Office of Environmental Health Hazard Assessment (OEHHA) is developing reference exposure levels (RELs) for MDI and TDI to protect against the adverse effects of repeated and chronic exposures. Because of the severity of response among sensitized persons, choosing RELs that prevent sensitization in the first place is a prudent approach to health protection but may not protect sensitized individuals. While RELs for 8-hr exposures are usually higher than chronic RELs, formaldehyde is an example of a chemical whose sensitizing potential dictated a lower 8-hr REL. Long term exposures of 50 and 500 ppb caused allergic sensitization (Thrasher et al., 1990). For formaldehyde, the chronic REL of 9 µg/m3 (7 ppb) is based on an occupational study in which irritation caused nasal obstruction and lower airway discomfort, but with no evidence of sensitization. To protect against sensitization with repeated exposures, the 8-hr REL was also set at 7 ppb. Similar considerations apply to MDI and TDI. Based on a NOAEL of 0.9 ppb and a LOAEL of 1.9 ppb for decreases in lung function (FEV1) in TDI workers, we derive a chronic REL of 0.004 ppb (0.026 µg/ m3). This includes a subchronic uncertainty factor (UF) of 3, a toxicokinetic UF of 3.14, and a toxicodynamic UF of 10. In workers with isocyanate-induced asthma, challenge at a level of 1 ppb for a total of 47 ppb*min isocyanates induced asthmatic responses in 3 of 8 subjects (Lemiere et al., 2002). This value is 10% of the sensitizing concentration. Comparing this with a REL of 0.004 ppb suggests that this REL will protect against initial sensitization and a subsequent hypersensitive response.

PS 1021 EXPOSURE AND HEALTH RISK ASSESSMENT FOR CHILDREN AND ADULTS POTENTIALLY EXPOSED TO BROMINATED FLAME RETARDANTS ON TELEVISIONS AND IN HOUSE DUST.

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The significance and potential sources of chemicals detected in house dust and their relative contribution to total human uptake of environmental contaminants have become topics of recent interest within the field of risk assessment. Brominated flame retardants (BFRs), which are used in a variety of consumer products in the home, have been receiving increased scientific scrutiny and public interest surrounding their detection in the indoor environment and in humans. There is particular concern with respect to children's exposures in the home because children spend the majority of their time indoors and have more frequent mouthing activities. In this evaluation, an exposure assessment and quantitative risk assessment was performed for BFRs that have been associated with house dust due to their use in television (TV) components. Specifically, this assessment focuses on a recent study that measured BFRs in Japanese TV sets. Using U.S. EPA guidelines we estimated carcinogenic risks and noncarcinogenic hazards for toddler and adult residents to Decabromodiphenyl ether (DecaBDE), Tetrabromobisphenol A (TBBPA), and Hexabromocyclododecane (HBCD). Results for toddlers indicate that direct contact exposures to BFRs in TV dust could result in a non-cancer hazard index of 0.038 (for all three BFRs evaluated) and a theoretical increased cancer risk of 7 x 10-9 (DecaBDE only). For comparison purposes, a separate risk assessment was also conducted for DecaBDE detected in house dust using data from published literature. While the Japan TV and general house dust estimates are not directly comparable, the results of this evaluation suggest that that residential exposure to BFRs from TVs would not present unacceptable health risks to adults or children.

PS 1022 A VAPOR CALIBRATION SYSTEM FOR EXAMINING THE EFFECTS OF TEMPERATURE AND HUMIDITY ON DIACETYL MEASUREMENTS.

M. C. Jackson, W. T. Goldsmith, W. G. McKinney, A. Afshari and D. G. Frazer. *HELD, CDC/NIOSH, Morgantown, WV.* Sponsor: A. Hubbs.

Inhaled diacetyl, a component of butter flavorings, has been shown to be responsible for adverse health effects in microwave popcorn workers and animals. Sampling devices and methodologies to quantitate exposure levels of diacetyl have been shown to be a function of temperature and humidity in the sampling environment. The objective of this investigation was to develop a vapor calibration system (VCS) to calibrate sampling devices under a wide variety of environmental conditions. A custom flow-temperature-humidity controller allowed accurate control of the diluent air input into the VCS. The liquid of interest was injected through a heated port where it was vaporized. The mixed vapor and air were then passed into a Teflon bag. The temperature around the bag was regulated to ensure that the temperature and humidity inside the bag were maintained at user-defined levels and to prevent condensation on the inner walls of the bag. After equilibration, sampling instruments pulled the vapor from the bag for analysis. Computerized valves, heaters, mass flow controllers, temperature sensors, humidity sensors and pressure transducers were utilized to precisely control environmental conditions. Custom data acquisition and control software was developed to automate the calibration process. The real-time response of a set (n=4) of volatile organic meter photo-ionization detectors (MINIRAE 2000) were calibrated for diacetyl with the VCS. Diacetyl concentrations of 5, 75 and 150 PPM were examined at temperatures of 66, 78 and 90°F and relative humidities of 5, 30 and 50%. Results indicated a correction factor of 0.73 + 0.12*exp(0.11*AH) needed to be applied to the MINIRAE readings to get the correct diacetyl concentration (AH = absolute humidity mg/L). Future uses for the VCS include calibrating other sensors and sampling methodologies along with different vapors.

