$ as the infectivity reduction by processing. The daily intake rate of gelatin is assumed 5 g/day to represent the contents in Taiwan diet. Furthermore, conversion reaction rate of prion has been estimated in the mathematic model to estimate exposure dose and lifetime vCJD risk of bovine gelatin.

Results
The median of vCJD risk from USA imported bovine gelatin is 8.40×10^{-9} and 95% confidence interval limit is 2.64×10^{-8}. As a reference, the upper bound vCJD risk from USA imported bovine gelatin was under an excess lifetime cancer risk of WHO which means imported bovine gelatin products from USA are acceptable for Taiwanese consumers.

Conclusions
The exposure dose and vCJD risk of bovine gelatin imported from USA have been assessed by using our established and validated mechanism-based statistical and mathematic model with probabilistic estimation. In mathematic model, acidification is an important factor of product processing to reduce prion infectivity in bovine material. Although the median and upper bound excess vCJD risk from USA imported bovine gelatin are lies in acceptable level, the intake rate of gelatin should be investigated for reducing uncertainty.

Oxidative Stress Effects on Semiconductor Workers of Exposure to Arsenic

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Background/Aim: Arsenic (As) compounds are extensively adopted in the semiconductor industry. Exposure to inorganic As in the workplace may result in the generation of highly reactive oxygen species, and the consequent oxidative stress promotes the development of cancer. This study examines the induction of oxidative stress in semiconductor workers by exposure to As.

Methods: Exposure was evaluated by measuring As levels in the urine, hair, and fingernails of workers. Both urinary 8-OHdG and MDA concentrations were measured to quantify overall oxidative stress in the human. The study participants were 518 male non-smoking workers, comprising 149 maintenance staff, 278 production staff, and 91 control subjects at 3 semiconductor factories in Taiwan. Personal spot urine samples, hair samples, fingernail samples and questionnaires were used to quantify exposure to As, oxidative DNA damage, lipid peroxidation, and environmental pollutants. Urinary As(III), As(V), monomethylarsonic (MMA), dimethylarsinic acid (DMA) were adopted to provide an internal dose of inorganic arsenic. Urinary 8-OHdG was employed as an oxidative DNA damage marker, and urinary MDA was used as a lipid peroxidation marker. Urinary As(III), As(V), MMA, and DMA were separated by HPLC and then detected by flow injection atomic absorption spectrometry. Urinary 8-OHdG and MDA concentrations were measured using HPLC/MS/MS and HPLC, respectively. The relationship between workers' urinary 8-OHdG and As levels, and that between their MDA and As levels were both estimated using multiple linear regression models.

Results: Geometric mean urinary levels of As, 8-OHdG and MDA in workers who had been exposed to As consistently exceeded those in control subjects. Urinary 8-OHdG concentrations were significantly positively correlated with urinary total inorganic arsenic metabolite (As(III) + As(V) + MMA + DMA) concentrations. Urinary MDA concentrations were not significantly correlated with urinary total inorganic arsenic metabolite.

Conclusions: Exposure to inorganic arsenic leads to an increased risk of oxidative DNA injury among semiconductor workers. As in urine, hair, and finger nail samples of semiconductor workers, revealing a need to develop immediately preventive measures, including ventilation improvement, the use of gloves and respirators to protect the health of semiconductor workers.

Keywords: inorganic arsenic metabolites, arsenic in hair, arsenic in fingernail, semiconductor workers, oxidative stress

Association between shift work and increased plasma homocysteine in steel manufacturing workers

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Background / Aim

Several previous studies have shown an association between shift work and cardiovascular disease. Plasma homocysteine level is also known as an independent risk factor for coronary artery disease. This study aims to investigate the relationship between shift work and increased plasma homocysteine in steel manufacturing workers.

Methods

This study collected the results of a health check-up of 456 workers (91 daytime workers, 365 night-shift workers) in the department of steel mill and rolling. Multiple logistic regression analysis was performed by adjusting the age, BMI, and blood pressure (SBP, DBP).

Results

Multivariate analysis showed that the risk of increased plasma homocysteine was significantly higher by 2.01 times (95% CI: 1.096 ~ 3.685) in the night-shift workers for more than 20 years comparing to da-time workers. The risk of increased plasma homocysteine was not significant in the group who worked for less than 10 years (OR 0.957, 95% CI: 0.526-1.72), and those who worked for 10 to 20 years (OR = 1.705, 95% CI: 0.816-3.563).

Conclusions

The incidence of increase of homocysteine was significantly higher in the group with long night shift work. The results of this study suggest that the risk of cardiovascular disease may be higher in a group with long-term night shift work.

0623_P2-60

The Analysis of Health Hazards for Foundry Workers in Taiwan

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Background/Aim
Studies have thus far indicate that workers in the foundry industry are among the high-risk groups suffering from silicosis, but there is no clear picture on the actual situation of workers suffering from silicosis in the foundry industry. The purpose of this study is to analyze the situation of workers suffering from pneumoconiosis or silicosis, estimate their risks, and provide prevention strategies for workers in the foundry industry.

Methods
The study using generation database of the foundry workers, linked with occupational injury payment, hospitalization expense, cancer registration of labor insurance database and health insurance database from 2000 through 2011, to calculate numbers, incidence and prevalence rates of pneumoconiosis or silicosis.

Results
Data from the Bureau of Labor Insurance between 2000 and 2011 indicates that no foundry worker had been hospitalized or had applied for benefits due to pneumoconiosis or silicosis. However, the National Health Insurance data reveals that the prevalence rates for foundry workers seeking medical attention due to pneumoconiosis or silicosis are 1.98 per thousand and 0.12 per thousand, respectively, while incidence rates are 0.06-0.38 per thousand and 0-0.11 per thousand, respectively. 60-70% of those who sought attention for pneumoconiosis are aged 45 to 60 when they first began foundry work; 40-50% of workers sought medical attention for pneumoconiosis and silicosis after 5 years of foundry work.

Conclusions
We recommend that future health insurance databases can be combined to strengthen the monitoring of workers' health condition and occupational disease, and to establish a notification system to strengthen case management. Also, the Occupational Safety and Health Administration of Ministry of Labor is to continue to provide health examination services and track workers who have left the industry, and to give priority to counsel the steel foundry industry in their implementation of exposure assessment, special health examination, protective equipment and education and training.

Keywords: Foundry, Silicosis, Pneumoconiosis

0623_P2-61

Work related health symptoms of woven fabric workers, Northern of Thailand

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Background/Aim

In Northern part of Thailand, woven fabric is the famous products but the information regarding to their work-related health symptoms are not well established. This study was conducted using a qualitative study with the aim to determine work related health symptoms of woven fabric products of the local in Northern part of Thailand.

Methods

An in-depth interview was completed by face to face from workers in woven fabric with natural dye community during 2017. There were all of members in natural dye community getting involved in this study.

Results

Most of the participants were female, age between 50-70 years. Woven workers expose to several of physical disorders activities, hazard, such as twisting, excessive bending, long period sitting and carrying loads. These are activating factors associated with health problems, especially symptoms of musculoskeletal disorders. The intensity of musculoskeletal symptoms was categorized into 9 parts (neck, shoulder, upper back, elbow, lower back, hand, hip, knee, and foot). The result showed that most common that affecting them was low back pain follow by shoulder and neck pain. Some of them reported upper back, hip and foot pain sometimes.

Conclusions

The finding suggested that the risk factors of work related health symptoms among woven fabric workers should be investigate. Furthermore, the improvement of working environment and educational related to working activities should be conducted in this community.

0623_P2-62

Occupational health for Indigenous weavers

Background: Increased demands Indigenous art led to increase workloads for traditional weavers. An ergonomically-friendly weaving machine was developed by the Institute of Labor, Occupational Safety and Health to reduce weaving-related injuries. This study aimed to explore Indigenous weavers' attitude toward using weaving machine and identify other occupational hazards among Indigenous weavers.

Methods: Structured questionnaires were used to collect data on (1) current demand and use of weaving machine (2) attitude toward a newly designed weaving machine, and (3) potential occupational hazards among Indigenous weavers. The research team hosted workshops across Taiwan on the application of weaving machine. Focus groups were also used collects more detail descriptions of weavers' work environment and their concerns on work related health and safety issues.

Results:
310 valid questionnaires were returned for statistical analysis. 30 weavers participated in the focus group. The most reported work-related hazard were poor ergonomics (40.3%) and poor lighting (32.8%). Poor ergonomics arose from repeated activity (68.5%) and sitting for a long time (67.5%). Most Indigenous weavers did not use weaving machine and had not heard of the newly designed weaving machine before, and 56.9% to 77.9% of the participants reported willingness to use the newly designed weaving machine after the workshop.

Discussion:
Literature reviews on weaving culture showed that Indigenous-weaving industry in Taiwan is essential for cultural inheritance. Most weaving workers have strong cultural identification and hold on to their cultural practices. Participants showed high interest in learning the new waving machine and cared about the ergonomic design. The study did found differences in attitude by ethnic groups, and factors that influence the use of weaving machine included the type of product that the weaver produced and weavers' attitude toward modernization. Responses from the focus group showed that work environments were diverse and were dependent on business and management styles.

0623_P2-64

External Indium Exposure and Internal Dose in Workers Operating Different Working Patterns in an Indium-Tin Oxide Target Manufacturing and Recycling factories in Taiwan.

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Background/Aim
The increased demand of ITO has resulted in more frequent and intense inhalation of indium/ ITO among LCD workers. Since 2003, more than 10 cases of indium lung diseases such as interstitial pneumonia and pulmonary alveolar proteinosis (PAP) have been reported in the USA, Japan, and China. Therefore, the potential health hazards of workers exposed to indium cannot be ignored. To investigate the relationship between indium exposure and internal dose of indium among workers with different job characteristics. In order to improve the work environment, and to protect workers from excessive exposure to airborne contaminates, it is of prime important to assess contamination of workplace in different processes.
Methods
We conducted a cross-sectional study and recruited all 329 workers from ITO target manufacturing and recycling factories. They were categorized into six groups, as powder section, ITO target section, bonding section, processing section, recycling section and administration (reference group). Field and personal air sampling were used to assess the exposure of indium among workers. Cumulative exposure was evaluated by respirable dusts in personal air sampling, exposed frequency and work duration.
Plasma indium (P-In), urine indium (U-In) and creatinine adjusted U-In (U-In/Cre) were analyzed as internal dose. Demographics and potential confounders were collected by a self-reported questionnaire.
Results
One-fourth of air indium concentration in work areas of the ITO target production and recycling factories were higher than TLV. Thirty-six percent of workers in this study exposed to unacceptable airborne concentration of indium. Over one-fifth of workers had P-In higher than biological exposure index (BEI). The geometric mean (GM) and geometric standard deviation (GSD) of P-In, U-In and creatinine adjusted U-In (U-In/Cre) of exposed group were 0.95 ± 5.01 μg/L, 0.76 ± 4.07 μg/L and 0.54 ± 3.47 μg/g creatinine respectively, and were 0.11 ± 3.16 μg/L, 0.15 ± 3.16 μg/L and 0.13 ± 2.63 μg/g creatinine among reference group. The range of P-In, U-In and U-In/Cre were 0.02-59.12, ND-40.56 and ND-16.75 among exposed group and the P-In, U-In and U-In/Cre of reference group were ranged 0.02-2.59, 0.02-2.19 and 0.03-1.10. After adjusting for potential confounders, significant difference were found between different sections for internal dose of indium. Bonding section workers had the highest P-In (β: 1.05, $p<0.001$), while recycling section workers had the highest U-In (β: 0.87, $p<0.001$) and creatinine adjusted U-In (β: 0.67, $p<0.001$).
Conclusions
Relationship between indium exposure from air sampling and internal dose was established by our study. We compared the results of field air sampling and biomonitoring from different work areas, except to establish the correlation between field air sampling and P-In in ITO manufacturing facilities, we suggest that U-In was an useful biomarker to assess the indium exposure of indium recycling workers. Indium distributed and eliminated differed by its chemical form, thus, to characteristic the chemical form of indium is important before biomonitoring. Notably, although workers were exposed to indium under ACGIH recommended TLV, biomonitoring data still exceeded JSOH recommended BEI. An Appropriate exposure index need to be specified.

TITLE: HIGHER LIVER CANCER MORTALITY IN AN AREA NEIGHBORING TO A CHLORALKALI PLANT

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Introduction:
Polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs) are carcinogens. To evaluate their associations with various cancers, we conducted a study in an area neighboring to a chloralkali plant, which manufactured sodium pentachlorophenol between 1964 and 1979. The soil and water were found to be contaminated with PCDD/Fs.
Methodology:
We calculated the standardized mortality rate ratios (RRs) using indirect standardization adjusting for gender, age, and calendar year from 1976 to 2000 with the death rates of the surrounding townships and the whole nation as the references. The 95% confidence intervals (CIs) were calculated by using Poisson regression. When the overall mortality RR of a cancer was found to be statistically significant, further analyses for 5-year intervals were performed.
Results:
Among the cancers studied, only the mortality RRs of liver cancer in female were significantly higher than that of the surrounding townships (RR=2.17, 95% CIs: 1.17-4.03) and the whole nation (RR=2.55, 95% CIs: 1.37-4.74). Further analyses of female liver cancer mortality showed significantly higher RRs in 1976-1980 and 1986-1990.
Conclusions:
Although this study was unable to control some important risk factors for liver cancer, our findings showed possible carcinogenic risks in the population living near the deserted chloralkali plant. Further study analyzing data on individual residents should be conducted in the future.

P2-67

Lifetime risks, loss of life expectancy, and health care expenditures for 19 types of cancer in Taiwan

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Background/Aim

The mortality rates for different cancers are no longer an efficient tool for making national policy. The purpose of this study were to quantify the lifetime risks, life expectancies (LEs) after diagnosis, expected years of life lost (EYLL), and lifetime health care expenditures for 19 major cancers in Taiwan.

