

Chemical Hazards

Addressing Uncertainty & Using Precaution To Protect Health & the Environment



Julia Quint, PhD

Hazard Evaluation System & Information Service
(HESIS), Occupational Health Branch, DHS

Used Oil Recycling/Household Hazardous Waste Conf.
Sacramento, CA, March 26, 2004

Hazard Evaluation System & Information Service (HESIS)

- Established by CA Legislature in 1979 in response to DBCP-induced sterility of workers
- Collect and evaluate information to establish harmful effects on health
- Provide “early warnings” and reliable information to prevent hazards to workers
- Recommend protective occupational health standards to Cal/OSHA

How HESIS Identifies Chemical Hazards

- Scientific journals
- NTP, IARC, Cal/EPA, etc. reports
- Industry toxicity reports, TSCA 8(e)
- Medical case reports
- HESIS Helpline





July 1982
Revised May 1984

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
DEPARTMENT OF INDUSTRIAL RELATIONS, CAL/OSHA

HEHS

2151 Berkeley Way
Berkeley, California 94704
Call Collect (415) 540-3014

HAZARD ALERT #3



HAZARD EVALUATION SYSTEM AND INFORMATION SERVICE

Ethylene Oxide (EtO)

Ethylene oxide (EtO) has recently been found to cause cancer in laboratory test animals. It also causes genetic damage in animals and changes in the chromosomes of exposed workers. The Division of Occupational Safety and Health has lowered its legal workplace exposure limit to 10 parts of EtO per each million parts of air (10 ppm). The American Conference of Governmental Industrial Hygienists has recommended a limit of 10 ppm. A number of industries have adopted limits between 1 and 10 ppm.

This Hazard Alert applies to the use of EtO to sterilize medical supplies*. Hospitals, health facilities, pharmaceutical companies and manufacturers of medical supplies use EtO to sterilize heat-sensitive materials that cannot be steam sterilized. For this purpose, there is no available safer substitute. When used for sterilization, exposure to EtO can occur: 1) while opening the sterilizer door; 2) while transferring materials from the sterilizer to the aerator; 3) while changing cylinder tanks; and 4) at the gas discharge point.

To prevent worker exposure to high concentrations, sterilization facilities should be carefully evaluated for such details as proper design, installation, ventilation, maintenance, and operation. The employer has a legal responsibility to develop and institute guidelines for the safe use of EtO, and train employees to understand potential health effects, equipment operation, sources of exposure, and control methods. Specific suggestions for limiting exposure begin on page 2 of this Alert.

HOW ETHYLENE OXIDE ENTERS THE BODY

EtO is a gas at room temperature and becomes a liquid below 55°F. It can enter the body by inhalation of the gas or by direct skin contact with the liquid.

HOW TO KNOW YOU ARE EXPOSED

Do not rely on smell to warn of overexposure. Most people cannot smell the sweetish ether-like odor of EtO until it reaches a hazardous concentration. Odor levels can vary depending on the concentration of EtO used and the

*Other exposures may occur when EtO is used as a fumigant.

May 1982

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HAZARD ALERT # 2



HAZARD EVALUATION SYSTEM AND INFORMATION SERVICE

Glycol Ethers (Cellosolve* Solvents)

Two glycol ethers, commonly called Cellosolves*, are now known to harm the reproductive systems of male and female test animals. They caused birth defects and damage to the male animals' testes at levels near the legal exposure limits for workers. It is not known whether these effects occur in humans.

The two chemicals are widely used industrial solvents which have until recently been treated as relatively safe. Because of their reproductive toxic effects, HESIS has recommended that the legal exposure limits be lowered, and Cal/OSHA has recommended to its Advisory Committee that the limits be lowered. A well-designed workplace and careful work practices can greatly reduce your exposure to these solvents.

