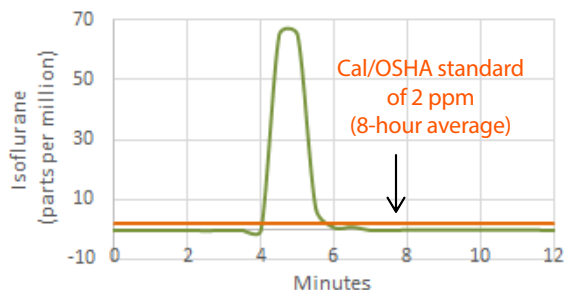


Isoflurane May Harm Veterinary Worker Health

There is increasing evidence that exposure to isoflurane, the anesthetic gas commonly used in veterinary practice, may pose health risks if not adequately controlled. **Workers may be unaware of the ways isoflurane is getting into the air they breathe.** Veterinary staff and facility owners should take steps to protect workers from this hazard.

Workers can be overexposed

A California Department of Public Health investigation found high levels of isoflurane in workers' breathing zones during common veterinary procedures.



This graph shows isoflurane levels while technicians roll a dog over. The peak on the graph occurred when the endotracheal tube was disconnected to reposition the animal while gas was still flowing. If high exposures like this occurred multiple times during a shift, workers could be exposed over the legal limit.



Nervous and reproductive system harm

While more study on human exposure is needed, scientists are concerned that evidence from laboratory animal studies points to potential nervous and reproductive system harm in people.

Reported effects of isoflurane

In workers:

- Dizziness and headaches

In laboratory animals:

- Nerve cell damage
- Learning and memory impairment, behavior changes
- Reduced sperm production and impaired sperm health
- Abnormalities in offspring exposed during pregnancy

It's the law!
**Cal/OSHA limits
isoflurane in
workplace air -
See pages 3 & 4**



HAZARD EVALUATION SYSTEM & INFORMATION SERVICE

California Department of Public Health • Occupational Health Branch
850 Marina Bay Parkway, Building P, 3rd Floor, Richmond, CA 94804
510-620-5757 • www.cdph.ca.gov/hesis

What workers can do to protect themselves

Workers can be exposed to isoflurane during everyday practices. Following best practices will reduce exposure and protect health.

Know how isoflurane gets into the air

- When repositioning the patient during procedures
- From the edges of a patient's mask or around the endotracheal cuff
- During hookup and disconnection of the system while the gas is still on
- From leaks in the breathing circuit if the connectors, tubing, and valves are not maintained and tightly connected
- When patients are exhaling isoflurane during recovery from anesthesia
- When opening the induction box
- When refilling the vaporizer
- When cleaning up spills. Large spills can cause overexposure. Personnel without respiratory protection should be evacuated from a room with a spill.

Use best practices

- **Visually inspect** all anesthesia delivery components (reservoir bag, tubing, and connectors) for obstructions, kinks, and cracks.
- **Leak test** prior to each use of the anesthesia machine.
- **Weigh charcoal canister** daily and cap it during storage and disposal.
- **Use the lowest anesthetic gas flow rate** possible.
- **Turn off anesthetic gas flow** before disconnecting patient during a procedure (e.g. repositioning patient).
- **Eliminate residual isoflurane.** Flush systems with oxygen, including breathing bag, before disconnecting patient from breathing system.
- **Minimize use of face masks** and induction boxes. Use properly inflated endotracheal cuffs to create a sealed airway.
- **Don't use the "smell test"** for assessing gas flow.
- **Use a key-fill adapter** when refilling the vaporizer to prevent spills.



Note: When effective scavenging is limited, supplemental respiratory protection used within a Cal/OSHA-compliant respirator program can further reduce exposures.

What about other anesthetic gases?

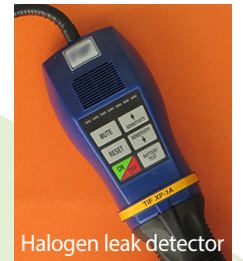
- While isoflurane is a very commonly used anesthetic gas, other gases in use are also known to have health effects. The same control practices should be used to reduce exposures.

Protect veterinary workers from isoflurane

Use proper equipment set-up and maintenance

- Never use isoflurane without a **scavenging system** attached to the anesthesia delivery system.
- Have a ventilation specialist measure the air flow of active scavenging systems at least annually and after changes or maintenance (Cal/OSHA requirement).
- Keep a permanent record of anesthesia machine maintenance and leak detection tests.
- Calibrate and perform preventive maintenance on anesthesia machines in accordance with manufacturers' recommendations. This should include leak detection checks of breathing circuits and scavenging systems.

A halogen leak detector or soap bubble solution can be used to test for leaks.



Measure isoflurane in the air workers breathe

Employers must measure the level of isoflurane in the air workers breathe to ensure levels are below Cal/OSHA's regulatory limit.