Methods

A total of 831,314 patients with 19 pathologically proven cancers were abstracted from the Taiwan Cancer Registry from 1998 to 2012. They were linked to the National Mortality Registry (1998–2014) and National Health Insurance reimbursement database (1998–2013) for survival and health care costs. We estimated the cumulative incidence rate for ages 0–79 years and the lifetime survival function for patients with different cancer sites. The EYLL was calculated by subtracting the LE of each cancer cohort from that of the age- and sex-matched referents simulated from national life tables. The estimated lifetime cost was calculated by adding up the product of survival probability and mean cost at the corresponding duration-to-date after adjustment for the inflation to the year of 2013.

Results

There were 5 cancers with a lifetime risk exceeding 4%: colorectal, liver, lung, and prostate in males, and breast and colorectal in females. Cancers with EYLL of >10 years were: esophageal, intrahepatic bile ducts, liver, pancreas, oral, nasopharyngeal, leukemia, lung, and gallbladder, extrahepatic bile ducts and biliary tract in males, and intrahepatic bile ducts, pancreas, nasopharyngeal, lung, esophageal, leukemia, liver, gallbladder, extrahepatic bile ducts and biliary tract, ovary, and stomach in females. Cancers with lifetime health care expenditures exceeding US$50,000 to the National Health Insurance were as follows: leukemia, kidney, testis, renal pelvis and ureter in males, and renal pelvis and ureter, leukemia, breast, urinary bladder, kidney, ovary, and nasopharyngeal in females. All these impacts should be considered in health policy decisions.

Conclusions

The impacts of cancer in Taiwan are very large. Future studies must consider both quality of life and the entire impact from societal perspectives. Above findings are recently accepted and will be published in Clinical Epidemiology, and our current project supported by the National Health Research Institutes aims to estimate the health impacts under different levels of $PM_{2.5}$ for the increased new cases of following diseases: chronic obstructive lung disease, lung cancer, stroke, and acute myocardial infarction.

0623_P2-68

Concomitant therapy versus triple therapy for the first-line treatment of Helicobacter pylori infection

BACKGROUND: Whether concomitant therapy is superior to triple therapy of various treatment lengths for the first-line treatment of *H. pylori* remains controversial.

OBJECTIVES: To compare the efficacy of concomitant therapy and triple therapy given for 5 to 14 days.

METHODS: Randomized control trials (RCTs) comparing the efficacy of concomitant therapy for 5 to 14 days and proton pump inhibitor-amoxicillin-clarithromycin (PAC) based triple therapy for 5 to 14 days in the first-line treatment of *H. pylori* infection published from 1990 to January 2018 were searched from the PubMed, Cochrane Library and Embase. Abstracts from international annual conferences were also searched. The primary and secondary outcomes were the eradication rate according to the intention-to-treat analysis and the adverse effects, respectively. Subgroup analyses were also performed according to treatment length.

RESULTS: Of the 639 articles identified, 23 RCTs including 3,305 patients in the concomitant therapy group and 3,327 patients in the triple therapy group were eligible. Overall, concomitant therapy was superior to triple therapy [Risk ratio (RR):

1.15; 95% confidence interval (CI):1.09-1.21; p<0.001]. However, there were significant heterogeneity (I^2=72.9%, p<0.001). In the subgroup analysis, 5-day concomitant therapy was superior to 5-day triple therapy (RR: 1.30;95% CI:1.04-1.62; p=0.02), 5-or 7-day concomitant therapy was superior to 7-day triple therapy (RR: 1.16; 95% CI: 1.12-1.21; p<0.001), and 7-or 10-day concomitant therapy was superior to 10-day triple therapy (RR: 1.15; 95% CI: 1.08-1.23; p<0.001). However, 5- or 10-day concomitant therapy was not superior to 14-day triple therapy (RR: 1.02; 95% CI: 0.89-1.16; p=0.796). The frequency of adverse effects was significantly higher in concomitant therapy than triple therapy (RR: 1.19; 95% CI: 1.06-1.34; P=0.004).

CONCLUSIONS: Concomitant therapy given for 5-10 days was superior to 5-10 day PAC based triple therapy, but was not superior to 14-day triple therapy.

0623_P2-70

Increased Incidence of Tinnitus in Patients with Hyperthyroidism

Tinnitus is the perception of a sound in the absence of exited sound. It puts variable discomforts on individual from disregardful to annoying and even disabling. Many causes and association of tinnitus have described in previous studies. Hearing impairment, anxiety, insomnia and vertigo are commonly associated with tinnitus. The association between thyroid disease and tinnitus has been described. However, the causation between hyperthyroidism and tinnitus has not been reported. We conducted a retrospective cohort study using Longitudinal Health Insurance Database 2000 (LHID2000). The comorbidity-specific hyperthyroidism cohort to non-hyperthyroidism cohort were significant for the patients without a comorbidity (adjusted HR = 1.35; 95% CI = 1.18–1.55) and for the patients presenting with any comorbidity (adjusted HR = 1.36; 95% CI = 1.22-1.51). The study bring us a clue of hyperthyroidism by which tinnitus could be induced. On the contrary, during the follow-up of patients with hyperthyroidism, clinical practitioners should be awareness of the emerge of tinnitus.

0623_P2-71

The level of house dust mite allergen (Der p1) at selected locations (except bed, mattress, pillows, and carpets) in households of schoolchildren in Taiwan

House dust mite (HDM) is a major perennial indoor allergen source and the most prevalent cause of allergic rhinitis and allergic asthma. Studies of indoor allergen exposures are often limited by the cost and logistics of sending technicians to homes to collect dust. The previous study often focuses on one county, and the sample size would be constrained by geographic area. In order to overcome this problem, Arbes S.J. et al reported that subject-collected dust sampling appears to be a valid and practical option for epidemiologic and clinical studies that report allergen concentration as a measure of exposure. In addition, some literature points out that, except mattresses, pillows, carpets, other places such as walls, desktops, bookcases or cabinets also have dust mite allergen distribution. However, awareness of the condition remains generally low. In this study, we evaluated the feasibility of having subjects collect their own dust samples from desktops, bookcases or cabinets in the living room and bedroom. A nationwide cross-sectional study was conducted in Taiwan using a modified Chinese version of the International Study of Asthma and Allergies in Childhood (ISSAC-C) questionnaire from March 2016 to March 2017. House dust was collected from in the homes of schoolchildren. Dust samples were analyzed for allergen content with ELISAs for Der p 1. From 20 elementary schools, 334 students aged 6–12 years were selected as candidates for the study. Among these homes, the mean of Der p1 were 0.23 μg per gram of dust (range from 0-2.5 μg per gram of dust). The dust mite levels from desk, bookshelf, and cabinets were associated with parental education and dehumidifier using. Even if the amount of these locations is not high, der p1 concentration is still related to allergic asthma ($p<0.05$).

0623_P2-72

Identification Of Microbeads From Personal Care Products And Its Estimated Emissions: An Evidence From Malaysia

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Background/Aim
Generally, personal care products have been identified as potentially significant contributor of microbeads (typically referred to as microplastics) emission into the environment. This study aims to characterizes and identifies composition of microbeads found in top ten personal care products used in Malaysia. Additionally, this study also estimates total emission of microbeads from top ten personal care products from wastewater to environment.

Methods
A questionnaire survey was developed to obtain the top ten personal care products used and customer usage data in Malaysia. A total of ten personal care products were selected based on questionnaire survey results with top five facial cleaner/scrub and toothpaste products were identified. Microbeads extraction and enumerations from each product were carried out based on modified method described by Cheung and Fok (2017). Identification and visualisation of these microbeads from personal care products were also conducted using microscope coupled with camera, FTIR Spectrometer and Image J. Lastly, estimation of microbeads emission into the aquatic environment is assumed through direct microbeads emissions from personal care products in areas without sewage treatment and microbeads escape from wastewater treatment plants.

Results
Respondents within the age of 21 to 29 years old were the majority of personal care products users with facial cleaner/scrub and toothpaste among the top ten personal care products in Malaysia. In particular, particles found in facial cleaner/scrub and toothpaste were coloured (green, blue, light brown) and colourless. Besides, most of the particles possessed a granular shape. Based on the data collected, toothpaste indicated to have smaller particles (3 to 145 µm) while particles in facial cleaner/scrub were found to be between 10 and 178 µm, stipulating the presence of microbeads. Concisely, all the facial cleaners/scrubs (A-E) and toothpaste (G) have indicated the presence of microbeads with detection of low-density polyethylene and polypropylene which are common types of plastic polymers found in microbeads. According to this study, an estimated amount of 0.199 trillion microbeads is expected to be released annually with 95% from direct emission of untreated sewage and 5% from treated effluent through incomplete removal of microbeads in wastewater treatment plants in Malaysia.

Conclusions
This study findings act as a communication tool among scientific communities, regulatory bodies, policy initiatives and public to phase out the use of microbeads in Southeast Asia.

Keywords: personal care products, microbeads, emission, aquatic environment

0623_P2-73

ABSTRACT TOPIC:

INDOOR AIR POLLUTION IN HOUSEHOLDS ULAANBAATAR, MONGOLIA

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Background: The air pollution is leading cause of the acute lower respiratory diseases for children under 5 years old and stroke, chronic obstructive disease and lung cancer for adults. According to previous studies, the fine particulate pollution source in Ger(traditional Mongolian house area) districts is coal combustion, whioch is used for heating and cooking of households. However, there is a lack of studies of the indoor fine particulate pollution in households. The aim of the our tudy is to determine the indoor fine particulate pollution in apartments and to determine the factors influencing on pollution.

Methods: The study were conducted in Sukhbaatar district of Ulaanbaatar, the capital city of Mongolia. Data collection were continued during the 2014 to 2015. Sampling for fine (PM2.5) particulates were collected for a 1 week with 5-minute intervals with Dylos DC1700 light scattering device. We conducted parallel measurements of PM2.5 concentration in 46 homes with gravimetric method with PTFE filters for a week with a 4L/min flow rate to obtain accurate results,.

Results: In the study selected households, the families had 2 adults and 1 child on average. Mean age of households were 19.92 years average with 3 windows, homes indoor area were 59.38 m2, volume were 132.75m3 respectively. Indoor PM2.5 concentrations by 24 hours were varied and significantly different (p=0.0001) between daytime and night time. The indoor fine particulate (PM2.5) pollution were higher in the morning (7-11am) than evening (9-11pm) at diurnal pattern. The lowest particulate pollution were during the summer. The average PM2.5 concentration were higher in winter time, especially in February (77.89 ug/m3) and lower in July (10.15 ug/m3) than winter, 2014.

Conclusions: The indoor air pollution in selected study apartments were higher in winter. The indoor air pollution (PM2.5) in apartments were varied by hourly, daily, monthly and seasonally.

Key words: Indoor air, pollutants, fine particulate pollution.

0624_P3-1

Changing relationship between ambient air pollution and childhood asthma in Taiwan: two national survey 5 years apart.

Introduction

This study investigated the change in the association of childhood asthma with ambient air pollution along with the change in time

Material and method

Two national questionnaire surveys of respiratory illness and symptoms were administered in Taiwanese elementary and middle school students in 2011 and 2016-2017. During the study period, concentrations of air pollutants were obtained from the Environmental Protection Administration monitoring station. Generalized estimating equation models were applied to examine the association between air pollution and risk of current asthma.

Result

A total of 6346 children from the 2011 survey and 11585 children from 2016-2017 survey attended schools located within 1 km of Taiwan EPA monitoring stations. Prevalence of current asthma was increased but level of air pollutants was decreased during this period. The level of particulate with an aerodynamic of 2.5 m or less (PM2.5) in the past one year was found to be associated with current asthma both in 2011 survey (OR=1.9, 95% confidence interval: 1.41, 2.57) and in 2016-2017 survey (OR=1.24, 95% confidence interval: 1.04, 1.48).

Conclusion

With the improvement of air quality, the impact of PM2.5 on childhood asthma is reduced but still not completely safe and secure in Taiwan.

Korea-China Collaborative Research on Ambient Air Quality: Ground-based Monitoring

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Background/Aim
Air pollution has become a critical problem in China because industries in China have been developed so rapidly. Especially, the increased occurrence of smog events is a major concern to the general public. The overall objectives of this study is to provide scientific evidence to make effective control strategies and management plans of contributing sources.

Methods
The measurement site is on the roof of the smog chamber laboratory building in Chinese Research Academy of Environmental Sciences (CRAES). $PM_{2.5}$ and chemically speciated samples were collected using a 3-channel system which is composed of three filter packs (URG Corp.). The samples were analyzed for gravimetric concentration, water-soluble ionic species, carbonaceous species (ie. Organic carbon and elemental carbon), and trace elements. High concentration events (HCEs) of $PM_{2.5}$ were determined by the class 2 standard of 24-hour average $PM_{2.5}$ mass concentration in China as 75 $\mu g/m^3$. To identify the possible source regions and calculate the effects of HCEs, Residence Time Analysis (RTA) and PSCF were used.

Results
The average $PM_{2.5}$ mass concentration was 48.2 $\mu g/m^3$ during the sampling periods. The average $PM_{2.5}$ concentration during fall was higher than that during summer due to the increased combustion for heating from fall. The average mass concentrations of carbonaceous species were 9.8 and 1.2 $\mu g/m^3$ for OC and EC and the average EC/OC ratio was 0.13. High nitrate and ammonium mass concentrations (6.9 and 4.8 $\mu g/m^3$, respectively) indicate that mobile sources are more attributable to the elevated $PM_{2.5}$ concentration compared to other point sources. HCEs occurred 18 days out of 87 days and the average $PM_{2.5}$ mass concentration was 109.6 $\mu g/m^3$ which was over three times higher than that in Non-events.

Conclusions
Average residence time in north China region was highest followed by east China and central China. High PSCF values for $PM_{2.5}$ were found in Hebei, Shandong, Shanxi, and Henan Provinces.