MANY PRODUCTS CONTAIN GLYCOL ETHERS

Glycol ethers are a family of several solvents. They are each used alone and as ingredients in cleaning and thinning agents, and in coatings such as epoxies, wood stains, varnishes, paints and inks. Two glycol ethers are the subject of this Alert:

<u>Ethoxyethanol (EE)</u>	<u>Methoxyethanol (ME)</u>
Trade Names	Trade Names
Cellosolve [®]	Methyl Cellosolve [®]
Dowanol EE [®]	Dowanol EM [®] Jeffersol EM [®]
Polysolve EE [®]	Polysolve EM [®] Ektasolve [®]
Oxitol [®]	Methyl Oxitol [®]
Chemical Names	Chemical Names
2-Ethoxyethanol	2-Methoxyethanol
Ethylene Glycol Monoethyl Ether	Ethylene Glycol Monomethyl Ether

A glycol ether may be in a product but not listed on the label. To find out if you're working with a glycol ether, ask your supervisor or the manufacturer for a Material Safety Data Sheet (MSDS) for each of the products you're

*Cellosolve[®] is the trade name for one glycol ether (ethoxyethanol) but is commonly used for the whole family of chemicals. This Hazard Alert applies only to the two glycol ethers listed above and their acetate derivatives.





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HAZARD ALERT #5



HAZARD EVALUATION SYSTEM AND INFORMATION SERVICE

Perchloroethylene ("perc")

(Tetrachloroethylene)

Perchloroethylene, or "perc" (pronounced "perk"), is the principal solvent used in the dry cleaning process. It is also used in metal degreasing, and during the production of fluorocarbons (commonly known as Freons[®]). It is used in some adhesives, aerosols, paints and coatings.

Perc caused cancer in animals in recent laboratory tests at exposure levels close to the level now legally allowed in the workplace. The animals were exposed to only twice the legal exposure limit for workers. Though perc has been widely used in the dry cleaning industry for the past 20 years, studies of dry cleaners have not been adequately designed to show whether perc causes cancer in humans.

Based on the animal tests, you should consider perc to be a potential cancer-causing substance (a potential carcinogen). HESIS has recommended that the California Division of Occupational Safety and Health (Cal/OSHA) review and consider reducing the amount of perc to which employees may now legally be exposed.

Exposure to a carcinogen does not necessarily mean that you will get cancer. No one can predict who will get cancer from exposure to cancer-causing substances. Some people have developed cancer after low or short exposures to certain chemicals. In general, however, the greater the length or amount of exposure, the greater the risk of developing cancer. The best way to protect your health is to reduce your exposure. This Hazard Alert has been issued to inform you about the potential cancer hazard and other health effects of perc, and to provide you with guidelines on how to work safely with it.

HOW TO FIND OUT IF YOU ARE WORKING WITH "PERC"

Perchloroethylene is a clear, colorless, non-flammable liquid with a sweetish smell like ether. Perc may be listed on a label or Material Safety Data Sheet (MSDS) by its chemical formula, $Cl_2C=CCl_2$, or by one of its chemical names:

ethylene tetrachloride	perchlor
tetrachloroethylene	1,1,2,2-tetrachloroethylene
tetrachloroethene	carbon dichloride

