

POLICY ON SCAVENGING OF WASTE ANESTHETIC GAS

INTRODUCTION

Inhalant anesthetic gases (e.g. halothane, isoflurane, methoxyflurane, etc.) are commonly used for purposes of anesthesia and euthanasia. Scientific literature contains evidence linking exposure to trace anesthetic gases with genetic mutations, cancer, spontaneous abortions, hepatic and renal disease, immunological effects, and psychomotor changes in humans.

The Animal Care and Use Committee (ACUC) has developed this policy to protect personnel who have occupational exposure to waste anesthetic gas.

REGULATIONS AND GUIDELINES

The NIH *Guide for the Care and Use of Laboratory Animals* (National Academy Press, 1996) states: “Exposure to anesthetic waste gases should be limited. This is usually accomplished by using various scavenging techniques.”

OSHA requires individual veterinary hospitals and practices to maintain a system to prevent waste gases from building up in the area of use and can enforce personal exposure limits that are consistent with recommendations offered by the National Institute of Occupational Safety and Health (NIOSH) and American Conference of Governmental Industrial Hygienists (ACGIH). NIOSH recommends that the maximum time-weighted average concentration of volatile halogenated anesthetics should not exceed 2 parts per million (ppm) over a period of no greater than one hour (NIOSH, 1977). NIOSH also recommends that exposure to nitrous oxide should not exceed 25 ppm over the period of anesthetic administration, and ACGIH recommends that nitrous oxide exposure should not exceed 50 ppm as an eight hour time weighted average.

The American College of Veterinary Anesthesiologists recommends that veterinary facilities using inhalant anesthetics should institute and maintain a control program for waste anesthetic gases, based on the possibility that trace gases may adversely affect human health. Additionally, the American Veterinary Medical Association Panel on Euthanasia states that “effective procedures must be used to protect personnel from anesthetic vapors” (AVMA, 2001).

METHOXYFLURANE CONSIDERATIONS

Methoxyflurane (Metofane, Penthrane) is a volatile inhalation anesthetic that the Food and Drug Administration (FDA) no longer approves for manufacture. The withdrawal of FDA approval was for safety reasons (Federal Register vol. 70, p. 53019) due to the association of nephrotoxicity and hepatotoxicity in humans who underwent prolonged anesthesia with this anesthetic agent. However, due to methoxyflurane’s low vapor pressure (4%), improvement of

myocardial contractility, profound analgesic properties, and rapid onset of action, methoxyflurane is a popular anesthetic agent for use in laboratory rodents for short-term anesthetic procedures. Other inhalation anesthetics (halothane, isoflurane, sevoflurane, and desmoflurane) have high vapor pressures (~36%), which require the use of precision vaporizers for safe use as rodent anesthetics.

The UVa Animal Care and Use Committee has approved the use of chemical grade methoxyflurane for rodent anesthesia, since pharmaceutical grade methoxyflurane is no longer available.

The Center for Comparative Medicine (CCM) will dispense chemical grade methoxyflurane to laboratories with approved protocols specifying the use of methoxyflurane for short term rodent anesthesia. In accordance with USDA Policy #3, should pharmaceutical or veterinary grade methoxyflurane become available again, chemical grade methoxyflurane will no longer be approved for use.

POLICY

Waste anesthetic gases must be scavenged in a manner which protects personnel from exposure. Scavenging must be accomplished using engineering control measures. Examples of preferred engineering controls include:

A. Precision vaporizers: When used properly, vaporizers equipped with activated charcoal canisters (e.g. F/Air) are effective in removing halogenated waste gases, but not nitrous oxide. A log indicating the hours used or weight increase must be indicated on the canister. Canisters that exceed 12 hours of use or 50 grams of accumulated weight must not be used unless indicated by the manufacturer's written instructions.

B. Chemical fume hoods: Hoods that have been certified by the Office of Environmental Health and Safety within the past twelve months may be used to control exposure to personnel when gases are applied in an induction chamber, nose cone, open drop technique or other means.

Alternative engineering control techniques such as chamber connection to house vacuum, ducted biological safety cabinets (e.g. Class II, Type B2), downdraft tables, commercially available scavenging equipment, and other devices may also be used to effectively control exposure to anesthetic gases during induction of anesthesia or euthanasia.

Selected engineering controls must be suitable for the application and used appropriately to be effective in the protection of personnel. Investigators should consult with the Office of Environmental Health and Safety (OEHS) for assistance in the selection, use, and evaluation of controls, especially when using alternative engineering control methods. When the effectiveness of gas scavenging requires validation, OEHS will perform air monitoring to determine airborne exposure to anesthetic gas and provide documentation of the evaluation.

Strategies used to control of exposure to anesthetic gases that do not employ engineering controls must be evaluated and approved by OEHS.

References

Criteria for a recommended standard: *Occupational exposure to waste anesthetic gases and vapors*. DHHS (NIOSH), Publication No. 77-140, 1977.

Commentary and recommendations on control of waste anesthetic gases in the workplace, American Veterinary Medical Association, JAVMA, 209 (1), 1996, pp. 75-77.

Report of the AVMA Panel on Euthanasia, JAVMA, 218 (5), 2001.