P3-4

Alteration in behavior after sub-acute exposure of urban air pollution in healthy rats

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Abstract

Long-term exposure to ambient air pollution has been associated with cardiopulmanory disease; however, the effect of air pollution on central nervous system (CNS) remains unclear. The objective of this study is to investigate the roles of air pollution on CNS in rats. We established an experimental station nearby traffic emission sources in New Taipei City (Taiwan). The station equipped with ultrafine particle counter, DustTrak™ II aerosol monitor, AEROTRAK nanoparticle aerosol monitor and MicroAeth black carbon monitor for particle monitoring as well as two exposure chambers for whole-body exposure of six-month-old SD rats (HEPA and $PM_{2.5}$). After three months of exposure, rotarod performance test and novel object recognition (NOR) were performed. The daily average of particle number concentration (PNC) was 11599.2 cm^{-3} with 53.1 nm in aerodynamic diameter. The $PM_{2.5}$ mass concentration, black carbon (BC) and surface area concentration in alveolar region was 14.8 $\mu g/m^3$, 1.8 $\mu g/m^3$ and 50.3 $\mu m^2/cm^3$, respectively. There was no significant difference in rotarod performance test (second) between control group, HEPA group or $PM_{2.5}$ group. Notably, we observed that the rats in $PM_{2.5}$ group had the lowest NOR performance (second) than the control and HEPA groups. In conclusion, sub-acute exposure to $PM_{2.5}$ may have the effect on cognitive changes in elderly population.

Keywords: novel object recognition, rotarod performance test, $PM_{2.5}$, cognitive change, aging

Air pollution in Sofia, Bulgaria and health protection measures

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Ambient air is a major component of the environment and its quality is essential for the health of the population. Contaminated air leads to a number of acute and chronic diseases, mainly to the respiratory, circulatory and nervous systems (accounting for about 30% of the total morbidity).

Background/Aim: to analyze the quality of the ambient air in the city of Sofia and to evaluate the health protection measures.

Methods: A network for monitoring of the quality of ambient air has been built in Bulgaria, through automatic measuring stations to the structures of the MoEW, in Sofia they are nine. The control is carried out by the Clean Ambient Air Act and the Ordinance on the concentration of harmful substances in the air. The reported pollutants are fine particulate matter, PM, SO_2, NO_2, CO, O_3, PB, gasoline, polycyclic aromatic hydrocarbons, heavy metals.

Results: The main problem in the airspace over Sofia is the fine particulate matter. Other pollutants have concentrations below the average annual rate. During the period 2013-2016 PM10 exceeded the 40 μg/m^3 rate from 49,04 μg/m^3 to 40,11 μg/m^3 and from 3 to 98 times the average daily rate in six of the stations, mainly around major road arteries and industry sites. For PM2,5 at rate of 25 μg/m^3 for the same period, rates from 30,57 μg/m^3 to 22,14 μg/m^3 were reported, mainly during the heating season. To improve the quality of the ambient air, protection measures have been developed by both the MoEW and a special program of Sofia Municipality with a period up to 2020, which has led to improvement of the air quality. In 2013, concentrations of fine particulate matter were higher than in 2016.

Keywords: ambient air; pollutants; health protection measures

0624_P3-6

Reactive Oxygen Species (ROS) activity of ambient fine particles ($PM_{2.5}$) measured in Seoul, Korea

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Background/Aim
Substantial increase in level of particulate matter has raised concerns in South Korea recently. Fine particulate matter ($PM_{2.5}$) which has a diameter less than 2.5 μm is likely to penetrate deeply into lung and is known to be eliciting adverse health effects. The objective of this study was to assess PM-induced oxidative potential by relating PM-induced oxidative potential with chemical constituents and possible sources in Seoul, Korea.

Methods
Ambient $PM_{2.5}$ samples were collected at the rooftop of former Seoul National University Graduate School of Public Health building from September 2013 to May 2015. A low-volume air sampler consisting of cyclone and filter pack system was loaded with Teflon filter, quartz microfiber filter, and zefluor filter. Teflon filter was used for $PM_{2.5}$ mass concentration measurement, elemental analysis and ROS analysis. Zefluor filters were used for ionic chemical analysis using Ion Chromatography and quartz filters were used to measure organic carbon (OC) and elemental carbon (EC) which were quantified by Carbon Aerosol Analyzer.

Results
$PM_{2.5}$ mass concentration during the cold season was relatively higher than mass concentration during the warm season and chemical constituents except for Secondary Organic Carbon (SOC) and SO_4^{2-} followed similar trends. The concentration of crustal elements was especially high during the cold season which can be an indication of long range transport of Asian dust. Water soluble organic carbon and transition metals (Cr and Zn) were also shown to be correlated to oxidative potential and metals such as As and V were shown to have a high contribution to ROS activity according to stepwise multiple linear regression. Principal Component Analysis (PCA) results identified six factors that can be interpreted as soil, mobile, industry, secondary inorganic aerosol, secondary organic aerosol and oil combustion. Moreover, through Principal Component Regression (PCR), industry, soil, mobile and SIA were shown to be statistically significant sources in a relation to ROS activity.

Conclusions
A number of epidemiological studies have been conducted on adverse health effects of PM-related diseases and mortality rate, yet particulate matter (PM)-induced reactive oxygen species (ROS) activity at the cellular level has not been actively studied in Korea. Oxidative potential was consistently detected at all levels of $PM_{2.5}$ mass concentration, thus it is more important to implement reduction policy based on chemical constituents and sources instead of reducing $PM_{2.5}$ mass concentration itself.

0624_P3-8

Potential for City Parks to Reduce Exposure to Hazardous Air Pollutants

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Background/Aim
Benzene, toluene, ethylbenzene, and xylenes (BTEX) are hazardous air pollutants commonly found in outdoor air. While several studies have explored phytoremediation as a potential pathway for BTEX mitigation in indoor air, none have addressed this possibility in outdoor air. The objective of this research study was to determine whether concentrations of BTEX are lower in city parks than in the surrounding neighborhood.

Methods
To investigate this question, we deployed passive organic air samplers for two weeks in three parks and nearby residences in Birmingham, Alabama and one park in the rural city of Camden, Alabama.

Results
All BTEX concentrations were below health-based guidelines and were comparable to those found in several other studies in urban and rural settings. However, benzene concentrations in two locations in Birmingham were higher than the 90th percentile at 137 EPA monitoring sites. We analyzed BTEX concentrations through an ANOVA and Tukey's Honestly Significant Difference Test on the natural log-transformed concentrations, grouped by site name, location type, and week. There was no difference in BTEX concentrations between parks and nearby residences, except that concentrations of benzene and o-xylene were significantly lower in the park in Camden during one week. This result suggests that parks of the size and type included in this study do not help mitigate exposure to BTEX. Toluene:benzene ratios (0.666–1.56) in two parks in Birmingham were outside the range expected for vehicular emissions ($p < 0.05$). All four sites exhibited high m-,p-xylene:ethylbenzene ratios (3.59±0.364), indicating the influence of fresh BTEX emissions. The BTEX compounds were highly correlated in most cases, except for two sites that may be impacted by nearby industrial sources of benzene whose emission ratios were comparable to our measurements.

Conclusions
To the best of our knowledge, this was the first field campaign conducted to assess the impact of city parks on ambient concentrations of BTEX. Although parks provide many benefits for the community, mitigation of exposure to BTEX does not appear to be among them. This study considered input from community members in the placement of passive samples, which allowed for the integration of community science in determining local exposure to BTEX.

0624_P3-9

Effects of prenatal exposure to air pollution on preeclampsia in Shenzhen, China

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Background/Aim
The impact of ambient air pollution on pregnant women is a concern in China. However, little is known about the association between air pollution and preeclampsia and the potential modifying effects of meteorological conditions have not been assessed. This study aimed to assess the effects of prenatal exposure to air pollution on preeclampsia, and to explore whether temperature and humidity modify the effects.
Methods
We performed a retrospective cohort study based on 1.21 million singleton births from the birth registration system in Shenzhen, China, between 2005 and 2012. Daily average measurements of particulate matter less than or equal to 10 μm (PM_{10}), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), air temperature (T), and dew point (T_d) were collected. Logistic regression models were performed to estimate associations between air pollution and preeclampsia during the first and second trimesters, and during the entire pregnancy.
Results
In each time window, we observed a positive gradient of increasing preeclampsia risk with increasing quartiles of PM_{10} and SO_2 exposure. When stratified by T and T_d in three categories ($<5^{th}$, 5^{th}-95^{th}, and $>95^{th}$ percentile), we found a significant interaction between PM_{10} and T_d on preeclampsia; the adverse effects of PM_{10} increased with T_d. During the entire pregnancy, there was a null association between PM_{10} and preeclampsia under T_d $<5^{th}$ percentile. Preeclampsia risk increased by 23% (95% CI: 19-26%) when 5^{th} $<T_d<$ 95^{th} percentile, and by 34% (16-55%) when $T_d>95^{th}$ percentile.
Conclusions
This is the first study to address modifying effects of meteorological factors on the association between air pollution and preeclampsia. Findings indicate that prenatal exposure to PM_{10} and SO_2 increase preeclampsia risk in Shenzhen, China, and the effects could be modified by humidity. Pregnant women should limit air pollution exposure, particularly during humid periods.

0624_P3-10

Health Risks of Urban Air Pollution on Cardiovascular and Respiratory Hospitalisations in Kuala Lumpur, Malaysia

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Many cities are currently burdened and confronted by multiple threats. The rapid urbanisations in Malaysia poses risks to the health of its residence. This study was done in order to estimate the relative risk (RR) of trace gaseous on cardiovascular and respiratory hospitalisations in Kuala Lumpur. Daily hospitalisations of cardiovascular and respiratory diseases from 2010-2014 were obtained from Hospital Canselor Tuanku Muhris (HCTM). Concentration of trace gaseous such as sulphur dioxide (SO_2) nitrogen dioxide (NO_2), carbon monoxide (CO) and ozone (O_3) as well as meteorological parameters (temperature and relative humidity) were obtained from the Department of Environment (DOE) Malaysia for the same study period. Generalised Additive Model (GAM) model based on Poisson regression was applied to this study. The results revealed that all trace gaseous showed significant effects towards cardiovascular and respiratory hospitalisations. Immediate effects on cardiovascular hospitalisations were observed for both NO_2 and O_3 but no immediate effect were found on respiratory hospitalisation. Delayed effects on cardiovascular and respiratory hospitalisations were found with SO_2 and NO_2. The highest RR value was observed at lag 4 for respiratory admissions with SO_2 (RR = 1.123, 95% CI = 1.045-1.207), followed by NO_2 at lag 5 for cardiovascular admissions (RR = 1.025, 95% CI = 1.005-1.046). For multi-pollutant model, NO_2 lag 5 has been found to have the highest risks towards cardiovascular hospitalisation after controlling for O_3 8h mean lag 1 (RR = 1.026, 95% CI = 1.006-1.047) while SO_2 at lag 4 has been found to have the highest risks towards respiratory hospitalisation after controlling for NO_2 lag 3 (RR = 1.132, 95% CI = 1.053-1.216). Urban air pollution showed both immediate and delayed effects for cardiovascular and respiratory hospitalisations in HCTM from exposure to criteria pollutants.

0624_P3-11

Long-term exposure to ambient particulate matter and incident cardiovascular disease in a South Korean nationwide cohort

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Background/Aim
Many cohort studies in Northern America and Europe found the association between long-term exposure to particulate matter and cardiovascular disease (CVD). However, the evidence of the association is insufficient and/or inconsistent in Asia where more people are exposed to relatively high concentration of ambient particulate matter. We investigated the association between long-term exposure to particulate matter with a diameter less than 10 μm (PM_{10}) and incident CVD using a nationwide cohort in South Korea.

Methods
We restricted the study population to 142,049 adults who were greater than 30 years old, underwent national health examination, and had not diagnosed with CVD for 2002-2006 in the National Health Insurance Service-National Sample Cohort. These selected people were followed-up through 2013. The incident CVD was defined as the first hospital visit after 2007, based on the International Classification Diseases, 10^{th} revision. To assess individual-level long-term PM_{10} concentrations, we averaged district-level annual average concentrations over 2002-2006 and weighted by residential addresses. These district-level annual-average concentrations were estimated from previously-developed exposure prediction approaches. Cox proportional hazard models were applied for estimating hazard ratios (HR) and 95% confidence intervals (CI) of incident CVD per 10 $\mu g/m^3$ increases in PM_{10} after adjusting for income, smoking, alcohol use, obese, exercise, and co-morbidity of hypertension, hyperlipidemia, and diabetes, district-level percent of high school education completed or more, percent of the elderly, and gross regional domestic product.

Results
The 59,791 incident CVD cases were diagnosed during 262,100,908 person-year. We found the marginally significant negative association (HR=0.99 [95% CI=0.97, 1.00]) after adjusting the individual- and area-level covariates.

Conclusions
Our study was the first national-scale cohort study of long-term PM_{10} and incident CVD in South Korea. Future studies should re-examine our findings of the negative association by including additional confounders and/or effect modification.

Keywords: air pollution, long-term exposure, particulate matter, morbidity, cardiovascular disease

P3-16

Effects of ambient particulate matter on blood pressure, fasting blood glucose, blood lipids in Chinese children

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Abstract

The impact of ambient particulate matters on health causes concerns in China. However, little is known about the association of intermediate-term ambient particulate matter exposure with cardiometabolic risk factors in Chinese children. The goal of present study was to assess the associations between intermediate-term ambient particulate matter and blood pressure, fasting blood glucose, blood lipids in Chinese children. This study enrolled 8324 children in 5 elementary schools (aged 6-12 years) from 5 districts in Guangzhou, during the period from March, 2017 to May, 2017. Individual particles with diameters ≤2.5 μm ($PM_{2.5}$) and PM_{10} exposures during 6 months before each physical examination were retrospectively estimated by inverse distance weighting interpolation and time-weighted approach according to home address, school address and individual activity pattern. Multivariable linear regression models were used to evaluate the relationship between airborne particulate matter and blood pressure (BP), fasting blood glucose (GLU), total cholesterol (CHO), triglyceride (TG), high-density lipoprotein cholesterol (HDLC), low-density lipoprotein cholesterol (LDLC) after adjusting for other covariates. Results showed that with per 10 $\mu g/m^3$ increase in PM_{10} level during the 6-month mean exposure, significant associations with elevated systolic BP/diastolic BP and decreased HDLC were observed, with estimated coefficients and 95% CIs of 1.22 (95% CI: 0.74, 1.69) mmHg for systolic BP, 0.49 (95% CI: 0.12, 0.85) mmHg for diastolic BP, -0.05 (95% CI: -0.07, -0.03) mmol/L for HDLC. Moreover, per 10 $\mu g/m^3$ increase in $PM_{2.5}$ during the 6-month mean exposure was associated with elevation of 0.26 (95% CI: 0.18, 0.34) mmol/L in GLU and 1.71 (95% CI: 0.32, 3.09) mmHg in systolic BP, respectively. When stratified by sex, positive relationships were observed for elevated diastolic BP with ambient particulate matter exposure only in males. This is the first report on the

relationship between intermediate-term ambient particulate matter and GLU, blood lipids of children in China. Findings indicate a need to control air pollutants and protect children from ambient particulate matter exposure in China.