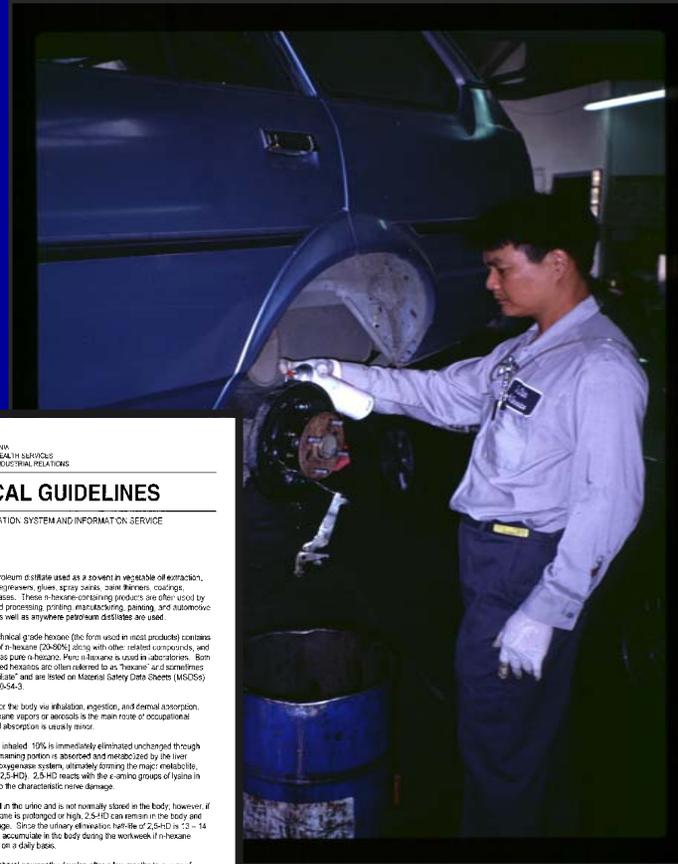
Some of the Challenges HESIS Faces in Providing "Early Warnings"

- Large number of industrial chemicals/
limited toxicity testing
- Delay between chronic testing & final reports
- New/unregulated chemicals & new uses of existing chemicals
- New industries, technologies, workforces
- Difficulty identifying where chemicals are used in California

N-Hexane Use in Vehicle Repair

New Use of An Existing Solvent

- Damages nerves in feet, legs, hands, and arms
- Can last a long time & may be permanent
- Acute symptoms include headache, dizziness, lost of appetite, drowsiness



May 2000	STATE OF CALIFORNIA DEPARTMENT OF HEALTH SERVICES DEPARTMENT OF INDUSTRIAL RELATIONS
HEHS	MEDICAL GUIDELINES
1015 Clay Street Suite 1001 Oakland, CA 94612	HAZARD EVALUATION SYSTEM AND INFORMATION SERVICE
	n-Hexane
Sources:	n-Hexane is a petroleum distillate used as a solvent in vegetable oil extraction, and in cleaners, degreasers, glues, spray paints, saw blades, coatings, silicones, and greases. These n-hexane-containing products are often used by workers in the food processing, printing, manufacturing, painting, and automotive repair industries as well as anywhere petroleum distillates are used.
Commercial or technical grade hexane (the form used in most products) contains varying amounts of n-hexane (20-80%) along with other related compounds, and should be treated as pure n-hexane. Pure n-hexane is used in laboratories. Both n-hexane and mixed hexanes are often referred to as "hexane" and are sometimes as "petroleum distillate" and are listed on Material Safety Data Sheets (MSDSs) with the CAS # 110543.	
Pharmacokinetics:	n-Hexane can enter the body via inhalation, ingestion, and dermal absorption. Irritation of n-hexane vapors or aerosols is the main route of occupational exposure. Dermal absorption is usually minor.
	When n-hexane is inhaled, 10% is immediately eliminated unchanged through the lungs. The remaining portion is absorbed and metabolized by the liver microsomal monooxygenase system, ultimately forming the major metabolite, 2,5-hexanedione (2,5-HD). 2,5-HD reacts with the ε-amino groups of lysine in proteins, leading to the characteristic nerve damage.
	2,5-HD is excreted in the urine and is not normally stored in the body, however, if exposure to n-hexane is prolonged or high, 2,5-HD can remain in the body and cause nerve damage. Since the urinary elimination half-life of 2,5-HD is 75 - 14 hours, 2,5-HD can accumulate in the body during the workweek if n-hexane products are used on a daily basis.
Clinical Presentation:	Symptoms of peripheral neuropathy develop after a few months to a year of repeated overexposure to n-hexane. Longer nerves and larger fibers are more susceptible to toxin-induced neuropathy, thus the symptoms usually begin in the feet or legs. The first symptoms are sensory and consist of tingling, numbness, burning, or prickling sensations in the feet or legs. The symptoms are usually

