families (LOD 1.0 to 3.0) and heterogeneous families (LOD 1.8 to 2.1 at the more telemeric peak), Thus, it appears that different phenotypic classifications and environmental risk factors maximize linkage in distinct regions of chr 10. It is therefore likely that multiple genetic risk factors play a role in FIP, with both environmental and phenotypic classifications distinguishing more homogeneous sub-groups.

1996 BLOOD GROUP TYPE B IS ASSOCIATED WITH HIGH BLOOD LEAD LEVELS IN CHILDREN WITH CHRONIC EXPOSURE.

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Children chronically exposed to environmental lead are at risk of suffering severe adverse health effects. The aim of this study was to assess a possible association between blood group type (as a marker of susceptibility) and blood lead concentrations (PbB) above 10mg/dL, value considered as indicative of lead poisoning. The study was conducted in Torreón, Coahuila, Mexico, a city where lead contamination in soil, dust and air around a smelter site has resulted in increased lead body burden in scholar children, living in the vicinity of the major smelter complex of Latin America. We examined PbB in 233 children, 5-7 years old, and determined their blood group type. Blood group type O was the most common type (153 [66.2%] children) followed by types A (24.2%), B (8.2%) and AB (1.3%). Median PbB was 8.39 µg/dL in children with blood group type A, 9.6 µg/dL in children with blood group type O, 10.6 µg/dL in children with blood group type AB and 12.4 µg/dL in children with blood group type B. In univariate analysis higher risks of PbB above 10 µg/dL were observed in children with blood group type B (OR=3.33; P=0.03) and blood group type O (OR=1.87;P=0.05), in male children (Odds Ratio 1.58; P=0.08) and in children living closer to the smelter complex (OR=13.8; P=0.000). After controlling for gender and vicinity to the smelter complex, children with blood group type B had the highest risk of PbB >10 µg/dL (OR=4.48; P=0.02), followed by children with blood group type O (OR=3.12; P=0.006), when compared to blood group type A.

1997 GENETIC SUSCEPTIBILITY TO ORGANOPHOSPHATE TOXICITY IN A GROUP OF MIGRANT SEASONAL FARMWORKER WOMEN OF MEXICAN ORIGIN RESIDING IN TEXAS.

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Organophosphate pesticides (OPs) are currently the most widely used pesticides in the world. Studies have demonstrated that the effect of OPs toxicity can be modified by genetic polymorphisms. These variations can place individuals at a higher risk for the toxic effects of OPs. The serum paraoxonase (PON1) gene at position 192 codifies for the synthesis of the paraoxonase enzyme. This enzyme is important in the hydrolysis of OPs. A common polymorphism (Q192R) has been established, and is mostly responsible for PON1 activity. The frequency of the Q192R polymorphism varies between individuals. Studies in Hispanics are still lacking. The Hispanic population is of special interest to health researchers because of their increasing number in the U.S., and because the majority of individuals occupationally exposed to OPs are of Mexican origin. The overall goal of this study was to predict OP sensitivity in a population of migrant seasonal farmworker (MSF) women of Mexican origin residing in Texas. A total of 200 women were randomly selected from an ongoing study conducted by The Center for Research on Minority Health at UTMDACC. The Q192R PON1 polymorphism was genotyped by Real-Time PCR using the TaqMan System and the serum PON1 Activity was analyzed spectrophotometrically using paraoxon as a substrate. Genotype frequencies were QQ=0.26, QR=0.495 and RR=0.245. The mean PON1 activity among genotypes were QQ=479.7 U/L, QR=969.4 U/L and RR=1518.5 U/L, respectively (p=.001), with the lowest PON1 activity observed among women with the QQ genotype, which makes them particularly vulnerable to OP toxicity. In summary, this study can help determine (1) which Hispanic sub-populations are at a higher risk for OP toxicity and (2) establish future policies regarding OP exposure to help reduce health disparities in Hispanic populations.

1998 PHYSIOLOGICALLY-BASED PHARMACOKINETIC MODELING OF PERSISTENT ORGANIC POLLUTANTS FOR LIFETIME EXPOSURE ASSESSMENT: A NEW TOOL FOR BREAST CANCER EPIDEMIOLOGICAL STUDIES.