Keywords: ambient particulate matter; blood pressure; fasting blood glucose; blood lipids

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0624_P3-20

How do indoor and outdoor environmental risk factors impact atopic dermatitis symptoms in children?

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Background: The effects of indoor and outdoor environmental risk factors on atopic dermatitis (AD) flares have not been well investigated.

Methods: A total of 48 young children (31 boys and 18 girls) under 18 years old with AD living in Seoul Metropolitan Area, Korea, were enrolled as a panel and followed for a year between November 2016 and October 2017. AD symptoms were recorded on a daily basis, including itching, sleep disturbance, erythema, dry skin, oozing, and edema. Indoor environments including temperature, relative humidity (RH), and CO_2 were monitored by using validated sensors and collected based on WiFi-Bluetooth system. Outdoor environments including temperature, RH, particulate matters with an aerodynamic diameter less than 10 μm (PM_{10}), NO_2, SO_2, and O_3 were obtained from air quality monitoring system. Generalized linear mixed models were used to analyze the effects of environmental factors at a population level and logistic regression models for individual analyses, after controlling for confounding factors.

Results: A total of 10,523 person-days of symptom records were collected. Overall, the risk of AD symptoms significantly increased by 27.6% [95% confidence interval (CI), 16.8-37.0] with increase in indoor RH per interquartile range (IQR, 17.0%). An increase in outdoor temperature was associated with a decrease in AD symptoms by 25.4% (95% CI, 5.8-33.0) and PM_{10} with an increase by 9.6% (95% CI, 0.2-19.9) per IQR units (11.3℃ and 28.0 μg/m^3). At an individual level, the associations between AD symptoms and environmental risk factors varied in each patient. Six out of 48 children (12.5%) showed a significantly positive association of AD symptoms with indoor temperature and 8 (16.7%) demonstrated a negative association with indoor RH. The effects of outdoor air pollution differed by child.

Conclusions: Indoor and outdoor environmental factors aggravate AD symptoms and the effects vary in each individual. Proper environmental condition is essential for the control of AD flares and a personalized approach is required.

0624_P3-21

Exposure assessment of $PM_{2.5}$ for elderly population in Taiwan

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Background/Aim
$PM_{2.5}$ levels of personal exposure among Taiwanese elders are still unknown while ambient $PM_{2.5}$ concentrations with fixed-site measurements have been comprehensively investigated. In addition, there are particular life style, culture, and habit (burning incense in home indoor) for the Taiwanese elderly population. Understanding the elder's $PM_{2.5}$ exposure characteristics and the time-activity patterns are important. Hence, this study was to investigate $PM_{2.5}$ concentrations for home indoor, home outdoor, personal, and ambient in Taiwan, and identify the significant risk factors affecting personal $PM_{2.5}$ exposure.

Methods
This study recruited elderly subjects (≥ 65-year), who living in Taipei, Hualien, Chiayi, and Kaohsiung of Taiwan, through a questionnaire survey of the annual health examination from a hospital-based cohort study for exposure measurements. In their house, we placed the real-time samplings in indoor, outdoor, and nearby central sites to measure $PM_{2.5}$ for 24-h. The daily measurements of $PM_{2.5}$ for home indoor, home outdoor, and personal $PM_{2.5}$ exposure concentrations were conducted for four seasons from 2016 to 2018. All subjects were asked to fill out questionnaires of the daily time-activity pattern (including the activity spaces, ventilation, indoor additional source, awareness of peculiar smell, etc.) during the sampling day.

Results
The highest magnitude of personal exposure to $PM_{2.5}$ for elderly populations was obtained in Kaohsiung (31.3 $\mu g/m^3$), followed by Chiayi (30.0 $\mu g/m^3$), Hualien (20.8 $\mu g/m^3$) and Taipei (14.0 $\mu g/m^3$). Personal $PM_{2.5}$ exposure was highly correlated with home indoor $PM_{2.5}$ level in Chiayi (r=0.86), with home outdoor $PM_{2.5}$ in Taipei (r=0.83), and with ambient air $PM_{2.5}$ in Hualien (r=0.76) and Kaohsiung (r=0.78). The highest personal $PM_{2.5}$ exposure on elders in four areas was obtained in the winter (18.3-47.1 $\mu g/m^3$) and the lowest in the summer (13.7-24.3 $\mu g/m^3$). According to the time-activity profiles we found that Taiwanese elders overall spent most of their time at home indoor (~88-93%). Although there were higher $PM_{2.5}$ levels in other indoor locations, outdoor locations, and in transit, subjects only spent less time (1.3-7.2%). The personal $PM_{2.5}$ exposure on elders was mainly attributable to home indoor air (86-93%). Through a linear regression with a single variable, we found that season, location, raining day, awareness of smell and personal activity (working, shopping, burning incense, etc.) could significantly affect personal exposure to $PM_{2.5}$.

Conclusions
The daily personal exposure to $PM_{2.5}$ is mainly attributed to home indoor air for Taiwanese elders. In addition to season and location, raining day, awareness of smell and personal activity were significant factors effecting personal $PM_{2.5}$ exposure.

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Land-Use Regression with Culture-Specific Sources to Model $PM_{2.5}$ Spatial-Temporal Variability in the South of Taiwan

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Background/Aim
Fine Particulate Matter ($PM_{2.5}$) is one of the air pollutants which affects human health and has been attracting great attention in recent years. Due to the uneven distribution and limited number of official monitoring stations, and complex local emission sources, it's a great challenge for environmental epidemiology to well depict the spatial-temporal variability of $PM_{2.5}$ in Taiwan. This study considered Asian culture-specific emission sources (temples and Chinese restaurants) with Land-use Regression (LUR) modelling to estimate the spatial-temporal variability of $PM_{2.5}$ using data from Kaohsiung-Pingtung Air Quality Zone (AQZ), which locates in the southern part of Taiwan.

Methods
On-site $PM_{2.5}$ measurements from 2006 to 2012 of 15 Environmental Protection Administration stations were used for model development. Several spatial databases were collected to obtain the land-use information as potential predictors for LUR model development including residential, commercial, and industrial areas, green spaces, water, road network, etc. Furthermore, the distribution of temples and Chinese restaurants were included to represent the contributions from incense and joss money burning, and gas cooking, respectively. A stepwise regression methodology was used for LUR model development at monthly and yearly scales, and 10-fold cross-validation was applied to assess the model reliability. Spatial-temporal variability of $PM_{2.5}$ of the study area was then estimated using the resultant LUR models.

Results
The obtained model R^2 was 0.9 and 0.85 for yearly and monthly models, respectively. The averaged 10-fold cross-validated R^2 was 0.75 for yearly model and 0.73 for monthly model, again confirmed the robustness of the model performance. Both the distribution of temples and Chinese restaurants were selected as predictor variables ($p < 0.05$) during the stepwise selection procedures, demonstrates the contributions of culture-specific sources on $PM_{2.5}$ pollutants in the southern Taiwan. Finally, estimations of $PM_{2.5}$ distribution over the Kaohsiung-Pingtung AQZ using the resultant models showed that, a decreasing trend was observed from the prediction maps during the 2006 to 2012, while the areas with high $PM_{2.5}$ level formed a spatial cluster at the center of the Kaohsiung/Pingtung city cores.

Conclusions
With an explanatory power greater than 0.85, the developed LUR model selected Asian culture-specific emission sources including temple and Chinese restaurants as important predictors for estimating spatial-temporal variability of $PM_{2.5}$ in Kaohsiung-Pingtung AQZ. The methodology used is applicable to other Asian countries with similar emission features.

Key Words: Fine Particulate Matter ($PM_{2.5}$), Land-use Regression (LUR), Asian culture-specific emission sources

0624_P3-23

Potential for exposure to aerosolized viruses from wastewater systems and virus survivability at different relative humidity conditions

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Background/Aim: Little is known about the potential for inhalation exposure to viruses aerosolized from wastewater into air. To transmit successfully, viruses must remain infectious in the environment. Thus, it is also important to understand the effect of environmental factors, for example relative humidity (RH), on virus' stability.

Methods: We evaluated the potential for viruses (MS2 and Phi6 serving as surrogates for enteric viruses, Ebola virus, and others) to be aerosolized from three types of wastewater systems: toilets, a lab-scale model of an aeration basin, and a lab-scale model of converging sewer pipes. We spiked viruses into each system and determined the emission rate of viruses into the air. To study the effect of RH on airborne viruses, we aerosolized them into a custom rotating drum and aged them at controlled RH for 1 hour.

Results: No viable viruses were detected in air after toilet flushing. Airborne concentrations of MS2 and Phi6 were ~20 PFU L^{-1} and ~0.1 PFU L^{-1}, respectively, in the chambers enclosing the aeration basin and sewer models. When the viruses were aerosolized in simple media, viruses survived best at low (<40%) and high (>80%) RH conditions, and worst at intermediate RHs. However, when viruses were aerosolized in human bronchial epithelial extracellular material, they remained infectious independent of RH.

Conclusions: Aerosolization from toilets appears to present the lowest risk, while aerosolization in aeration basins and sewer systems may be a concern if infectious virus is present. We estimate that a worker in an enclosed sewer system could be exposed 10 virions, the amount thought necessary to cause infection, in 12 hours. Aerosolized viruses are likely to maintain their infectivity across a wide range of RHs in certain types of media.

The effects of active commuting on cardiovascular health in Asia: A systematic review protocol

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Background
Active commuting affects cardiovascular health through many mechanisms either directly through physical activity or indirectly through the factors of environment such as air quality. Besides, as it is free of emissions, urban governors in the Asian countries have encouraged the use of active transport to substitute motor vehicles especially cars and motorcycles, in order to tackle issues of air pollution and carbon emissions in the cities. This study aims to systematically review the evidence of the association between active commuting and cardiovascular health among the population in the Asian context.

Methods
Health related databases (Medline, CENTRAL, EMBASE) will be searched systematically from inception to 2017. Besides, the references of articles will be searched manually. Only articles published in English language will be included. The review will include studies on the primary outcome (hypertension, diabetes) and secondary outcome (coronary heart disease, myocardial infarction, stroke, death) from active commuting among adult population in Asia (East Asia, South Asia, Southeast Asia). This review will be managed using RevMan 5. The quality of the included studies will be assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system. Data will be extracted by pretested data collection form, which will include study design, sample size, population settings, type of active commuting, outcomes and their relative risks. The homogenous data will be pooled using random-effects meta-analyses, and presented using forest plot. For the assessment of publication bias, a funnel plot will be used.

Discussions
This systematic review will provide pooled evidence on the effects of active commuting on cardiovascular health in the Asian region. Such information is important to facilitate urban planners and policy makers in creating health promoting built environment for the urban population.

In vitro and *in silico* studies on PPARα/γ and PXR activation by di-(2-ethylhexyl) phthalate and its metabolites

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Background/Aim: Di-(2-ethylhexyl) phthalate (DEHP) is widely used as a plasticizer, and DEHP exposure was found to be associated with atopic disorders. Worryingly, its primary metabolite, mono-(2-ethylhexyl) phthalate (MEHP) and further oxidative metabolites have been detected in human blood and urinary samples. We aimed to reveal the effects of DEHP and its metabolites on the activation of nuclear receptors, PPARα/γ and PXR, and investigate the gene expression profiles in immune cells exposed to DEHP or MEHP.
Methods: PPARα/γ and PXR activation by DEHP and six of its metabolites (MEHP, 5OH-MEHP, 5oxo-MEHP, 5cx-MEPP, 2cx-MMHP and 6OH-MEHP) were studied using cell-based transactivation assays and computational molecular docking methods. Global gene expression in human macrophage-like THP-1 cells exposed to DEHP or MEHP (30 μM) was undertaken by microarray analysis using SurePrint G3 human GE 8x60K Ver. 3.0 (Agilent). The up- or down-regulation of several genes in response to each compound was confirmed using RT-PCR method.
Results: Although DEHP did not show any PPARα/γ agonistic activity, MEHP activated both PPARα and PPARγ. Three metabolites (6OH-MEHP, 2cx-MMHP and 5cx-MEPP) acted as weaker PPARα agonists than MEHP. DEHP and MEHP were also found to be PXR agonists whereas other metabolites did not have any PXR agonistic activity. These results obtained from *in vitro* assays were supported by the results obtained from computational molecular docking simulations. In addition, exposure of THP-1 cells to DEHP or MEHP resulted in the induction or suppression of many genes, including PPAR- or PXR-related signalling genes.
Conclusions: The results from *in vitro* and *in silico* studies indicate that DEHP metabolites have PPARα/γ and PXR activities that differ from those of the parent compound. Interestingly, the results obtained from the microarray analysis suggest that DEHP and MEHP might affect the gene expression of THP-1 cells *via* PPARα/γ and PXR.