1-Bromopropane

New, Unregulated Solvent

Replacement for Ozone-Depleting Solvents

1-Bromopropane (n-Propyl Bromide)

1-Bromopropane can harm the reproductive system and the nervous system. It causes sterility in both male and female test animals, and harms the developing fetus when tested in pregnant animals. 1-Bromopropane can damage the nerves, causing weakness, pain, numbness, and paralysis. It will soon be tested in animals to find out if it can cause cancer, as many similar chemicals do. The effects of 1-bromopropane on human health have not been well studied. However, a few human case reports suggest that 1-bromopropane can harm the nervous system. 1-Bromopropane is a new solvent intended to replace solvents like trichloroethane and some Freons that damage the upper ozone layer. HESIS is issuing this Hazard Alert because 1-bromopropane is being considered for widespread use and is not regulated to protect workers, consumers, or the environment.

Health
Hazard
ALERT

How to find out if you are working with 1-bromopropane

1-Bromopropane is a solvent. It might be used wherever there is a need to dissolve fats, waxes, or resins. So far, two of its main uses are in degreasing and in spray adhesives. It is being considered for use in drycleaning and for many other uses as a replacement for other organic solvents that damage the upper ozone layer.

Your employer must tell you if you are working with 1-bromopropane, and must train you to use it safely (California Code of Regulations, Title 8, Sections 3203 and 5194). If you think you may be exposed to 1-bromopropane on the job, ask to see the Material Safety Data Sheets (MSDSs) for the products you are using. The MSDS for a product that contains 1-bromopropane must identify it in Section 2, by the CAS number 106-94-5. 1-Bromopropane is also called n-propyl bromide. Some MSDSs do not fully describe the hazards of the product.

How 1-bromopropane enters your body

1-Bromopropane enters your body when you breathe its vapor or drops of spray in the air. Some can enter your body through your skin.

Your risk of health effects depends on the amount of 1-bromopropane that enters your body. That depends mainly on the amount (the concentration) of 1-bromopropane in the air, your skin contact, and how long you are exposed.

How 1-bromopropane can affect your health

The toxic effects of 1-bromopropane in humans have not yet been well studied. Because it is a recently introduced chemical, most information comes from animal testing, not from experience with human use.

In most of the animal tests, the animals breathed 1-bromopropane in the air. However, you can also absorb 1-bromopropane through your skin.



JULY 2003

California Department of Health Services • California Department of Industrial Relations



LPS Degreaser (90% 1-Bromopropane) Hazardous Materials Description: "Aerosol Consumer Commodity"



Decamethylcyclopentasiloxane (D5) New Drycleaning Solvent



- Volatile siloxane
- Liver toxicant
- Carcinogen (pending)
- Highly lipid soluble
- Can bioconcentrate
- Special equip. needed
- Not ozone-depleting
- Not listed as HAP
- Low odor
- Unregulated