- Measure for the full shift and compare to Cal/OSHA's exposure limit.
- Identify more intense exposures by collecting shorter duration samples during all types of procedures.
- Measure the air for the staff with the highest exposures at the facility.
- Share the results with staff.
- Industrial hygiene consultants can be hired to do detailed exposure monitoring.



Inexpensive clip-on badges (dosimeters) can be used for easy monitoring of isoflurane.

CDPH recommends repeating air monitoring at least twice a year to detect changes over time.

Legal limit on isoflurane in workplace air

- The Cal/OSHA Permissible Exposure Limit (PEL) is the maximum level of isoflurane workers are allowed to breathe, averaged over an 8-hour day.
The PEL for isoflurane is 2 parts per million (ppm).
- To further protect workers, the National Institute for Occupational Safety and Health (NIOSH) *recommends* worker exposures not exceed 2 ppm isoflurane, averaged over 1 hour.
- See page 4 for more information about Cal/OSHA regulations.

Train workers on hazards and prevention

- Train staff on isoflurane hazards and ways to minimize exposure.
- Show workers the Safety Data Sheet for isoflurane and this Update, and be sure they understand them.
- Train staff to use equipment properly and always follow practices that minimize exposure.
- Develop and train on a spill clean-up and evacuation plan.

RESOURCES

WHERE TO GET HELP

- ▶ **Hazard Evaluation System and Information Service (HESIS)** answers questions about chemicals and other workplace hazards.
www.cdph.ca.gov/hesis
(510) 620-5817 • (866) 282-5516 (toll-free in California)
Free publications on workplace health and safety topics.
(510) 620-5717 • (866) 627-1586 (toll-free in California)
www.cdph.ca.gov/Programs/CCDCPHP/DEODC/OHB/HESIS/Pages/Publications.aspx
- ▶ **Cal/OSHA - California Division of Occupational Safety and Health** investigates workers' complaints and answers questions about workplace health and safety issues. Find a Cal/OSHA enforcement office near you: www.dir.ca.gov/dosh/DistrictOffices.htm
(510) 286-7000
- ▶ **Cal/OSHA Consultation Service** provides free assistance to employers to help them improve health and safety and comply with Cal/OSHA regulations.
800-963-9424 • InfoCons@dir.ca.gov
www.dir.ca.gov/dosh/consultation_offices.html
- ▶ **To find a doctor who specializes in work-related injury and illness:**
Workers, Employers
Search for "occupational medicine providers, your city name, CA" in www.googlemaps.com or another browser.
Health Care Providers
Contact a University of California Occupational Medicine Clinic in your area.
 - * Irvine (949) 824-8685
 - * San Francisco Bay Area (415) 885-7580, ext. #1
 - * Sacramento/Davis Area (530) 752-1281
 - * San Diego (619) 471-9210 or (858) 657-1600

ANESTHETIC GAS GUIDELINES & RESOURCES

- American College of Veterinary Anesthesia and Analgesia** - detailed recommendations http://www.acvaa.org/docs/2013_ACVAA_Waste_Anesthetic_Gas_Recommendations.pdf
- OSHA Guidelines for Workplace Exposures to Anesthetic Gases**
<https://www.osha.gov/dts/osta/anestheticgases/>

CAL/OSHA STANDARDS

Regulations that help protect workers

- ▶ **Control of Hazardous Substances, Airborne Contaminants**
(Title 8 CCR 5155) - sets limits on airborne contaminants, including anesthetic gases, that can be in the air workers breathe. It requires employers to measure exposures whenever employees may be exposed to levels above the limits.
- ▶ **Ventilation System Testing**
(Title 8 CCR 5143) - requires that exhaust ventilation systems including mechanical scavenging systems be tested at least annually.
- ▶ **Hazard Communication**
(Title 8 CCR 5194) - requires employers to tell workers about hazardous substances they are working with and train them to work safely.
- ▶ **Injury and Illness Prevention Program**
(IIPP, Title 8 CCR 3203) - requires employers to develop and implement an effective written IIPP for identifying and correcting workplace hazards in a timely manner, and training workers on any hazards they might face on the job.
- ▶ **Access to Medical and Exposure Records**
(Title 8 CCR 3204) - gives workers the right to see and copy their own medical records and any records related to identifying and measuring toxic substances they may have been exposed to on the job. These records are important in determining whether an employee's health has been affected by their work.

Search official text of all Cal/OSHA standards
<http://www.dir.ca.gov/title8/index/T8index.asp>

This workplace hazard update is an information alert from HESIS.

To obtain a copy of this document in an alternate format, please call (510) 620-5757 (CA Relay Service: 711). Please allow at least ten (10) working days to coordinate alternate format services.