Effects of essential oil constituents on *in vitro* transcriptional activity *via* estrogen and androgen receptors, and in an *in silico* molecular docking study

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Background/Aim: Essential oils are extracts of flagrance ingredients from plants to which humans are exposed through cosmetic products and aroma therapy. Some of them are reported to have been detected in indoor environments. However, studies on the physiological effects of essential oils are limited. In this study, we investigated agonistic/antagonistic activities of 60 chemicals contained in essential oil against estrogen receptor (ER) alpha/beta and androgen receptor (AR). The receptor-binding abilities of some of the potent compounds identified in the assays were analysed using a molecular docking simulation study.
Methods: The agonistic and antagonistic activities of the test compounds ($<3.0 \times 10^{-5}$ M) against ER alpha/beta or AR were measured by reporter gene assays using CHO-K1 cells transiently transfected with the appropriate receptor and reporter plasmids. Molecular binding energy between each receptor and test compounds showing relatively potent ER alpha/beta or AR activity was calculated using AutoDock 4.2 software.
Results: In the ER alpha/beta assays, four and 11 of the 60 essential oil constituents tested showed ER alpha/beta agonistic activities, respectively. The most potent estrogenic compound was farnesol. In addition, two and eight compounds tested showed ER alpha/beta antagonistic activities, respectively. In the AR assay, 10 compounds tested showed antagonistic activity. The most potent anti-androgenic compound in this study was nootkatone. Computer docking simulation of these potent compounds were investigated and the results supported the potential receptor- binding of farnesol to ER alpha/beta, and nootkatone, bergapten, (+)-, and (-)-aromadendrene to AR.
Conclusions: These results suggest that a number of constituents of essential oils might act as agonists and/or antagonists against ER alpha/beta, and AR. Interestingly, except for (+)-, and (-)-aromadendrene, the ER agonists found in this study have marked preference for ER beta rather than ER alpha. Taken together, these findings indicate that some constituents found in essential oils might disrupt endocrine functions through their binding to nuclear hormone receptors.

0624_P3-28

Associations of temperature variation and mortality in 47 Japanese prefectures

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Background / Aim: Few studies have investigated the mortality effects of temperature variation (TV) in Japan. In this study, we employed the newly proposed indicators of inter- and intra-day TVs computed separately using daily mean temperatures above or below the minimum mortality temperature to assess the TV-mortality associations and their relative contribution in comparison to daily mean temperature across Japan.

Methods: We collected daily data on temperature and mortality during 1972-2012 from 47 Japanese prefectures. We performed a quasi-Poisson regression analysis incorporating a distributed-lag non-linear model to estimate associations of daily mean temperature, inter- and intra-day TVs with mortality in each prefecture.

Results: Most prefectures showed a significant increase in mortality risk associated with daily mean temperature, with relative risks (RRs) reaching 1.236 (95% confidence interval (CI): 1.163, 1.313) for heat in Aomori, and 1.676 (95% CI: 1.313, 2.138) for cold in Wakayama. Inconsistent results for inter- / intra-day TVs were found, except for some protective associations between intra-day TV and mortality in Kochi (RR 0.979; 95% CI: 0.965, 0.993) and Gifu (RR 0.988; 95% CI: 0.98, 0.996) on cold days.

Conclusion: We found that the association between mortality and TV was generally small compared with daily mean temperature in Japan.

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0624_P3-29

Interaction between temperature and pm10 in estimating future burden of mortality

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Background/Aim
Many studies have reported that particulate matter up to 10μm (PM_{10}) is positively associated with mortality and the association maybe higher in warm days, than cold days. So, the health burden of PM_{10} can be amplified by climate change. Therefore, this study aims to estimate the mortality burden of PM_{10} using the future climate change scenario data for Seoul, Korea.

Methods
We used daily time-series PM_{10}, weather and mortality data in Seoul, Korea (2003-2015). And we obtained daily mean temperature series under climate change scenarios with two representative concentration pathways (RCPs; RCP 4.5 and RCP 8.5), and generated the temperature series under each RCP by five general circulation models (GCMs) from 2016 to 2100.

We estimated the association between PM_{10} and mortality by temperature level (four strata; 0-50th, 50-90th, 90-95th, over 95th percentiles of daily mean temperature) with historical data, and predicted the future excessive mortality attributable to PM_{10} under alternative climate change scenarios using the modelled PM_{10}-mortality association by temperature.

Results
We found that the association between PM_{10} and mortality increased by temperature level, thus the future excessive mortality attributable to PM_{10} also expected to increase in the future. This tendency was more pronounced under scenarios of intense warming (RCP8.5), than mild warming (RCP4.5).

Conclusions
As the PM_{10}-mortality association increased by temperature, the warming climates should be considered in estimating the future impacts of PM_{10}. The mortality burden of PM_{10} may increase under climate change.

0624_P3-30

Fungal aerosol concentrations during the rain storm period in Bangkok, Thailand

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Background: Fungal aerosol is one of major ambient air pollutants associated with adverse health outcomes. Ambient fungal aerosol levels were significantly associated with daily meteorological factors. However, climate change affected weather pattern, increased the number of storms, and caused dramatic changes in daily meteorological conditions, all of which affect the level of ambient fungal aerosols. This study, therefore, investigates the levels of fungal aerosol during the tropical storm periods in Bangkok metropolitan area.
Methods: Culturable fungal aerosols were collected during October-November 2017 when Thailand was affected by three major tropical rain storms (i.e. Khanun, Domrey, and Kirogi). Samples were collected twice a week (i.e.Tueday and Friday; 10 am and 2 pm), at Chulabhorn Graduated Institute using single-stage impactor with Malt extract agar. Fungal colonies were counted and identified according to their morphological characteristics. Tropical rain storm and meteorological data were obtained from Thailand Meteorological Department website. Multiple regression analysis was used to investigate the association of fungal aerosol levels and meteorological parameters.
Results: The average fungal concentration (mean ± S.D.) during the entire sampling period was 1,230 ± 1,136 CFU/m^3 (n = 60), while that of non-storm and storm period were 1,418 ± 1,193 CFU/m^3 and 479 ± 226 CFU/m^3, respectively. Major identifiable fungal genera were *Cladosporium sp., Penicillium sp.* and *Aspergillus sp*. However, these fungal levels were still lower than the levels of non-sporulate fungi, which comprised more than 68% of total colonies. Relative humidity, wind speed, and rainfall were noticeably increased during the storm period. Fungal levels were positively associated with meteorological parameters, namely, temperature, relative humidity, and wind speed (adjusted R^2 = 0.55).
Conclusions: Dramatic changes of daily weather conditions during rain storm periods significantly affected the fungal aerosol concentrations. More fungal monitoring data are needed to determine actual effects of changes in weather conditions.

Key words: fungal aerosol, rain storm, meteorological factor, Bangkok

0624_P3-32

Heat related illness among solid waste management workers during the 2016 El Nino episode in Negeri Sembilan, Malaysia.

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Background/Aim: Although El Nino is a naturally occurring phenomenon, the impact of high temperature during the 2016's episode in Malaysia was undeniable, as it recorded a more extreme and severe phenomenon than the ones in 1982 and 1997. This study was done to determine the prevalence of heat related illness and it's predictors among solid waste management workers in Negeri Sembilan, Malaysia during the 2016 El Nino episode.

Methods : A cross sectional study was conducted among solid waste management workers from March to April 2016. It involved a Wet bulb globe temperature (WBGT) measurement at their workplace and a questionnaire survey. Heat related illness was categorised as (i) light and (ii) moderate and severe heat related illness based on a person-item variable map using Rasch analysis. Bivariate and multivariate linear regression analyses were also conducted .

Results**:** The workplace had an average WBGT of 30.5ºC (SD=0.53) with maximum and minimum reading of 34.06ºC and 26.42ºC, respectively. Results showed that heat stress exceeds the threshold limit value (ACGIH 2015) and workers were at high risk of developing occupational heat related illness. A total of 320 respondents were interviewed. The prevalence of heat related illness was 44.1%. The significant independent predictors for heat related illness were time of fluid intake, type of drink, hydration status, history of heat related illness and $WBGT_{eff}$ with age group as a controlled variable. Heat related illness had higher odds among those with irregular fluid intake (OR : 15.02, 95% CI : 3.91;57.59), who consume other than plain water during working hours (OR: 5.48, 95% CI : 2.62;11.44), who are dehydrated based on urine colour (OR : 3.40, 95% CI : 1.97;5.86), who had previous history of heat illness (OR : 2.25, 95% CI : 1.31;3.86) and those with increasing WBGT (OR: 1.71, 95% CI : 1.02;2.87).

Conclusion : Excessive heat at workplace during El Nino episode had affected solid waste management workers' health. Physiological and behavioural factors were found to be significant in predicting heat related illness among exposed workers. Identification of high risk individuals, preventive action towards behaviour of fluid intake at

workplace and monitoring of hydration status based on urine colour can reduce the risk of heat related illness among workers who are exposed to heat stress environment

0624_P3-35

Maternal prenatal psychological stress and atopic dermatitis in children: A systematic review and meta-analysis

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Background/Aim
Atopic dermatitis (AD) is the most common skin disease among children and is considered to be the first step of atopic march. Maternal stress during pregnancy has been suggested as a risk factor for AD in the offspring. We undertook a systematic review and meta-analysis to investigate the associations between maternal prenatal psychological stress and childhood AD.

Methods
This systematic review was conducted by following PRISMA guideline. We searched and selected electronic databases (including PubMed, Scopus, Embase and Web of science and so on) since their inception until January 2018. We included prospective cohort studies reporting adjusted association between maternal stress and children with AD before the age of 6.

Results
A total of nine studies were included in the systematic review, and random-effects meta-analyses were conducted to synthesize the data. We found that children whose mothers suffered from psychological stress during pregnancy showed a higher risk of AD than those whose mothers did not. The pooled OR was 1.37 (95% CI 1.23–1.53) with low heterogeneity (I^2 0%).

Conclusions
Our study found a significant relationship between maternal stress during pregnancy and atopic disorders in children. However, the existing studies are with wide definitions of self-reported psychological stress exposure, which involved utilization of different survey instruments. Future research with similar instruments of stress assessment and even objective measures are needed.

Key words: prenatal maternal stress, pregnancy, meta-analysis, atopic dermatitis, children

P3-37

Abstract title: The relationship of mortality between selective serotonin reuptake inhibitor and liver cirrhosis patients

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Background & Aims:

The aim of this study was to determine the relationship of the mortality between selective serotonin reuptake inhibitor (SSRI) and liver cirrhosis patients.

Methods:

We conducted a population-based cohort study by using claims data from National Health Insurance Research Database (NHIRD) in Taiwan. The study cohort comprised 887 newly diagnosed liver cirrhosis patients with SSRI use who were matched by sex, age and diagnosis years of cirrhosis in a ratio of 1:2 (with SSRI use vs. without SSRI use) in the comparison cohort. Each patient case was followed from 2000 to 2012 to identify mortality. Cox proportional hazards regression was performed to evaluate the association between SSRI use and mortality.

Results:

We identified 458 and 1036 mortality cases in the study and comparison cohorts during the follow-up period of 4736 and 7826 person-years, respectively. The incidence rate of mortality was 96.71 and 132.39 per 1000 person-years for SSRI and non-SSRI users, respectively. After adjusting for potential confounders, the adjusted hazard ratio (HR) for SSRI use was 0.68 (95% CI, 0.61-0.76; *P* <0.0001). For SSRI users with a cumulative defined daily dose (cDDD) of 28-89, 90-364, and ≥365, the adjusted HRs were 0.75, 0.75, and 0.46, respectively, (95% CI, 0.64-10.87, 0.63-0.88, and 0.36-0.59, respectively) compared with non-SSRI users (<28 cDDD). A dose-responsive relationship was noted between SSRI use and mortality. The SSRI effect was dependent on the dose-responsive relationship in each cDDD subgroup within different adjustment models for propranolol, metformin, statins, and aspirin.

Conclusion:

SSRIs use may possibly reduce the risk of mortality in liver cirrhosis patients in a dose-responsive manner.

Association between acute methanol poisoning and long-term mortality: a nationwide population-based study in Taiwan

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Background/Aim
Methanol poisoning (MP) often causes acute mortality and morbidities; however, the association between MP and long-term mortality has not been well studied.

Methods
We conducted a nationwide population-based cohort study by identifying 621 participants with MP from the Nationwide Poisoning Database and 6,210 participants without MP from the Longitudinal Health Insurance Database 2000 by matching the index date at a 1:10 ratio between 1999 and 2012. Comparison of the mortality rate between the two cohorts was performed by following up until 2013.

Results
A total of 249 (40%) participants with MP and 154 (2.5%) participants without MP died during the follow-up ($p < 0.001$). Statistic analysis showed that participants with MP had a higher risk for mortality than did the participants without MP (adjusted hazard ratio [AHR]: 14.68; 95% confidence interval [CI]: 11.7–18.41). The risk of mortality was highest in the first 2 months after MP (AHR: 961.21; 95% CI: 133.17–6937.93). Older age, male sex, hypertension, liver disease, malignancy, drug abuse, and lower monthly income also predicted mortality.

Conclusions
MP was associated with increased long-term mortality. Close follow-up for comorbidity control and socioeconomic assistance are suggested for patients with MP.

Keywords: intoxication; long-term; methanol; mortality; poisoning

0622_P3-39

Correlation between environmental green cover rate and asthma among children and adolescents.

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Background/Aim
Due to large emissions of greenhouse gas , the growing greenhouse effect result in the well-known global warming. In order to lower global warming speed, increasing environmental greenness is potential to absorb excessive greenhouse gases. However, many fungi can maintain a symbiotic relationship with plants, and the growth of greenness may also imply that pollen concentrations in allergic diseases will also increase. Therefore, we conduct a study to evaluate the relationship between environmental greenness and asthma by available data from the National Health Insurance database.

Methods
The object of study was based on ICD-9-CM diagnosis code. The case group was who has asthmatic medical recordsat least three times during the year from 2006 to 2015. The control group was personally paired with the case by age, gender, and the first confirmed year but without asthma medical records. Finally, we get the greenness cover rate nearby the residence place of both case and control groupto evaluate the relationship of asthma occurrence and greenness cover rate.

Results
Our results indicatedthat Taiwan's greenness cover rate has significantly increased from 2004 to 2013. In addition,the asthma incidence of teenager is higher in males. If the greenness cover rate was higher than 20%, the risk of asthma was significantly higher than that were living in low green coverage (< 20%).

Conclusions
Up to date, green planting is considered to have positive effect on mitigating the greenhouse effect. However, in the promotion of green plant planting policy, the plant characteristics should be considered to avoid the risk of allergic diseases.

0624_P3-41

The relationship between melamine and phthalate exposure and urinary biomarkers of renal injury and oxidative stress in pregnant women.