PS 1023 METHYL FORMATE AS A SUBSTITUTE BLOWING AGENT FOR PLASTICS.

J. F. Collins, A. G. Salmon and M. A. Marty. *OEHHA, CalEPA, Oakland, CA.*

Concerns about smog formation, ozone depletion, and global warming have prompted the desire to reduce use of, or to replace, specific, currently used chemicals. Often very little is known about the toxicity of the substitute chemical. Because of the smog forming properties of alkanes and alkenes, methyl formate (CAS 107-31-3) has been proposed as a partial substitute for n-butane, isobutene, and isopentane in their use as blowing agents in plastics manufacturing in California. If allowed by regulators, increased exposure to workers and to the general public near facilities using methyl formate will occur. Methyl formate has been in use for more than 70 years and has a TLV of 100 ppm for workers. Methyl formate is an ester and would be expected to be less irritating to mucous membranes than its metabolites, formaldehyde and formic acid. In the body methyl formate is hydrolyzed to methanol and formic acid. Methanol is oxidized to formaldehyde and then to formic acid. At high levels internal toxicity could occur. At dose levels likely to be achieved in environmental exposures by inhalation, toxicity appears to be minor. OEHHA has derived an interim acute (1-hour) Reference Exposure Level (REL) of 0.93 ppm for methyl formate based on effects on the human nervous system. Although derived by approved methodology, the REL for methyl formate has not undergone external peer review.

PS 1024 PROVISIONAL ADVISORY LEVEL (PAL) DEVELOPMENT FOR MALATHION.

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PAL values developed for hazardous materials by the U.S. EPA represent general public emergency exposure limits for oral and inhalation exposures corresponding to three different severity levels (1, 2, and 3) for 24-hr, 30-d, 90-d, and 2-yr durations. PAL 1 represents the threshold for mild effects; PAL 2 represents the threshold for serious, irreversible or escape-impairing effects; PAL 3 represents the threshold for lethal effects. PALs have not been promulgated nor have they been formally issued as regulatory guidance. They are intended to be used at the discretion of risk managers in emergency situations when site specific risk assessments are not available. Application of PAL protocols has been performed for malathion to estimate oral and inhalation exposure limits, as experimental data permit. Malathion is a broad-spectrum organophosphorous insecticide with a wide variety of uses. Pharmacokinetics of malathion are influenced by the degree of carboxylester hydrolysis in mammalian tissues. The acute neurotoxic action of malathion is cholinergic. Estimated lethal oral doses to humans range from 350-2000 mg/kg. Subchronic inhalation exposure to a concentration that caused eye and nose irritation did not result in ChE activity inhibition. Inhalation exposure of laboratory animals caused plasma and RBC ChE activity inhibition in the absence of clinical signs. A reliable lethality study was not found for inhalation exposure. The LD50 values in rats ranged from 1000-1400 mg/kg and in mice were 1430-3500 mg/kg for different strains. In longer term oral studies with rats or mice, ChE activity inhibition was measured in the absence of clinical signs; at high doses, body weight gain was decreased, gastric lesions were observed, and mortality in male rats was increased. PAL estimates, based on evaluation of experimental data in humans and rats, were approved by the Expert Consultation Panel for Provisional Advisory Levels in April 2008 and will be presented.

PS 1025 EFFECTS OF DECOSAHEXAENOIC ACID ON DEVELOPMENTAL METHYLMERCURY TOXICITY IN MICE: NEUROBEHAVIOURAL IMPACTS.

S. Jayashankar[1], C. Glover[2], K. Folven[1], T. Bratellid[1], C. Hogstrand[3] and A. Lundebye[1]. [1]*National Institute of Nutrition and Seafood Research, Bergen, Norway,* [2]*University of Canterbury, Christchurch, New Zealand and* [3]*King's College, London, United Kingdom.* Sponsor: T. Syversen.