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Persistent organic pollutants (POP) have been shown to promote breast cancer development in experimental models. Meta-analyses of epidemiological studies did not support an association between POP exposure and breast cancer incidence in humans. This may be due, in part, to difficulties in relevant exposure assessment and to the lack of tools to adequately estimate blood or tissue POP concentrations at critical time periods of the carcinogenic process. This study aimed to build a physiologically-based pharmacokinetic model (PBPK) which could be used as a tool for the estimation of past internal exposure to POP in epidemiological studies of breast cancer. The developed lifetime PBPK model simulates woman body physiological processes (e.g., growth, pregnancy, breastfeeding) and POP kinetics for given exposure scenarios. Using data on height, weight and age, the model estimates the values of physiological parameters (e.g., organ volume, blood flow and composition) throughout the entire life of a woman. The model allows to consider temporal variations in the daily intake from ingestion. The latter can be based on data obtained from a questionnaire on exposure or on theoretical average scenarios. Several model runs with different physiological profiles were simulated using the POP hexachlorobenzene. Simulations showed that women with a same blood concentration at 55 years of age may have completely different lifetime toxicokinetic profiles. Aside from exposure scenarios, factors that were shown to have the greatest impact on the lifetime toxicokinetic profile are the time and duration of lactation periods and weight history. This PBPK modeling tool will permit researchers conducting environmental epidemiology studies to reduce the uncertainty linked to past POP exposure estimation and to consider exposure time windows that are hypothesized to be mechanistically critical in carcinogenesis. (SH is recipient of a research scholarship from FRSQ)

1999 ESTIMATING HEALTH RISKS IN WORKERS ABOARD CRUDE OIL TANKERS DUE TO EXPOSURES TO N-HEXANE, TOLUENE, AND BENZENE.

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Most health studies of petroleum workers involve exposures at fixed facilities on land (e.g. refineries). There is a paucity of literature regarding the degree to which petroleum workers aboard ships (such as sea-going crude oil tankers) might represent an at-risk population, even though these workers are often aboard the ships in enclosed spaces for extended periods of time. We relied on historical on-board industrial hygiene data, employee work records and self-reported activities to estimate the magnitude of exposure to benzene, toluene, and n-hexane experienced by individuals aboard these vessels. A total of over 65 surveys performed on 15 ships spanning the years 1988 to 2003 were evaluated in this analysis. A Monte-Carlo model was developed that incorporated available concentration information during nine distinct work tasks that comprised a majority of work performed by crew members on these vessels during crude oil loading and while these vessels were underway. It was determined that airborne concentrations were location- and activity-dependent, with the highest levels experienced during work performed in partially enclosed spaces or near tank vents. Lifetime exposures to n-hexane, toluene, and benzene were calculated to be 9.6, 0.7, and 1.1 ppm-year at the 50th percentile and 28.4, 2.6, and 6.1 ppm-year at the 95th percentile. The estimated exposures are substantially below the levels suspected to cause clinical or subclinical neurological effects, and the estimated upper-bound cumulative benzene exposures are below the effects threshold for acute myelogenous leukemia reported in the well-studied "Pliofilm cohort" of rubber industry workers (200-400 ppm-year). Additionally, the estimated exposures are below the levels expected if the contemporaneous permissible exposure limit (PEL) concentrations were experienced over a working lifetime (20,000 ppm-year for n-hexane, 8000 ppm-year for toluene, and 40 ppm-year for benzene). These results are consistent with the available epidemiology literature on seamen aboard crude-oil tankers.