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Background

The melamine and phthalate are still ubiquitously present in our environment even after the food scandal. Previous studies suggested melamine and phthalate exposure could induce kidney diseases in humans. No clinical epidemiological study is to investigate the relationship between the melamine and phthalate exposure in pregnant women and their early renal injury markers. The aim of this study is to investigate the effect of maternal melamine exposure on markers of early renal damage among the pregnant women themselves.

Methods

The Taiwan Maternal & Infant Cohort Study (TMICS) study is a nationwide prospective birth cohort, established by epidemiologists from northern, central, southern and eastern Taiwan since October 2012 and the pregnant women received routine pre-birth examinations their 3rd trimester (weeks 29 to 40). Their urine sample was used for the measurement of melamine, phthalate metabolites, biomarkers of renal injury and oxidative stress.

Results

Three hundred and seventeen pregnant women in south Taiwan were enrolled in this study and they had mean age of 28.78±8.85 years, mean serum creatinine of 0.57±0.13 mg/dL, had urine melamine levels ranging from 0.02 to 39.25 μg/mmol creatinine, and had DEHP intake levels ranging from 0.44 to 516.92 μg/kg/day. No significant correlation between urinary melamine level and makers of early renal injury and oxidative stress. The higher DEHP intake quartile, urine albumin-to-creatinine ratio (ACR) and 8-hydroxy-2'-deoxyguanosine (8-oxdG) level were higher (p for trend = 0.011 and 0.028). Multivariate linear regression models did not reveal significant difference between urinary melamine level and urinary biomarkers of early renal injury and oxidative stress.

Conclusions

Neither melamine nor phthalate exposure was significantly associated with biomarkers of renal injury and oxidative stress. Future studies may need more data to investigate the health effects of melamine and phthalate in pregnant women.

P3-42

Exposure factors for cleaning products and spray products for exposure assessment

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[Background/Aim] Consumer products (CPs) were developed to meet various purposes of daily life. However, they contain various chemicals and may cause adverse health effects. To prevent health problems by using CPs, accurate exposure assessment is important. The goal of this study was to develop a database of national representative exposure factors of cleaning and spray products for exposure assessment.

[Methods] We determined the exposure factors of 9 CPs (cleaning tissue, disposal cleaner, dishwashing detergent, automobile interior cleaner, deodorizing spray for car, anti-static spray, waterproofing spray, effective microorganism deodorizer, and disinfectant spray). Field survey was carried out using questionnaire to obtain detailed use pattern information of the CPs by face-to-face interview. In total, 10,000 (5,010 men and 4,990 women) subjects older than 15 years completed the questionnaire.

[Results] Use rates of cleaning products were relatively higher than spray products. Use rate of dishwashing detergent was the highest with 66.7%. Use rates of the CPs were significantly different by gender ($p<0.001$). While dishwashing detergent was used with the highest frequency, CPs for automobile related purpose were used less frequently. Usage amount for CPs were different by application type. For spray products, aerosol types had the higher mass per use value and longer duration of usage than trigger types.

[Conclusions] Exposure factors of the 9 CPs were determined by a face-to-face interview of over 10,000 people in Korea. The exposure factor data would be useful input data for exposure and risk assessment.

0624_P3-44

Indoor air pollution due to electronic cigarette and heat-not-burn tobacco smoking

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Background/Aim
Electronic cigarettes (e-cig) and heat-not-burn tobacco have been popular recently. It is said that they are safer than conventional tobacco and do not produce sidestream smoke, but some specific pollutants have been found from mainstream smoke in some studies. It may occur involuntary exposure to smoke when e-cig and/or heat-not burn tobacco are smoked. In this study, we conducted a preliminary measurement study on indoor air pollution due to e-cig and heat-not-burn tobacco smoking.
Methods
In a 50-m3 laboratory room (3×6×3 m) with ventilation system, 2 smokers generated vapor or smoke from 3 brands of heat-not-burn tobacco, 4 electronic non-nicotine cigarettes and 1 conventional tobacco individually. We conducted real-time measurement of air pollutants (PM2.5, TVOC, PAH, formaldehyde, CO) during smoking at 1.5 meter away from smokers. We simultaneously measured VOCs and aldehydes by using active samplers for 30 minutes.
Results
PM2.5 and TVOC concentrations increased during smoking of each tobacco. PM2.5 peak concentration for conventional tobacco was 2 times higher than heat-not-burn tobacco and 10 times higher than e-cig. TVOC peak concentration for conventional tobacco smoking was 10 times higher than heat-not-burn tobacco and 2 times higher than e-cig. CO was detected only in conventional tobacco smoke.
Conclusions
Indoor environment due to those new products may be less polluted, but in order to check whether they are much safer for bystanders, more investigation such as the measurement of other pollutants should be necessary. We will also conduct a web research about the smoking behaviours of e-cig and heat-not-burn tobacco from the perspective of risk assessment.

P3-45

Review papaer: study on the health risk of arsenic in rice in countries

Rice is mainly crop in world. However, there is high arsenic level in rice. It is known inorganic arsenic can cause cancer by long term exposure. Now inorganic arsenic exposure in rice is an important issue in the world. This study is aim to discuss potential risk for arsenic in rice in countries. Using “arsenic”, ”rice” and “risk” to search papers including arsenic level in rice and ingestion rate in 2007-2018 by Google Scholar. Cancer risk for inorganic arsenic is mainly affected by inorganic arsenic level and rice ingestion rate. Inorganic arsenic level in white rice is different in countries. Range of inorganic arsenic level is 0.06 - 0.195(ppm) in countries and it is different by 3 times. White rice (uncooked) ingestion is 21 - 432 (g/day) and it is different by 20 times. Cancer risk of inorganic arsenic is 1.4×10^{-3} - 3.4×10^{-4} and it is different by 20 times. It is over limitation 10^{-4} by USEPA. Risk for arsenic in rice should be continuously concerned for food safety in future.

0624_P3-47

Environment as Risk factor of Tuberculosis in Malaysia: A systematic review of the literature

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ABSTRACT

Background: Probability for risk of transmission for Mycobacterium Tuberculosis (TB) usually occur in high density communities, in crowded enclosed spaces with inadequate ventilation. With the influx of the foreign workers into the country, the reemergence of TB among the Malaysian population occurred because many of the immigrants act as TB carriers. Rapid urbanization which include the substandard housing for these workers leads to various sanitation and health problems. The low socio-economic background and poor health among these foreign worker made them more susceptible to infection and the prevalence of most communicable diseases especially TB is on the rise. This systematic review of the literatures on TB is to establish the existing knowledge on the prevalence and incidence of the diseases as well as to focus on its environmental risk factor in Malaysia.

Objective: To investigate the prevalence and incidence of TB cases and the environmental risk factors associated with it.

Methods: We searched 15 databases that published literatures (January 2008 - January 2018) of studies related to TB and the environmental risk factors in Malaysia. Articles initially identified were screened for relevance. A narrative review for heterogeneity of studies eligible for inclusion in the systematic review was then conducted.

Results: We found 13 relevant articles. Studies showed associated environmental risk factors were due to overcrowding, high congregate setting including prison and hospital, poor working conditions, type of house, proximity to factories, the house locations, type of land use or urbanization, and distance to healthcare facilities. However, the evidence for these factors were not statistically significant, thus assumed to be conflicting or weak. Studies on the association between physical environment and TB risk were too few and too small to provide explanations for the increasing trend of the cases.

Conclusion: High urbanization rate and migration patterns of communities in Malaysia are constantly changing. Further research into the combine effects between weather variability, air pollution and TB infection in vulnerable population is urgently needed to improve the health services for the management of TB transmission.

Keywords: *environment*, *risk factors*, *systematic review*, *tuberculosis*

0624_P3-48

SAWASDEE birth cohort study: A cohort development in Chiang Mai, Thailand

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Background/Aim: The Study of Asian Women and their Offspring's Development and Environmental Exposures (SAWASDEE birth cohort study) is a 5-year NIH-funded study on impact of prenatal insecticide exposure on neurodevelopmental trajectories in a Thai birth cohort. This study is based in Chiang Mai Province. Aims of this cohort study are to continue building the capacity of Thai researchers to develop and maintain a birth cohort in Thailand and evaluate markers of insecticide exposure and neurodevelopmental outcomes. Here, we present the cohort development information at Chom Thong Hospital, one of two hospital sites of the study.

Methods: Pregnant women (n=300) are aimed to enroll into the cohort. Chom Thong (CT) and Fang (FA), 2 major general district hospitals of Chiang Mai Province, are enrollment sites. We started enrollment at antenatal care (ANC) unit of CT hospital since July 2017. Pregnant women who came for their first visit at ANC unit were screened with 3-page form regarding inclusion and exclusion criteria. Participants signed informed consent and were enrolled into the study. Details of the cohort study protocol will be presented.

Results: From July 2017 to 19 February 2018, 381 pregnant women had their first ANC at CT Hospital, were screened, and 104 (27.3%) met inclusion criteria and enrolled into the study. Of 104 women, their geometric mean of age, gestational age, weight, height, and body mass index are 25.0 years old, 9 weeks, 55.3 kg, 154.8 cm, and 23.1 kg/m2, respectively. Enrollment rate was 77% increased after community outreach intervention was executed intensively from December 2017.

Conclusions: Most pregnant women had their first ANC visits with second trimester. Intensive operation of community outreach intervention was found increasing target population especially early pregnancy (first trimester) at their first ANC visit.

0624_P3-50

Time-activity patterns and their affecting factors in South Korean

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Background/Aim
The main purpose of the present study was to provide an updated time-activity database as reference to population exposure and risk assessment. The final stratification was also carried out for applicability of the reference values to general exposure modelling. The roles of socioeconomic and demographic factors in shaping time-activity patterns were assessed to facilitate the usage of national big data in the perspective of exposure research. Data from these types of large-scale studies or databases can be a useful alternative to collecting study-specific data.

Methods
Overall, this study was designed based on the three stages of human population in Korea: children aged 0 ~ 9 years; teenagers aged 10 ~ 18 years; and adults aged 19 years and up. The part for the children was conducted through a children survey carried out between 2013 and 2014, where a total of 2,080 children were drawn from the entire children population. Their social demographic characteristics and time-activity information were collected. The teenagers part was analyzed using the data of the 2014 Time-Use Survey. The adult part was conducted by combining the 2014 Time-Use Survey and supplement adult survey.

Results
This study was designed to acquire updated time-activity data, which was representative of Korea. Analyses of time spent and number of occurrences of people (doers) were presented for selected locations by selected geographic, socioeconomic, and time factors. These analyses were based on a 24-hour diary data of population from different age groups and regions in Korea. The survey design and the high response rate indicated that the results were highly representative of Korean population. The strengths of our study were its large sample size and population-based design. Detailed information was provided for accurate determination of frequency of occurrence and duration of locations. The data was a good indicator of the significance of the microenvironment to the entire population and its relative significance between subgroups. Moreover, they were a better indicator of the potential exposure associated with microenvironments for the specific subgroups being exposed.

Conclusions
National-level time-activity patterns were required in exposure assessments and risk assessments, as well as for other risk analyses and major policy decisions. The importance of time-activity patterns data had increased the realization that many types of exposure to environment pollutants occurring in their activity space. Moreover, the time-activity data could explain the variation in exposure to environmental pollutants. Moreover, the findings highlighted the need for an evaluation of the interactive effects of socio-demographic, economic, and public policy influences on subgroups dividing, especially to high risk groups screening to many environment pollutants.

Keywords: Time-activity pattern, Time-of-the-Day, Affecting Factors, Exposure, Risk

0622_P3-52

Application of ATP bioluminescence for Rapidly Quantifying Indoor Bioaerosol Concentrations.

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Background/Aim

Bioaerosols are all the biologically suspended particulates in the air. Since the exposure of bioaerosols is associated with many diseases, rapid quantification of bioaerosols is an important issue. Although the Environmental Protection Administration(EPA) in Taiwan has established a standard method for the sampling and analysis of total bacteria and fungi concentration, but this method must to take more than 48 hours to form colonies. Recently, ATP Bioluminescence is a rapid method to detect the content of ATP in organism. The test results were reported as relative light units (RLUs) and could be a potential indicator to predict total bacterial and fungal concentrations.

Methods

The objective of this study is to establish the relationship between RLUs value and indoor bioaerosol's concentration.

First, the sampling efficiency of different bioaerosol samplers combined with ATP assay was analyzed in a test chamber. After the sampling method had been opitimized, this assay was then applied in the field environments including hospital, library and the elderly institution.

Results

There was a significant correlation between RLUs value and bioaerosol concentrations for all test microbes. Among all the test samplers, Coriolis@ μ Sampler demonstrated the best performance in collecting bioaerosols when the sampling flowrate was 200 LPM combined with 30 minutes sampling. In field study, the ROC curve analysis shows the best cut-off point for ATP levels of bacteria and fungi was 330、180 RLU（AUC=0.829、0.572）, respectively.

Conclusions

Our study indicated ATP bioluminescence technology is a simple and rapid method to predict bioaerosol concentration. This assay can be widely used as a potential indoor air quality management tool in quantifying bioaerosols.

0624_P3-53

Thyroid Nodules and Thyroid Cancers in Fukushima: An Analysis of 1st and 2nd Round Thyroid Examination

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Background/Aim
After the Fukushima–Daiichi nuclear power plant disaster, thyroid ultrasound examination (TUE) has been performed in subjects who were aged ≤18 years. In the 1st round TUE (October 2011 to March 2014), 116 malignancies (including suspicious cases, "malignancies", hereafter) were detected. Beside malignancies, 2,293 nodules with diameter ≤5 mm and 1,244 with nodules larger than 5mm were detected among 300,476 participants. They comprise 0.039%, 0.76% and 0.41% of participants respectively. In the 2nd round TUE (April 2014 to March 2016), while much less malignancy was expected, additional 71 malignancies, 1,570 nodules with diameter ≤5 mm and 2,219 with nodules larger than 5mm were detected among 270,515 participants as of June 2017. They comprise 0.026%, 0.6% and 0.8% of participants respectively.

Methods
This study examined the relationship between radiation dose and the number of participants with thyroid malignancy or nodules, using publicly available municipality level data (N=59). Poisson regression was applied to that data with three estimated doses: UNSCEAR estimated thyroid dose, re-estimated thyroid dose (Suzuki et al. 2017) that reports 1/2 of UNSCEAR dose on average, and external (effective) dose (Akahane et al. 2013).

