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his/her end-of-shift urine contains phenol levels greater than 75 mg/L adjusted for specific gravity, further medical evaluation is required. ACGIH has published biological exposure indices (BEIs) for benzene exposure of 500 µg t,t-muconic acid (ttMA)/g creatinine and 25 µg s-phenylmercapturic acid/g creatinine. However, much of the published literature questions whether or not these urinary metabolites are useful indicators of exposure for persons exposed to a time weighted average (TWA) of less than 5 ppm benzene in an 8-hr workday. A voluntary study was conducted where a worker was exposed to low levels of benzene, toluene, and xylene for four days. The 8-hr TWA benzene exposure each day was less than 1 ppm. Twenty-nine urine samples were collected during the four days of the study and thirty background urine samples were also collected. Approximately 7% of the background samples had levels of phenol over 75 mg/L and 30% had levels of ttMA over the BEI. Statistically, phenol corrected for specific gravity was significantly greater in the urine samples collected during the exposure period than in the urine collected during the background period (p=0.003). However, the levels of uncorrected phenol, phenol corrected for creatinine, uncorrected ttMA, and ttMA corrected for creatinine were not statistically different from background concentrations for this volunteer (p=0.31, 0.79, 0.21, 0.21, respectively). Total daily excretions of phenol and ttMA were also compared. These results support the current literature that spot urine samples are not good indicators of exposure when 8-hr TWA exposures do not exceed 1 ppm. Furthermore, background urine samples are essential in any biomonitoring situation as there may be great inter-individual differences in background levels of urinary metabolites that ordinarily are associated with chemical overexposure.

1254 EVALUATION OF PCDD/F AND DIOXIN-LIKE PCB SERUM CONCENTRATION DATA FROM THE 2001-2002 NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY IN THE UNITED STATES

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We analyzed the weighted 2001-2002 NHANES data to assess potential differences in mean total TCDD TEQ of various groups of individuals and to determine serum reference concentrations for polychlorinated dibenzo-p-dioxins, dibenzofurans (PCDD/Fs) and dioxin-like polychlorinated biphenyls (PCBs) in the general U.S. population. Significant differences (p<0.05) in the total TCDD TEQ existed between female smokers and non-smokers and between non-Hispanic groups and all other races. Significant differences were also observed among the four age groups evaluated with an increasing trend in mean total TCDD TEQ with increasing age. Both age and gender appeared to confound the association between smoking status and total TCDD TEQ, dictating the need for further analysis. As anticipated, the mean total TCDD TEQ reported for each sample set increased as the number of congeners in each set increased such that TEQ_{PCB}, TEQ_{PCDD/F}, TEQ_{17,3}, TEQ_{17,9}, indicating PCBs contribute significantly to the total TCDD TEQ levels in the background population. The majority of the mean total TCDD TEQ was attributable to four PCDD/Fs and two PCBs. Analysis of the limits of detection (LODs) revealed that the LODs had less of an impact on the mean total TCDD TEQ at the higher percentiles for each sample set evaluated. Given that ninety-fifth percentile or maximum background values are typically used to assess exposure to these chemicals, concerns about the LOD of individual congeners impacting the interpretation of this data are minimal. Overall, the reference TEQs we have calculated provide relevant, up-to-date data that can be used to evaluate biomonitoring results of individuals exposed or potentially exposed to PCDD/Fs and PCBs.

1255 URINARY ARSENIC, PORPHYRINS AND MALONDIALDEHYDE IN A POPULATION 16 YEARS AFTER ARSENIC MITIGATION PROGRAM IN XINJIANG, CHINA

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Arsenic contamination of groundwater (0.05 to 0.84 mg/L) in Kuitun, Xinjiang was first found in 1970's. Alternative clean surface water was introduced in 1985. We aimed to assess the exposure and health outcome since the mitigation. In 2000, we collected a total of 360 urine samples from villagers from the endemic area and a nearby control area for arsenic (As), porphyrins and malondialdehyde (MDA) measurements. The averaged urinary As level of villagers from the endemic site (117±8.3 µg/g creatinine; 4.2 to 943.8 µg/g creat) was higher than that of the control site (73.6±3.2 µg/g creat). No significant differences were found in urinary porphyrins or MDA between the endemic and control sites. However, when the