2000 A COMPREHENSIVE REVIEW OF OCCUPATIONAL EXPOSURE TO DIACETYL IN MICROWAVE POPCORN FACILITIES.

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In May 2000, eight former employees of a microwave popcorn packaging plant were reportedly diagnosed with a pattern of respiratory symptoms "consistent with" respiratory obliterative bronchiolitis (OB), a severe and sometimes fatal lung disease. It was suggested that the symptoms were a result of exposure to diacetyl, a

chemical used in the popcorn butter flavorings. Since that time the National Institute of Occupational Safety and Health (NIOSH) has conducted cross-sectional industrial hygiene and medical investigations in four microwave popcorn facilities: Gilster-Mary Lee Popcorn Plant, Agrilink Popcorn Plant, American Popcorn Company, and Con Agra. The conclusions offered in the NIOSH reports appear to generally support the belief that respiratory disorders are elevated in certain workers and that diacetyl appears to be a likely candidate for the causative effects. This analysis summarizes the strengths and weaknesses of the existing information and identifies key data gaps. In addition to a detailed analysis of the NIOSH reports, we reviewed the PUBMED and MEDLINE databases for studies that reported animal toxicology and epidemiology results for diacetyl and artificial butter, known or suspected causes of OB, and diagnostic criteria for OB. There exists little toxicology or epidemiology literature for diacetyl, although cases of OB have been noted in agricultural workers and attributed to oxides of nitrogen. There are significant gaps in our knowledge of the effects of diacetyl and definitive conclusions regarding its toxicity to occupationally-exposed workers are difficult to offer.

2001 EXPOSURE OF CHILDREN TO VARIOUS CHEMICAL CONTAMINANTS THROUGH FISH CONSUMPTION.

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Exposure to arsenic (As), cadmium (Cd), mercury (Hg), lead (Pb), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs), polychlorinated biphenyls (PCBs), polychlorinated naphthalenes (PCNs), polybrominated diphenylethers (PBDEs), polychlorinated diphenylethers (PCDEs), hexachlorobenzene (HCB), and polycyclic aromatic hydrocarbons (PAHs) through fish and seafood consumption by children of Catalonia, Spain, was assessed. In 2005, samples of the 14 most consumed edible marine species in Catalonia (sardine, tuna, anchovy, mackerel, swordfish, salmon, hake, red mullet, sole, cuttlefish, squid, clam, mussel, and shrimp) were randomly acquired in various cities of the country. Analysis of the above chemical contaminants was determined according to the appropriate analytical techniques. Intakes were subsequently estimated. The daily intakes for the analyzed contaminants were the following (boys/girls): total As, 126.5/110.6 μg; Cd, 0.48/0.61 μg; total Hg 7.45/5.60 μg; Pb, 1.55/1.27 μg; PCDD/Fs, 3.19/2.35 pg WHO-TEQ; PCBs (dioxin-like), 18.20/13.83 pg WHO-TEQ; PCNs, 0.97/0.52 ng; PBDEs, 12.17/8.21 ng; PCDEs, 21.08/17.58; HCB, 7.76/4.04 ng, and PAHs, 0.12/0.12 μg. For most pollutants, intake was higher in boys than in girls. Average exposure of children from Catalonia to metals through fish and seafood consumption did not exceed the respective tolerable daily intake of those pollutants for which it has been already established (metals, PCDD/Fs and dioxin-like PCBs, HCB, and PAHs). In relation to body weight, intake by children of most contaminants was higher than that found for other age groups of the general population of Catalonia.

2002 NON-LINEAR EXPOSURE-RESPONSE RELATIONSHIPS BETWEEN AMBIENT PM10 AND DAILY MORTALITY.

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PM time-series studies (e.g. NMAAPS, 2003; Zanobetti and Schwartz, 2005; Abrahamowicz et al., 2003) have suggested the existence of a non-linear exposure-response relationship between ambient particulate matter (PM10) and health endpoints such as non-accidental mortality, with steeper exposure-response slopes at lower PM10 levels compared to higher PM10 levels. Because this is diametrically opposed to what would be expected on the basis of toxicology, we explore the mathematical constraints placed on the shape of such exposure-response relationships when the environmental measure, or independent variable, is lognormally distributed (e.g. PM10) and the effect, or dependent variable, has a different distributional shape, for example, a Poisson or Gaussian distribution (e.g. daily mortality). For this analysis, we rely on published literature that reports correlations between daily fluctuations in PM10 (measured at central monitors) and daily fluctuations in population mortality (aggregated on the city or county basis) to establish the general magnitude of the relationship. We examine the shape of the exposure-response relationship that results from constraints imposed by the distributional shapes of the independent and dependent variables, considering as well the distributional properties of both confounders and error terms. Results of our analyses show that a non-linear slope is an expected outcome of correlations between data distributions where one is lognormally distributed and the other has a different distributional form. Comparisons with published data sets show that our analysis yields similar shapes of exposure-response curves and similar differences in slopes between low versus high PM10 levels. The analysis shows that caution should be exercised when assigning biological significance to non-linear exposure-response relationships in some instances, and that consistency of findings among numerous epidemiological studies is an insufficient basis for concluding that the finding of steeper slopes at lower PM10 levels is of biological significance, as all studies share a common alternative explanation.