Results
In spite of the UNSCEAR thyroid dose was insignificant for malignancies for both the 1st round (β= 15.96, t=1.07, p>0.1) and for the 2nd round TUE (β=22.59,t=1.31, p=0.19), it was positive and significant for smaller nodules both the 1st round TUE (β= 17.36,t=4.92, p<0.01) and for the 2nd round TUE (β= 5.42,t=2.04, p=0.042). It was also significant for larger nodule both for the 1st (β=9.50, t=1.95, p=.05) and for the 2nd round TUE (β=9.02, t=2.17, p<0.05). Although re-estimated thyroid dose was less than 1/2 of UNSCEAR dose, similar results were obtained. More over, external (effective) dose was significant for thyroid malignancy for the 2nd round TUE(β= 0.431,t=1.89, p=0.059).

Conclusions
Although this was an ecological study at the municipality level, our results are consistent with previous studies that confirm significant relationships with radiation exposure and prevalence of nodule. According to follow up studies of a-bomb and Chernobyl, nodule group has larger risk of later incidents of thyroid cancer. Health follow-up for children in Fukushima is necessary.

0624_P3-54

Food safety at home: Knowledge and practices among adults in suburban community in Malaysia

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Background/Aim

Foodborne illness is attributable to improper preparation of foods either at home or food premises. Due to hot and humid climate in Malaysia, it becomes the favourable condition for the growth of foodborne bacteria and contributed the high number of reported cases for food poisoning. Most people unaware that the risk of food poisoning may originate from home is higher than food consumed in the restaurants. Even though there is usually a small outbreaks that come from home, the actual proportion of this outbreaks is likely to be much larger than it has been reported to be. Thus, this study aims to determine the level of knowledge and practices of food safety among adults in sub urban Malaysia living at home.

Methods

A cross-sectional study was conducted among adults lived in sub urban area located in the east coast of Malaysia. All participants aged between 18 to 65 years old were randomly recruited. Data were collected through a guided self-administered validated questionnaire which consisted of questions regarding knowledge and practices of food safety.

Results

A total of 390 eligible adults with a mean age of 35.9 years (SD: 9.1) responded to our study (response rate: 68.3%). Majority of them had good knowledge (66.2%) and practices (96.4%). The level of good knowledge was significantly associated with those who had sources of information on food safety (χ^2=10.733, p = 0.001). However, there were no significant differences for all sociodemographic factors with their practices. A significant positive relationship between total score of knowledge and practices was also observed (r_s = 0.211, p < 0.001).

Conclusions

Overall, this study demonstrated that food safety knowledge of the adults reflected their good practice towards food handling at home. Findings will help the policy maker to make decision in preventing the foodborne illness.

Association between fetal exposure to phthalate endocrine disruptor and genome-wide DNA methylation at birth

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Background
Phthalic acid esters are ubiquitous and antiandrogenic, and may cause systemic effects in humans, particularly with *in utero* exposure. Epigenetic modification, such as DNA methylation, has been hypothesized to be an important mechanism that mediates certain biological processes and pathogenic effects of *in utero* phthalate exposure.

Aim
The aim of this study was to examine the association between genome-wide DNA methylation at birth and prenatal exposure to phthalate.

Methods
We studied 64 infant–mother pairs included in TMICS (Taiwan Maternal and Infant Cohort Study), a long-term follow-up birth cohort from the general population. DNA methylation levels at more than 450,000 CpG sites were measured in cord blood samples using Illumina Infinium HumanMethylation450 BeadChips. The concentrations of three metabolites of di-(2-ethylhexyl) phthalate (DEHP) were measured using liquid chromatography tandem–mass spectrometry (LC–MS/MS) in urine samples collected from the pregnant women during 28–36 weeks gestation.

Results
We identified 25 CpG sites whose methylation levels in cord blood were significantly correlated with prenatal DEHP exposure using a false discovery rate (FDR) of 5% (q-value < 0.05). Via gene-set enrichment analysis (GSEA), we also found that there was significant enrichment of genes involved in the androgen response, estrogen response, and spermatogenesis within those genes showing DNA methylation changes in response to exposure. Specifically, PA2G4, HMGCR, and XRCC6 genes were involved in genes in response to androgen.

Conclusions
Phthalate exposure *in utero* may cause significant alterations in the DNA methylation in cord blood. These changes in DNA methylation might serve as biomarkers of maternal exposure to phthalate in infancy and potential candidates for studying mechanisms via which phthalate may impact on health in later life. Future investigations are warranted.

0624_P3-56

Genetic and Epigenetic Evidences of Tobacco Smoking on Allergy

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Background/Aim
Tobacco smoking has been suspected as one of the main causes of rapid increasing of allergic diseases. However, toxic mechanisms of tobacco smoking for allergy are not completely understood, yet.
Methods
I performed a cross sectional study in order to study etiological mechanisms of tobacco smoking on allergy (N=12, Korean men smokers and nonsmokers, age, 39±4 yrs) via genetic and epigenetic alteration. At first, I performed biological monitoring of tobacco exposure and response biomarkers, e.g., urinary cotinine, malondialdehyde (MDA) and trans,trans-muconic acid (TMA). Secondly, I isolated total RNA from the blood of the all subjects and applied it to qPCR-based 96 well plate- microarrays, which targeted 84 core genes for allergic response. I also analyzed differences in global (LINE-1) and targeted (*PDCD1* and *TGFB1*) DNA-methylation between smokers and nonsmokers.
Results
The three allergy genes including *PDCD1, IL13RA2* and *IL17RB* were significantly down-regulated due to tobacco smoking or cotinine levels ($P<0.05$ and >1.5 fold change). In addition, other allergy-genes, *IL13RA2, IL33* and *RETNLB,* were also negatively associated with urinary MDA levels ($P<0.05$ and >1.8 fold change). Moreover, there were negative associations between TMA levels and *EPX, IFNG, PDCD1, TBX21, TGFB1* or *TNFRSF4* ($P<0.05$ and >1.8 fold change). However, the global and targeted DNA methylation statuses were not significantly altered by smoking.
Conclusions
The above altered expression of allergy-genes can explain the risks of tobacco smoking on allergy, although DNA methylation of these genes may be not related.

Comparison of the risk of developing lumbar herniated intervertebral disc between dentists and other occupations: a nationwide population-based study in Taiwan

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Background/Aim
Dentists may have a higher risk of developing lumbar herniated intervertebral disc (HIVD) due to prolonged sitting and improper postures during work. We conducted this study to delineate this issue, which is still unclear.

Methods
This nationwide population-based study was conducted using Taiwan National Health Insurance Research Database. We identified 10,734 dentists, 72,066 non-dentist health care providers (HCPs), and an identical number of age- and sex-matched participants from the general population. The risk of developing lumbar HIVD among dentists, non-dentist HCPs, and general population was compared by tracing their medical histories between 2007 and 2011.

Results
The cumulative incidence rate of lumbar HIVD among dentists during the 5-year follow-up period was 1.40%. After adjusting for age, sex, and comorbidities, the risk of developing lumbar HIVD was found to be lower among dentists than that among the general population (adjusted odds ratio [AOR]: 0.80, 95% confidence interval [CI]: 0.64–1.00) and non-dentist HCPs (AOR: 0.81; 95% CI: 0.68–0.96).

Conclusions
Dentists in Taiwan have a lower risk of developing lumbar HIVD than that among other occupations. Although this result is different from the general cognition, it does not imply that the prevention of lumbar HIVD in dentists is not important. Further studies are warranted to better address this issue.

Keywords: dentists; health care provider; herniated intervertebral disc; lumbar

0624_P3-59

Mortality of cancer among telecommunication workers with exposures to acid mists

Background/Aim: Exposure to high-level acid mists is a well-documented risk factor of cancer, but effects of low-level exposure are not clear. To assess cancer risks associated with low-level exposures to acid mists, we studied employees of a telecommunication company who worked in buildings with battery rooms. The batteries are used as back-up power supplies and may give off sulfuric acid mists.

Methods: We collected data on the 10,229 workers who had worked in buildings with battery rooms from January 1, 1985 to December 31, 1996. Environmental levels of sulfuric acid were measured in 23 buildings. Using the general population in Taiwan as the reference, we assess risks of cancer by standardized proportional mortality ratio (SPMR). Environmental levels of sulfuric acid were the highest in battery rooms (3.05 to 32.6 g/m3, geometric mean = 10.7 g/m3), but all were within the regulatory standard of 1000 g/m3.

Results: A total of 155 deaths were observed. Increased risks were found for all cancers combined (SPMR = 1.46, p = 0.01) and cancers of digestive organs and peritoneum (SPMR = 1.61, p = 0.02). In particular, an increased SPMR of 2.94 (p = 0.02) was observed for gastric cancer.

Conclusions: Exposures to acid mists at relatively low level were associated with an increased risk of cancer, particularly gastric cancer. Further studies are warranted; particularly those to evaluate whether inhalation and subsequent ingestion of acid mists can cause similar effects as gastroesophageal reflux, which has been shown as a risk factor of gastric cancer.

0624_P3-61

Psychosocial Safety Climate, Workplace Violence and Personal Burnout: a Multi-level Study among Junior High School Teachers

Background and objective: Workplace violence has been recognized as a major psychological work hazard in the workplace. This study investigated the prevalence and distribution of workplace violence and examined the associations between the schools' psychosocial safety climate (PSC), workplace violence, and personal burnout among junior high school teachers.
Methods: A cross-sectional survey of 347 male and712 female teachers was conducted. A standardized self-administered questionnaire was used to obtain information regarding teachers' experiences of workplace violence over the past year, including four types: physical, psychological, verbal and sexual. Psychosocial work conditions including psychological job demands, job control, and workplace justice were assessed. Personal burnout was measured by the occupational burnout inventory. PSC was measured by the Chinese version Psychosocial Safety Climate (PSC-12C) scale. Hierarchical linear modeling (HLM) was used to examine the association between school-level PSC, workplace violence, and personal burnout.
Results: The results showed that the prevalence rates of workplace violence in teachers were: verbal violence 27.4%, psychological violence 18.2%, physical violence 3.7%, and sexual harassment 6.0%. It was also found that verbal violence, physical violence, and sexual harassment came mainly from students and psychological violence came mainly from co-workers or supervisors. With adjustment of gender, seniority, administrative duties and work characteristics, teachers who had experienced workplace violence reported higher risks for personal burnout (OR=1.66, 95% CI (1.239, 2.229). In the hierarchical linear model, teachers from school with the lowest PSC score had higher risks of personal burnout.
Conclusion: Findings of this study identified the sources of workplace violence and its distribution. This study also documented the associations between the experiences of workplace violence with personal burnout among junior high school teachers. Future research should investigate the natures and impacts of workplace violence as well as the effective preventative strategies.

0624_P3-62

Comparison among insulated handle grips for reducing hand-transmitted vibration in two-wheel mower worker at Nakhon Ratchasima Province, Thailand.

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The two-wheel mower worker exposed to hand arm vibration (HAV). It has been reported to effect safety and health, both short term and long term. This study was a comparative experimental study of HAV among the two-wheel mower worker with bare hands, and using three types of insulated handle materials (Ethylene-Propylene Diene Rubber (EPDM), ethylene vinyl acetate (EVA) and Motorcycle Inner Tube) in each octave band center frequencies (16, 31.5, 63, 125, 250, 500, and 1000 Hz) and vibration total value for all three axes (Xh, Yh and Zh). Using vibration meter to collect data. Ten experienced the two-wheel mower worker operators were chosen for the study. Three repetition were carried out for 30 minute in each sample during working-hour. They were evaluated for reducing vibration with regard to their performance as per ISO 8662.

Results of the study revealed that EPDM, EVA and Motorcycle Inner Tube materials in the form of insulated handle type could reduce vibration at frequencies of 16, 125, 250 and 500 Hz. The insulated handle type could reduce at the frequencies of 16, 125, 250, 500 and 1000 Hz. Regarding the maximum efficiency compared to bare hands in reduction of vibration, total value was 40.61% for EPDM material insulated handle ($p>0.001$). The insulated handle type could reduce vibration more than bare hands at the frequency of 63, 125, 250, 500 and 1000 Hz but vibration total value of insulated handle were significantly different at 1000 Hz. The workers were more satisfied with EPDM material insulated handle type. The result can be used as guidance to apply damping materials as insulated handle to reduce hand arm vibration.

Keywords: Hand Arm vibration, the two-wheel mower worker, Ethylene-Propylene Diene Rubber, ethylene vinyl acetate and Motorcycle Inner Tube)

0624_P3-65

Application of machine learning and sensor arrays analysis to detect lung cancer: a case-control study

Background/Aim

Lung cancer is the leading cause of cancer death in the world. The challenge of screening for early stage lung cancer is still unresolved. The use of sensor arrays can detect the electronic resistance changes cause by volatile metabolites of diseases. The aim of the study was to use machine learning technique to diagnosis lung cancer and assess the diagnostic accuracy.

Methods

We conducted a prospective study to enrol cases of lung cancer and controls who received surgery for gall bladder stone, hernia, hemorrhoid resection, and varicose vein surgery in the same hospital between July 2016 and November 2017. We collected the alveolar air of subjects. The air was analysed by an electronic nose composed of 32 carbon nanotubes sensors to measure the changes of electronic resistance. We used support vector machines (SVM) of machine learning algorism to generate the predict models, and used the pathological reports as the reference standard. The data were randomly split into 80% for model building (training set) and 20% for validation (test set) to assess the diagnostic accuracy.

Results

This study enrolled 241 patients with density sampling. We excluded 3 subjects with technical problems in sampling, 38 subjects with cancers in other sites, benign lung tumor, metastatic lung cancer, carcinoma in situ or minimally invasive adenocarcinoma, and 14 subjects with chemotherapy. A total of 35 lung cancer cases and 35 age-matched controls were used in the final analysis. By SVM, the accuracy, sensitivity, specificity, false positive rate, false negative rate, and ROC-AUC were 85.7%, 85.7%, 85.7%, 14.3%, 14.3%, and 0.92 (95% CI = 0.75-1.00) in the test set.