urinary arsenic was higher than 150 µg/g creat, these two biomarkers were higher in the exposed group than the control. Within the exposed group, villagers with arsenic-related skin symptoms had higher arsenic, uroporphyrin and MDA compared to those who had not shown symptoms. Since the water mitigation, villagers whose urinary arsenic levels were <90 µg/g creat remained at 43% of the population compared to 40% prior to intervention. However, urinary arsenic >270 µg/g creat dropped from 20% to 10% of the population. Population with arsenic-related skin symptoms remained unchanged at 31%. We noted that 7.8% of those who had skin lesions were born after the implementation of intervention and that some villagers still prefer to drink the groundwater. Further, in the dry season, lack of surface water and electrical power breakdowns are to blame for failure to ensure continuous supply of clean water. It is concluded that despite the prompt action and successful water mitigation program to curb arsenic poisonings, it is essential to continue to monitor the health outcome of this population.

1256 RELATION OF URINARY METABOLITES OF INORGANIC ARSENIC WITH TRANSFORMING GROWTH FACTOR ALPHA CONCENTRATION IN BLADDER UROTHELIAL CELLS FROM A POPULATION ENVIRONMENTALLY EXPOSED TO INORGANIC ARSENIC

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Inorganic arsenic (iAs) is a well established human carcinogen and its exposure is associated with a variety of cancers including those of skin, lung, and bladder. High expression of transforming growth factor alpha (TGFα) has associated with local relapses in early stages of urinary bladder cancer. Due to the extent and character of adverse effects associated with iAs exposures are at least in part determined by the rate of formation and composition of iAs metabolites (MMA, DMA), this study examines the relationship between TGFα concentration in exfoliated bladder urothelial cells (BUC) separated from urine and urinary arsenic species among 78 residents (18-51-year-old) in both high and low iAs-exposed subjects of an endemic region of central Mexico.

Urinary arsenic species, including trivalent methylated metabolites were measured by hydride generation atomic absorption spectrometry method. The concentration of TGFα in BUC was measured by using an ELISA assay. The participants on this study are from areas exposed to different concentrations of iAs in drinking water (6-378 ppb). Results show a statistically significant positive correlation between TGFα concentration in BUC and each of the six arsenic species present in urine. However, urinary arsenicals in pentavalency (iAsV+MMAV+DMAV) were better associated with TGFα concentration (p=0.005 vs. 0.021) than the trivalency (iAsIII+MMAIII+DMAIII). People from areas with high arsenic concentration had a significantly higher TGFα concentration in BUC than people of areas with low arsenic exposure (67.5 vs. 34.6 pg/mg protein; p=0.020). These results indicate that in iAs-endemic areas, the concentration of TGFα in exfoliated BUC may serve as a marker of the exposure to iAs in drinking water and as an indicator of adverse epithelial health effects associated with this exposure. (Supported in part by CYTED, XI.23).

1257 BIOMARKERS OF AIR POLLUTION EXPOSURE - STUDY IN POLICEMEN IN PRAGUE

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The effect of exposure to organic compounds adsorbed onto respirable air particles (<2.5 microns) on DNA adducts in lymphocytes was studied in a group of non-smoking policemen (N= 109) working in the downtown area of Prague and spending more than 8 h daily outdoors. Personal exposure monitoring of carcinogenic polycyclic aromatic hydrocarbons (c-PAHs) adsorbed on respirable particles was monitored in each subject for 48 h before biological sampling. DNA adducts, cotinine in urine, plasma levels of vitamins A, C and E and polymorphisms of metabolic genotypes (GSTs, EPHX, CYP1A1, MTHFR, MS), DNA repair genotypes (XRCC1, hOGG1 and XPD) and polymorphisms in p53 gene were studied. All the biomarkers were analyzed repeatedly during the period of 1 year (January, March, June and September 2004). Highest personal exposure to c-PAHs was found in January (8.1+/-8.6 ng/m3), while other 3 samplings exhibited 3-4-fold lower c-PAHs exposure (1.9-3.1 ng/m3). The total DNA adducts were in January only slightly elevated (2.08+/-1.6 adducts/10(8) nucleotides) compared to March (1.66+/-0.65), June (1.96+/-1.73) and September (1.77+/-1.15). However, "like"-BaP DNA adducts were significantly higher in January than in March and June