Decamethylcyclopentasiloxane (D5) Other Uses / Products

Industrial

- Drycleaning
- Automotive dressings

Beauty/Personal Care

- Cosmetics
- Shower gels, Deodorants

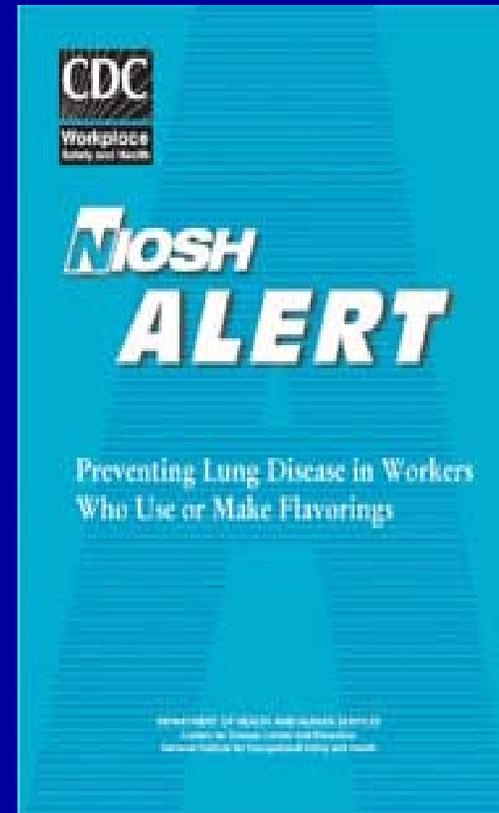
Healthcare

- Scar Therapy



Lung Damage in Workers Making Microwave Popcorn (Butter Flavoring Exposure)

Case Study of Failed "Early Warning"



Addressing the Challenges— Promoting Integrated Illness, Disease & Pollution Prevention Strategies

Recommending Non-Toxic Substitutes



AQUEOUS BRAKE WASHERS





Aqueous brake washers perform as effective solvent washers, they are better for the environment and reduce hazardous waste management costs.

n-Hexane Use in Vehicle Repair

Long-term overexposure to n-hexane can damage the nerves in the feet, legs, hands, and arms. The damage can last a long time and may become permanent. The symptoms include numbness, tingling, weakness (sometimes even paralysis), and reduced ability to feel touch, pain, vibration, and temperature. Short-term overexposure can cause headache, dizziness, loss of appetite, giddiness, and drowsiness. Health effects have only been reported when exposure levels were above California's workplace Permissible Exposure Limit—but people working with n-hexane can easily be exposed to levels that high. This Health Hazard Advisory was prompted by cases of nerve damage identified among auto mechanics using spray brake cleaner that contains n-hexane.

Health Hazard Advisory

How to know if you are working with n-Hexane

Hexane is a solvent. It's used mainly in vegetable oil extraction and in cleaners, degreasers, glues, and spray paints. n-Hexane is one kind of hexane. Commercial hexane usually contains 20% to 80% n-hexane, so you should treat all hexane as if it's n-hexane. Pure n-hexane is a colorless, very fast-evaporating liquid with a faint disagreeable odor.

In addition to the recent cases among auto mechanics, nerve damage from hexane exposure has been reported among workers making jet engine parts, furniture, shoes, sandals, and vegetable oil, and doing printing press proofing. Other workers likely to be exposed to hexane include laboratory workers, construction workers, and artists. Pure n-hexane is used in laboratories.

If you may be exposed to hexane at work, ask to see the Material Safety Data Sheet (MSDS) for each brake and parts cleaning product in your work area. Your employer must have an MSDS for any workplace product that contains a hazardous substance, and must make the MSDS available to you on request. If a product contains n-hexane, the MSDS should identify it in section 2 by the CAS number 110-54-3.

WHAT ARE YOU WAITING FOR?

If you perform 20 or more brake jobs per month operate an aqueous brake washer and achieve years. This payback threshold was estimated

- Aerosol brake cleaner = \$2 per can • Aqueous brake cleaner = \$2 per can
- Aqueous brake washing unit = \$400 • Filter
- 1 can used per brake job • Cost

HEALTH HAZARD ADVISORY

HESIS HAZARD EVALUATION SYSTEM & INFORMATION SERVICE
 California Department of Health Services
 Occupational Health Branch
 1515 Clay Street, Suite 1901, Oakland, CA 94612
 510-622-4300 • www.dhs.ca.gov/ohb

JUNE 2001 California Department of Health Services • California Department of Industrial Relations

Recent HESIS publications that include specific recommended substitutes

- ▶ n-hexane
- ▶ 1-bromopropane
- ▶ formaldehyde
- ▶ diesel engine exhaust

Addressing the Challenges (cont'd)