Conclusions

Combination of sensor array technique and machine learning is able to detect lung cancer with high accuracy.

0624_P3-66

Effects of maternal language and culture on developmental delays of children in Taiwan

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Background/Aim: Transnational marriages are common as a result of globalization, and immigrant mothers face various degrees of differences in language and culture backgrounds. A mother has a large influence on the development of her children, but the effects of immigrant mothers' language and culture backgrounds on developmental delays (DD) of children are seldom studied. We conducted a study in Taiwan to evaluate the potential effects.

Methods: We analyzed data from the national registry of DD in Taiwan from 2010 to 2013 and compared the incidence of DD in young children born to mothers from China, Vietnam, and Indonesia, where most of the immigrant mothers in Taiwan come from.

Results: We included 4604 new cases of DD in children under 7 years of age born to immigrant mothers during the study period. The incidence rates showed an increasing trend among children born to mothers from China, Vietnam, and Indonesia ($p < 0.01$ in all years). Using Vietnam as the reference, we found the incidence rate ratios in children born to mothers from China ranged from 0.65 to 0.73, and those in children born to mothers from Indonesia ranged from 1.04 to 1.26.

Conclusions: The findings support the important role of mothers' language and culture backgrounds in the development of children.

0624_P3-67

Association between Hepatic Index and Urinary Thiodiglycolic Acid in Residents of Dacheng Township north of No.6 naphtha cracking Complex

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Background/Aim

No.6 Naphtha Cracking Complex, one of the industrial processes, produces vinyl chloride monomer (VCM) and polyvinyl chloride (PVC) by Ethylene dichloride (EDC), which might release trace level of VCM and EDC in the atmosphere. International Agency for Research on Cancer (IARC) classified VCM, EDC as group 1, 2B respectively. Both VCM and EDC can also cause liver damage and lead to liver fibrosis even cirrhosis. Upon exposure, these will be metabolized by the cytochrome P450 enzymes and be excreted through urine as thiodiglycolic acid (TdGA).

Our objective is to estimate the VCM and EDC exposure level with urinary thiodiglycolic acid (TdGA) as biomarker and utilize non-invasive index (FIB-4) to evaluate the liver damages caused by VCM and EDC among residents in Southern Changhua County, then establish the correlation between TdGA and FIB-4.

Methods

Urine samples, blood samples and life style questionnaire were collected during 2016 April 10 and Apri 16 in Dacheng Township and Zhutang Township, South Changhua, Taiwan. The TdGA level in urine samples were analyzed by LC-MS/MS with the adjustment of creatinine, also divided into 4 groups dummy variables by IQR. Bases on the study population age distribution, subjects older than 70 years old were excluded. Subjects who take Vitamin B complex, have hepatitis B virus infection, hepatitis C virus infection and abnormal platelet counts were also excluded, then there are total 447 subjects. Non-invasive, Fibrosis-4 (FIB-4) were utilized to evaluate the liver fibrosis level caused by VCM and EDC. The Logistic regression model were developed to assess the relationship between urinary TdGA and FIB-4.

Results

The correlation betweenTdGA and the distances to industry of subjects is -0.20, and p-value <0.05. Subjects in Dacheng Township, is nearer to complex than Zhutang Townhip, average TdGA level is 269.6 μg/g creatinine, Subjects in Zhutang Township average TdGA level is 199.25 μg/g creatinine. With FIB-4 cuttof 1.29, subjects whos FIB-4 value over 1.29 were predicted to have significant liver fibrosis. Proportion of FIB-4 >1.29, in Dacheng Township is 39%, in Zhutang Township is 32%. In the logistic regression model , after adjusting gender, wrok in complex or not, smoke habbit, drink habbit, BMI and total cholesterol variables, we found that the highest TdGA concentration group (>Q_3), OR is 2.092(95%CI: [1.171-3.774]), p-value <0.05.

Conclusion

Subjects living near to VCM/PVC factory with increasing level of urinary TdGA. Subjects with the highest TdGA concentration (>Q_3) has 2.092 times than subjects with the lowest TdGA concentration group (<Q_1) to be led to FIB-4 >1.29. VCM/PVC factory of No.6 Naphtha Cracking Complex has probably affected residents living in South Changhua County, and caused residents liver fibrosis.

0624_P3-69

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Title: Environmental Risk Factor of Tuberculosis Infection: A Systematic Review of the Literature

ABSTRACT

Background: Probability for risk of transmission for Mycobacterium Tuberculosis (TB) usually occur in high density communities, in crowded enclosed spaces with inadequate ventilation. With the influx of the foreign workers into the country, the reemergence of TB among the Malaysian population occurred because many of the immigrants act as TB carriers. Rapid urbanization which include the substandard housing for these workers leads to various sanitation and health problems. The low socio-economic background and poor health among these foreign worker made them more susceptible to infection and the prevalence of most communicable diseases especially TB is on the rise. This systematic review of the literatures on TB is to establish the existing knowledge on the prevalence and incidence of the diseases as well as to focus on its environmental risk factor in Malaysia.

Objective: To investigate the prevalence and incidence of TB cases and the environmental risk factors associated with it.

Methods: We searched 15 databases that published literatures (January 2008 - January 2018) of studies related to TB and the environmental risk factors in Malaysia. Articles initially identified were screened for relevance. A narrative review for heterogeneity of studies eligible for inclusion in the systematic review was then conducted.

Results: We found 13 relevant articles. Studies showed associated environmental risk factors were due to overcrowding, high congregate setting including prison and hospital, poor working conditions, type of house, proximity to factories, the house locations, type of land use or urbanization, and distance to healthcare facilities. However, the evidence for these factors were not statistically significant, thus assumed to be conflicting or weak. Studies on the association between physical environment and TB risk were too few and too small to provide explanations for the increasing trend of the cases.

Conclusion: High urbanization rate and migration patterns of communities in Malaysia are constantly changing. Further research into the combine effects between weather variability, air pollution and TB infection in vulnerable population is urgently needed to improve the health services for the management of TB transmission.

Keywords: *environment*, *risk factors*, *systematic review*, *tuberculosis*

0624_P3-70

Diversity of *Wolbachia* in mosquitoes of Taiwan and cultivation of *Wolbachia* in C6/36 cells by shell-vial technique

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Vector-borne diseases are caused by diverse pathogens and dengue is the most common arboviral disease of humans. It accounts for many health threats and the World Health Organization (WHO) reputes it as the most important mosquito-borne viral disease in the world. Historically, epidemics of dengue can be traced back to 19th century in Taiwan. Today dengue outbreaks have mainly occurred in the south of Taiwan. There is no effective treatment or vaccine for dengue fever, so vector control is regarded as the major strategy. *Wolbachia* is a maternally transmitted bacterium that naturally symbiotic with about 40-65% of insects and induces a reproductive phenotype in mosquitoes known as cytoplasmic incompatibility. Besides, recent studies showed that *Wolbachia* has functions to reduce mosquito life span and block the replication of arboviruses. Therefore, *Wolbachia* infection in mosquitoes in Taiwan for conducting *Wolbachia*-based vector control was of interest. In the study, we analyzed *Wolbachia* infection in diverse mosquito species in Taiwan. First, field-collected mosquitoes were identified by both morphological characteristics and molecular methods. The cytochrome C oxidase I gene (*COI*) was used for DNA barcoding of mosquito species. *Wolbachia* was then detected by polymerase chain reaction (PCR) with primer pairs of *Wolbachia* surface protein gene (*wsp*). The results showed that among 35 mosquitoes species in Taiwan, 14 were found harboring *Wolbachia* (14/35=40%). Four of them were infected by group A *Wolbachia*, seven were infected by group B *Wolbachia*, and three were infected by both groups. The *COI* gene of 35 mosquito species and *wsp* gene of *Wolbachia* were sequenced for setting up the molecular database. The fact that certain disease vectors such as *Anopheles* spp. and *Aedes aegypti* didn't harbor *Wolbachia* further strengthened the idea that *Wolbachia* may be used against vector-borne diseases. Therefore, we tried to culture *Wolbachia* in cell line. Ovaries of female mosquitoes which naturally harboring *Wolbachia* were dissected and used to infect C6/36 cells by shell-vial technique. The infection was confirmed by real-time PCR which revealed increasing copies of *Wolbachia* gene fragments by days. Immunofluorescence assay also provided evidence of successful infection of C6/36 cells. Future study will examine the interactions between dengue virus and *Wolbachia*.

0624_P3-70

Keywords: vector control, *Wolbachia*, cytochrome C oxidase I gene, *Wolbachia* surface protein gene, dengue

0624_P3-71

Filaggrin gene mutations on the association between phthalates and phosphorus flame retardants in house dust and eczema and wheeze among children

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Background/Aim Exposure to phthalates and phosphors flame retardants (PFRs) are considered as one of the risk factors of asthma and allergies. However, little is known about the contribution of filaggrin (*FLG*) gene mutations, which impair skin barrier function and hydration, to these associations. We investigated the associations between phthalates and PFRs and eczema/wheeze among Japanese children at age 7 taking into consideration with loss-of-function mutations in *FLG*.

Methods This study is a part of the Hokkaido study on Environment and Children's Health. Seven phthalates and 11 PFRs in dust collected age at 7 were measured by GC/MS. Eczema and wheeze were assessed at 7y using the International Study of Asthma and Allergies in Childhood questionnaire. Participants were screened for 10 *FLG* mutations from cord blood previously identified in the Japanese population. The participants with one or more *FLG* mutations were assessed as *FLG* mutations positive. We included 296 children who have all the data of birth records, *FLG* mutations, 1st trimester and 7-year-old questionnaire, and phthalates and PFRs in the analyses. Odds ratio (OR) and 95 % confidential intervals (CI) were calculated with loge-transformed concentrations by logistic regression model adjusted for confounders. We also considered stratified analysis with *FLG* mutations.

Results The prevalence of eczema and wheeze were 20.6% and 13.9%, respectively. BBzP increased the OR of eczema among the children with *FLG* mutations, however, not statistically significant. TDCPP increased the OR of wheeze (OR=1.26, CI:1.04-1.52), especially among the children without any of the *FLG* mutations (OR=1.24, CI:1.02-1.51).

Conclusions The association of BBzP on eczema with *FLG* mutations may explain of impair skin barrier function. Our study design and sample size could not remove the influence of parental behavior such as lifestyle and medication, which might account for the inverse associations of TDCPP. Further studies investigating parental behavior are required.

0624_P3-72

A Pilot Study on Patterns and Predictors on Dietary-related Health and Environmental Co-benefits Behaviours in Hong Kong

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Background/Aim: As numerous climate change mitigation measures promote health as well as environmental benefits, it is imperative to assess their uptake in communities. A previous study in Hong Kong showed women and older people practiced health and environmental co-benefit behaviours more frequently. However, the attitude and awareness behind those behaviours have not been explored. This study examines the patterns and predictors among dietary-related co-benefit behaviours.

Methods: We conducted a population-based random-digit dialling telephone survey for n=1000 Hong Kong residents in February 2018. Only residents aged 15 or above and spoke Cantonese were interviewed. Socio-demographic information, dietary-related behaviour, views on climate change, and awareness of co-benefit behaviours were asked. Descriptive characteristics, chi-squared test, and ANOVA test were used to describe the patterns and examine the initial associations.

Results: Based on preliminary results from the pilot (n=51), 60.8% of respondents believe climate change is affecting Hong Kong people. Although respondents were aware red meat intake is not good for health (88%) and for the environment (95.8%), only around a third of the respondents actually reduced their meat intake and ate more organic food. Only 11.8% brought their own utensils when having meals outside. Associations were found between eating less red meat in the past 6 months with sociodemographic factors such as older age (p=0.009) and being marriage (p=0.03); and eating more organic food with having children (p=0.008) and being marriage (p=0.007). Overall, our pilot study results indicate risk perception of climate change and awareness of co-benefit behaviours were not associated with dietary related behaviours.

Conclusions: Awareness of dietary related co-benefit behaviours and perceived risk of climate change appeared to be high among residents in Hong Kong but these were not necessarily reflected in their behaviour. Further study will be needed to address the gap between awareness, risk perception, and behaviour.

0624_P3-73

Abstract title:

The effect of portable HEPA filter air cleaner use during pregnancy on fetal growth: the UGAAR randomized controlled trial

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Background: Fine particulate matter ($PM_{2.5}$) exposure may impair fetal growth. We assessed the effect of portable high efficiency particulate air (HEPA) filter air cleaner use during pregnancy on fetal growth.

Methods: The Ulaanbaatar Gestation and Air Pollution Research (UGAAR) study is a single-blind randomized controlled trial conducted in Ulaanbaatar, Mongolia. Non-smoking pregnant women recruited at ≤ 18 weeks were randomized to an intervention (1-2 air cleaners in homes from early pregnancy until childbirth) or control (no air cleaners) group. Demographic, health, and birth outcome data were obtained via questionnaires and clinic records. We used linear and logistic regression and time to event analysis to evaluate the intervention. Our primary outcome was birth weight. Additional outcomes were gestational age-adjusted birth weight, birth length, head circumference, gestational age at birth, and small for gestational age (SGA) at birth. The study is registered at ClinicalTrials.gov (NCT01741051).

Result: We recruited 540 participants (272 control and 268 intervention) from January 9, 2014 to May 1, 2015. There were 465 live births and 28 losses to follow up. Adverse events included spontaneous abortion (24 control, 10 intervention), stillbirth (5 control, 8 intervention), and neonatal death (1 control, 4 intervention). We previously reported a 29% (95% CI: 21, 37%) reduction in indoor $PM_{2.5}$ concentrations with portable HEPA filter air cleaner use. The median (25th, 75th percentile) birth weights for control and intervention participants were 3450 g (3150, 3800 g) and 3550 g (3200, 3800 g), respectively (p=0.34). The intervention was not associated with significant differences in mean birth weight (18 g; 95% CI: -84, 120 g; n = 463), but in a pre-specified subgroup analysis, the intervention was associated with greater birth weight among 429 term births (85 g; 95% CI: 3, 167).

Key words: Indoor air, fine particulate, indoor pollution HEPA filter, air cleaner