2003 EXPOSURE LEVELS OF ULTRAFINE PARTICLES DURING DIATHERMY SURGERY IN OPERATING THEATRES IN SWEDEN.

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Diathermy smoke contains complex hydrocarbons and organic material, and may also contain viable tumour cells or viral particles. These particles measure from 0.05 to more than 25 μm and exposure to such particles may have adverse effects on health. For that reason, the surgical operations personnel were concerned about the level of particles in the operating theatres. The objective of this study was to determine the exposure level of ultrafine particles for health care personnel working in an operating theatre.

Measurement of particles was performed during surgical operations using dithermal equipment. Personnel sampling equipments were carried by the physician using a TSI's P-TRAK® Ultrafine Particle Counter. The background levels in the operating theatre during surgery were measured with a TSI's P-TRAK® Ultrafine Particle Counter. Temperature, carbon dioxide (CO2), and air humidity was also measured in the operating theatre.

The concentration of ultrafine particles in the operating theatres ranged from 73 to more than 300 000 particles/cm3. The background levels in the room during surgery were high with peaks levels of 160 000 particles/cm3. The temperature in the operating theatres was 19-26°C, the CO2 level was 485-786 ppm and the air humidity was 16-38%.

The ultrafine particle levels in the operating theatres are extremely high compared to those of other work environments. For instance, the level in offices is 1000 – 2000 particles/cm3. The high levels of this study indicate that the local exhaust in the operating theater is not sufficient for particle removal.

2004 MEASUREMENT OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) ASSOCIATED WITH FINE PARTICULATE MATTER TO ESTIMATE STATEWIDE CUMULATIVE EXPOSURES IN NORTH CAROLINA.

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In the United States, there are over 1000 sites that routinely collect particulate matter less than 2.5 um in aerodynamic diameter (PM2.5) on Teflon filters for non-destructive gravimetric assay. By law, these filters are subsequently archived under refrigeration for at least 1 year. In the State of North Carolina, there are 32 sites that monitor PM2.5 every third day, but there are no routine measurements of organic species. Recently, analytical methods have been developed to exploit archived PM2.5 filters to retrospectively assess particle bound polycyclic aromatic hydrocarbons (PAHs) exposures without the need for special monitoring instrumentation. PAHs are of public health concern because they are ubiquitous in the environment (from all combustion sources) and have been linked to human carcinogenicity. We selected specific filters from the archives that corresponded to the 50 largest fire events from 2004 and 2005 and also chose spatial and temporal control filters. Each filter was analyzed for a suite of 9 PAHs ranging from 4- to 6-rings using solvent extraction followed by gas chromatography – mass spectrometry (GC-MS). From consideration of PM2.5 mass and measured PAHs content, we calculated the relative impact of forest fires to local environments. We also mapped overall PAHs across the State and interpreted the incremental risk posed by the State's 4000 wild fires documented each year with respect to the baseline risk.

2005 EXPOSURE TO ASBESTOS WITHIN THE AUTOMOTIVE REPAIR INDUSTRY BEYOND BRAKE COMPONENTS.

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Beyond those for brake friction material, limited exposure data are currently available to characterize the level of asbestos released during the maintenance work involving automotive asbestos-containing materials (ACMs). Two independent investigations were conducted to evaluate the potential release of asbestos during the