Developing effective **water-based, aerosol** automotive cleaners & guidance information



- funded by EPA
- IRTA collaboration
- 14 diverse facilities
- conduct site visits
- interview stakeholders
- identify illness/injury (workers' comp. claims)
- identify H&S issues (Cal/OSHA citations)
- develop educational & resource materials

Addressing the Challenges (cont'd)

Large-scale Steam Autoclaving of Medical Waste —
Investigating Potential Impacts on Worker H&S



- Replaced medical waste incineration (dioxin hazard)
- Healthcare Without Harm request
- Generation, treatment, disposal of medical waste
- Site visits, stakeholder interviews, records review
- Report / recommendations

Addressing the Challenges (cont'd)

Identifying CA Workplaces Where Specific Hazardous Chemicals Are Used

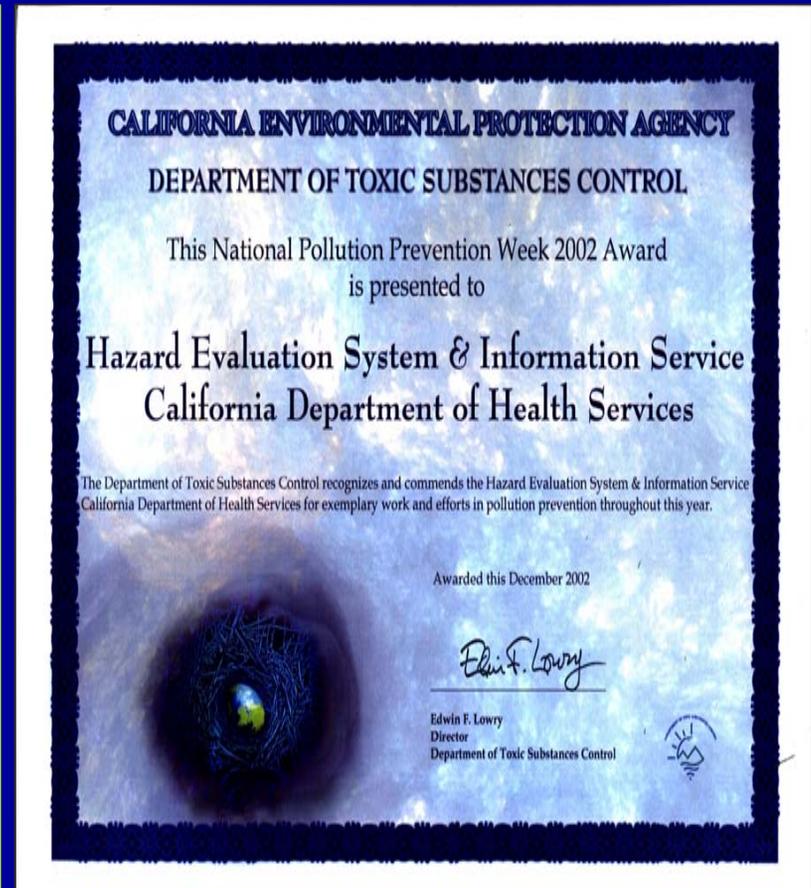


- HESIS chemical hazard tracking project
- evaluated existing state & international systems
- tested voluntary compliance
- international chemical registry system
- computerize inventories
- client lists for specific chemicals to HESIS

Addressing the Challenges (cont'd)

Participating in Pollution Prevention / Environmental Protection Activities

- IRTA P2 Advis. Comm.
- SCAQMD Lithographic Printing Industry Study Tech. Panel
- CARB Drycleaning ATCM Eval. Group
- Presentations / Training



Protecting Health & the Environment

Some Long-Term Strategies

- A chemical policy that requires toxicity testing to ensure safety prior to marketing and use
- Effective enforcement of TSCA
- Dedicated funding for the development & testing of effective, safer alternatives
- Incentives for the marketing & use of proven, safer alternatives