Methylmercury (MeHg) persists as an environmental neurotoxicant with adverse effects particularly noted in the developing brain. The main source of MeHg into the human food chain is via seafood consumption. However, fish is also an impor-

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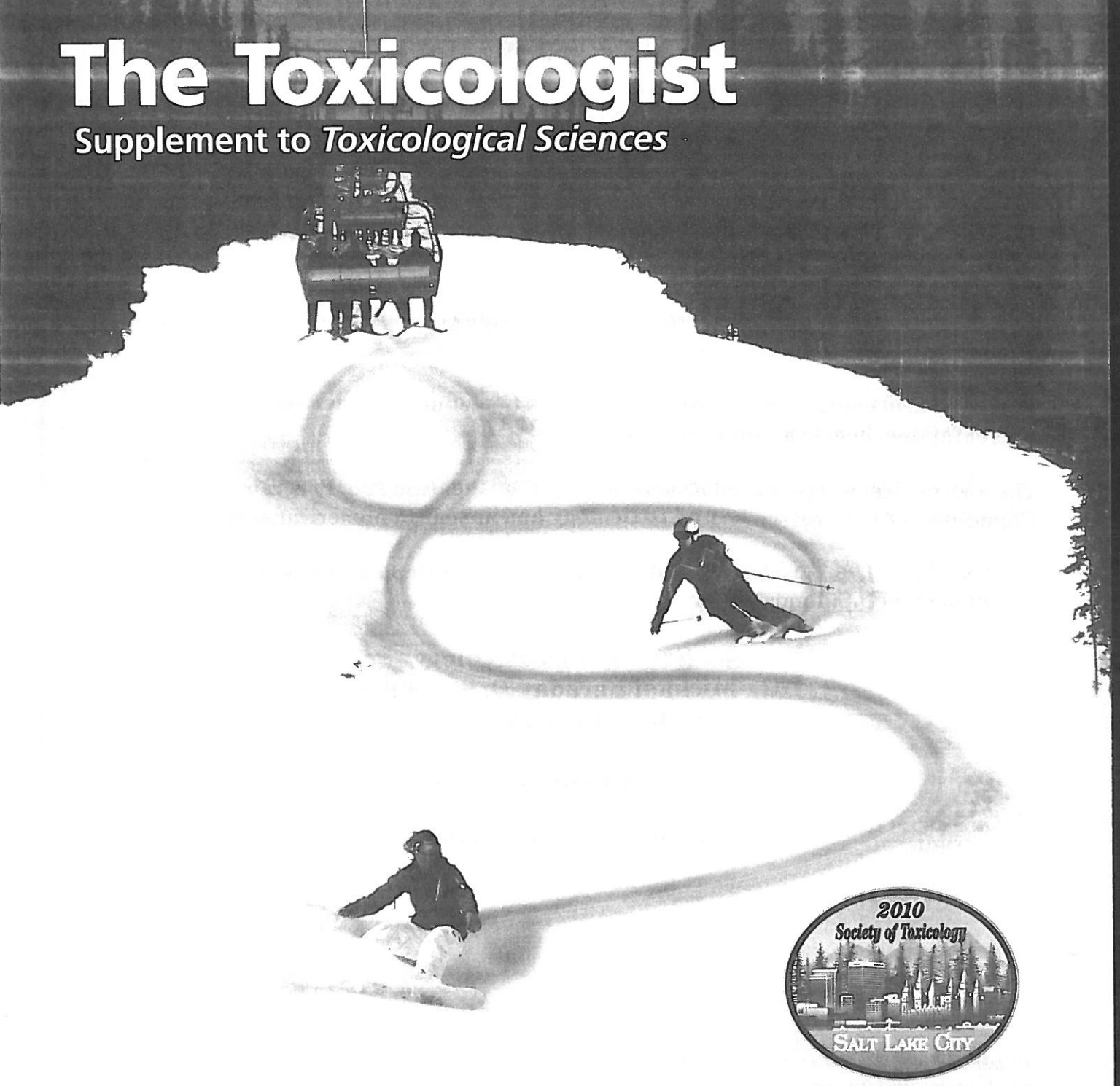

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Preface

This issue of *The Toxicologist* is devoted to the abstracts of the presentations for the Continuing Education courses and scientific sessions of the 49th Annual Meeting of the Society of Toxicology, held at the Salt Palace Convention Center, March 7–11, 2010.

An alphabetical Author Index, cross referencing the corresponding abstract number(s), begins on page 473.

The issue also contains a Key Word Index (by subject or chemical) of all the presentations, beginning on page 496.

The abstracts are reproduced as accepted by the Scientific Program Committee of the Society of Toxicology and appear in numerical sequence.

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