HESIS

Chemical Watch List (March 2011)

The Hazard Evaluation System and Information Service (HESIS) is responsible for monitoring emerging chemical hazards in the California workplace. The following are chemicals for which HESIS personnel are currently tracking new developments:

- **Dimethyl carbonate (DMC)**
  - ✓ *Background:* DMC is used as a chemical intermediate and has been proposed for use as a solvent in consumer products because of its lack of photo-reactivity. In 2009 it was classified by the U.S. EPA as exempt from volatile organic compound (VOC) regulations.
  - ✓ *New developments:* Recent reports (*US EPA* 2009, *OEHHA* 2009, and *Kowa American* 2009) indicate that DMC is hydrolyzed to methanol, which is then oxidized to formaldehyde and formic acid. This metabolic pathway implicates DMC as a likely carcinogen as well as a reproductive and developmental toxicant in humans.
  - ✓ *Current activities:* HESIS responded to an inquiry from the South Coast Air Quality Management District (SCAQMD) to provide information about the potential hazards of DMC in the workplace. Based on the available toxicological data, HESIS informed SCAQMD that setting a scientifically based Permissible Exposure Limit is not currently practical and that expanded worker exposures resulting from an increased use of DMC due to VOC exemption of this chemical are not prudent.

- **Flavoring Chemicals – Diacetyl and diacetyl substitutes**
  - ✓ *Background:* In light of documented severe lung disease (bronchiolitis obliterans) among exposed food production and flavoring workers, the California Occupational Safety and Health Standards Board recently adopted a workplace standard for diacetyl (2,3-butanedione). This standard also includes provision for reporting of potential health effects among diacetyl workers exposed to other, structurally similar, "diketone" compounds.
  - ✓ *New developments:* Structure-activity relationships predict that various diketones (butane-, pentane-, hexane- and heptane-dione), as well as the diacetyl precursor, acetoin, may have similar biological effects. Consistent with this premise, recent inhalation toxicology studies in rodents showed that 2,3-pentanedione exposure produces identical respiratory pathology to that of diacetyl (*Proceedings of the Annual Meeting of the Society of Toxicology* 2010, Abstracts Nos. 1490, 1492, and 1506). Of note, a recent NIOSH Health Hazard Evaluation found 2,3-pentane-dione and other alpha-diketones in the air of a bakery products facility (DHHS/CDC/NIOSH – *Health Hazard Evaluation Report* - HETA 2008-0230-3096).
  - ✓ *Current activities:* HESIS staff continues to monitor the emerging animal toxicology and industrial hygiene literatures with respect to flavoring agents structurally related to diacetyl. HESIS will also collaborate with Cal/OSHA should the new standard result in reporting of respiratory illness in workers exposed to these diacetyl-like compounds.

- **Bisphenol-A (BPA)**
  - ✓ *Background:* BPA is widely used in both epoxies and other plastic resins. Animal studies suggest that BPA may be a human endocrine disruptor (*Toxicol Sci* 2009; 108:427).
  - ✓ *New developments:* Li et al. released two studies documenting male sexual dysfunction among Chinese workers exposed to BPA in plastics manufacturing. One study is based on airborne occupational exposures (*Hum Reprod* 2010; 25:519); the other is based on a biological measurement of workers' urine BPA levels (*J Androl* 2010; 31:500).
  - ✓ *Current activities:* HESIS will work with other OHB sections and with Cal/OSHA to identify segments of the California workforce with potentially significant BPA exposures, and to monitor the reproductive sciences literature relevant to potential BPA toxicity.

- **Diisocyanates**
  - ✓ *Background:* Diisocyanates – components of polyurethane foams and automotive paints – are recognized as both skin and respiratory tract sensitizers. However, the mechanism(s) of sensitization in the skin and lung have, until recently, been thought to be distinct from one another.
  - ✓ *New developments:* Animal studies have long demonstrated that in rodents, skin exposure to isocyanates can lead to respiratory sensitization (asthma). There is now increasing evidence of a similar relationship between skin exposure and asthma in humans (*Proc Am Thorac Soc* 2010; 7:134).
  - ✓ *Current activities:* HESIS staff has:
    - Reviewed the literature indicating that skin exposure leads to respiratory sensitivity.
    - Reviewed occupational exposure limits recommended and/or enforced by NIOSH, OSHA, ACGIH (American Conference of Governmental Industrial Hygienists), Cal/OSHA, the United Kingdom's HSE (Health and Safety Executive), and Australia's NOHSC (National Occupational Health and Safety Commission).
    - Determined that an update of Cal/OSHA PELs for isocyanates, including addition of a "skin" notation, is warranted.

- **Nanoparticles**
  - ✓ *Background:* Although nanoparticles (particles measuring less than 100 nanometers in diameter) are contained in over 1,000 consumer products, little is known about how workers are exposed during the life cycle of these products. Evidence from experiments in animals and in vitro continues to suggest that some nanoparticles may cause adverse health effects.
  - ✓ *New developments:* Given that their physical properties are similar to those of asbestos fibers, the effects of exposure to carbon nanotubes (CNT) are a prime concern. A recently published study demonstrated that laboratory workers may be exposed to airborne CNT while handling nanomaterials in common scenarios (*Environ Health Perspect* 2010; 118:49).
  - ✓ *Current activities:*
    - HESIS staff convened a working group within CDPH to discuss current issues in nanotoxicology, to invite subject area experts as guest speakers, and to propose future activities spanning multiple branches within CDPH.
    - HESIS staff attended nanotoxicology sessions sponsored by both the American Academy of Allergy Asthma and Immunology and the California NanoSystems Institute.
    - Other Occupational Health Branch staff attended a NIOSH-sponsored conference on worker surveillance for health effects of nanomaterials, and submitted a manuscript for a peer-reviewed publication describing potential surveillance approaches.

- **Quaternary ammonium surface disinfectants**
  - ✓ *Background:* The use of surface disinfectants is expanding in multiple sectors of society. In addition to their established use in health care and food service settings, they are increasingly being utilized in commercial, personal services, and school settings. Of those surface disinfectants used, quaternary ammonium compounds are a major subgroup.
  - ✓ *New developments:* Through both the Workplace Hazard Helpline and clinical channels, HESIS / OHB personnel have learned of several cases of respiratory or skin allergy in which the suspected agent was a quaternary ammonium compound. In a recent multi-state study, quaternary ammonium compounds were the leading chemical class implicated in disinfectant-related illnesses in health care workers (*MMWR* 2010; 19:551).
  - ✓ *Current activities:* HESIS staff reviewed the published literature for reports of occupational allergic disease ascribed to quaternary ammonium compounds. Several case reports were identified in which this class of agents was implicated in asthma and other allergic disorders (*J Allergy Clin Immunol* 1994; 94:257; *Int Arch Occup Environ Health* 2000; 73:423). Other OHB staff is engaged in both asthma surveillance and health education involving the use of cleaning products, many of which include disinfectant ingredients. HESIS staff recommends that both benefits *and risks* be considered when use of this class of surface disinfectant is contemplated.