P-323 INDOOR AIR CONTAMINATION IN INDOOR SWIMMING POOLS: ANOTHER LEAK?

I. SANTA MARINA, J. IBARUZEA, M. BASTERRETXEA, F. GORI, E. ULIBARREN, J. ARTIADA, I. ORRUNO
(1) Regional Health Office of Guipuzcoa, Health Department, San Sebastian.

Introduction: A number of studies have linked the respiratory symptoms of competitive swimmers in indoor swimming pools with exposure to toxic products in the air. These effects are attributed to the presence in the air of compounds derived from disinfection (chlorine, chloramine, chloroform, etc.).

Methods: Water and air sampling and characterisation of the ventilation system of 10 installations comprising indoor swimming pools. Samples were taken in winter (on two non-consecutive days during the teams' training sessions). Air was tested for relative humidity, temperature, chlorinated oxidants and chloroform (considering the water sheet at 'breathing level'). Water was tested for pH, temperature, free and combined chlorine and chloroform (30 cm deep). Air conditioning system: age of air (CO2) and air recirculation rate. Tests also determined the number of swimmers at the moment of sampling and during accumulated sampling.

A self-administered questionnaire was used to gather information on respiratory symptoms (itching nose, eyes and throat, wheezing and chest tightness, lack of air or breathlessness, persistent coughing and asthma episodes) during training and during the subsequent twelve hours, as well as information on previous cases of respiratory pathology. All the respondents belong to swimming clubs.

Results: Air concentrations of free chlorine, combined chlorine and chloroform in water amounted to 0.91 mg/l, 0.15 mg/l and 1.09 mg/l, respectively. Average concentrations of total chlorine and chloroform in air amounted to 0.48 mg/m3 and 25.3 mg/m3 respectively. Total chlorine concentration in air was linked with relative humidity of air (r=0.58; p<0.01) and with age at air (r=0.50; p<0.05). Chloroform concentration in air was linked with relative humidity (r=-0.51; p<0.05), age of air (r=0.73; p<0.01), temperature of water (r=0.53; p<0.01) and chloroform in water (r=0.81; p<0.01).

Discussion and Conclusions: While chloroform concentrations are similar to those found in other studies. The chlorine concentrations in air come close to the level from which adverse effects can be expected (0.5 mg/m3) according to some authors. High concentrations of chlorine and chloroform in air are related to poor air conditioning systems (age of air and relative humidity). Slight respiratory symptoms that appeared among competitive swimmers.


P-324 ESTIMATING OUTDOOR AND INDOOR CONTRIBUTIONS OF PARTICULATE MATTER TO PERSONAL EXPOSURE USING A CHEMICAL MASS BALANCE METHOD

C. SCHREINER, P. JAQUES, A. FERRO
(1) CLARKSON UNIVERSITY, POTSDAM.

Introduction: The Centers for Disease Control/National Center for Health Statistics (CDC/NCCHS) collects and analyzes data describing the health of the U.S. population, such as the National Health Interview Survey (NHIS), a household interview survey of ~100,000 respondents each year, and Natality data for ~4 million births each year. The Environmental Protection Agency (EPA) maintains several databases that monitor environmental exposures. Geographically linking CDC/NCCHS health information and EPA environmental data could enhance our understanding of the effects of environment on health; such linkages, however, have been limited. Furthermore, as air pollution monitors are not located in all U.S. counties, comprehensive exposure data are unavailable, particularly for simultaneous exposure to multiple pollutants. This study describes and evaluates potential linkages between two CDC/NCCHS datasets and EPA air pollution data.

Methods: After linking 2001-2003 NHIS and 2002 Natality files to corresponding annual county-level averages of exposures for 6 pollutants (fine (PM2.5) and coarse (PM10) particles, NO2, NOx, CO, O3), the authors compare demographic and health characteristics for people living in areas with extensive air pollution data to those with limited pollution data to determine the impact of this differential linkage on observed associations between air pollution and health outcomes. For each dataset, 2 linked subsets based on exposure availability were defined: (a) linked to PM2.5 or (b) linked to all pollutants.

Results: About 70% of records were linked to county-level PM2.5 data; about one-third were linked to all pollutants. Linkage differed by most available demographic factors (e.g., race, ethnicity, poverty, region/state) and health indicators (poorer health status, smoking, overweight), but not all (e.g. low birthweight). The unadjusted odds ratios and 95% confidence intervals for poor health status (NHIS) and a 10 ug/m3 change in PM2.5 exposure were similar for the 2 linked subsets ((a) 1.26, 1.21-1.30; (b) 1.24, 1.19-1.29). Adjustment for race and poverty status, the associations weakened but remained both significant and similar. In contrast, there was no overall effect of PM2.5 on mean birthweight (Natality) among teens, but the adjusted effect varied by both linkage and state: e.g., New York (a) 1.11, 1.06-1.17, (b) 1.05, 1.00-1.11; California (a) 1.21, 1.14-1.29, (b) 1.18, 1.11-1.27); and Texas (a) 1.20, 1.14-1.27, (b) 1.27, 1.21-1.34).

Discussion/Conclusions: Linking CDC/NCCHS - EPA files have limited geographical coverage of exposure to pollutants. Preliminary analyses of NHIS suggest that linked files may provide consistent inference. The Natality results, however, suggest that inferences could vary by geographic area or outcome.

P-325 POTENTIAL FOR AIRBORNE DISPERSION OF BROMADIOLONE AND EXPOSURE IN AN OFFICE SETTING

J. PANKO, E. SHAY

INTRODUCTION
Anticoagulant rodenticides are widely used in residential and commercial buildings throughout the United States for the control of commercial rodents. Bromadiolone is one of the primary anticoagulants used in such rodenticides. It is not a volatile chemical and due to its use in bait packets that are designed to be eaten by the rodents, it is generally assumed that the rodenticide will not become airborne. In this study, however, the airborne route of exposure was investigated following employee complaints of eye and respiratory irritation and odors, and the possible association with the placement of bromadiolone-containing bait packets in perimeter ventilators in an office building in New York City.

METHODS
Because air sampling methods have not been developed for bromadiolone, air concentrations measurements could not be made. However, visual observations indicated that the rodenticide did become airborne. In this study, however, the airborne route of exposure was investigated following employee complaints of eye and respiratory irritation and odors, and the possible association with the placement of bromadiolone-containing bait packets in perimeter ventilators in an office building in New York City.

RESULTS
Bromadiolone was detected in small amounts in the two of the three wipe samples. Surface loadings were 1.8 ug/ft2 and 0.23 ug/ft2. The particulate monitoring indicated that PM2.5 and PM10 levels were below health protective levels. Ultrafine particulate levels were generally low; however, higher particle counts were measured in some perimeter areas, indicative of outdoor air infiltration. General IAQ indicator parameters were measured and various particle size monitoring (i.e., PM2.5, PM10 and ultrafine) was conducted using direct reading instruments.

DISCUSSION
Health-based screening criteria for bromadiolone do not exist, thus, a margin of exposure (MOE) analysis was performed. Reasonable maximum exposures were calculated for employees and the doses compared to a toxicity endpoint derived from EPA's Registration Eligibility Document for bromadiolone. MOEs of 18,575 and 225,135 were calculated and indicated that there was no significant health risk to employees. Employees' irritation effects were most likely caused by low humidity levels, and odors were likely due to infiltration of construction dust from outside air. Although bromadiolone is generally not expected to become airborne, our investigation showed that this assumption can be invalidated when the rodenticide is placed in areas of excessive air movement.