

# 國立中央大學照護委員會(IACUC)

## 有關氣體麻醉劑(halogenated agents)

### 操作環境的規範

#### 1. 目的:

Halogenated agents 如 isoflurane, halothane, enflurane, desflurane, sevoflurane, and methoxyflurane。這些氣體都是清澈、無色、室溫下呈揮發性液體，一般用於氣體麻醉。當在操作氣體麻醉過程中，這些氣體可能曝露在空氣中，又因為它們具有不易察覺和無臭的特性，因此必須特別注意相關操作的風險控制。

#### 2. 規範內容:

##### 3.1 控制風險的方法:

##### 3.1.1 工程控制:

為了降低曝露在外溢氣體的風險，在麻醉操作過程中，以下幾種控制方式應該被使用:

3.1.1.1. First Choice: Placement of entire gas mixing and delivery system inside a fume hood. (Capture of waste gas using gas scavenging canisters)

3.1.1.2. Second Choice: Installation of local exhaust over isoflurane delivery system to address a single source of anesthetic gas. (需經 IACUC 同意才能操作)

3.1.1.3. Third Choice: Capture of waste gas using gas scavenging canisters.

This method is only recommended as a control measure under the following circumstances:

- There is no fume hood or other local, hazardous exhaust system available for use
- Leak checks are performed routinely on equipment
- Saturation levels of canisters are checked prior to each use
- Researchers are well trained and supervised in proper use and maintenance of the anesthetic equipment. If not properly

used or maintained, gases may escape into the work area resulting in overexposure

### 3.1.2 使用廢氣收集瓶(gas scavenging system)需注意:

3.1.2.1 廢氣收集瓶的吸收口位於罐子上方比位於下方的效果好，但不論哪一種都應該直立擺放。

3.1.2.2 在操作氣體麻醉時，降低氧的供應流速，可以降低外溢氣體在工作環境中的濃度。例如氧流速由 2 降至 0.4。

有過濾設備(filters)的抽氣櫃(汙染物質經由過濾設備吸收而不排出室外)不被允許當作控制風險的方式。理由如下:

3.1.2.3 The filters require a high degree of attention and maintenance.

3.1.2.4 Users must be thoroughly trained and diligent about properly using and maintaining such as system.

3.1.2.5 If not properly maintained, hazardous chemicals exhaust back into the room.

3.1.2.6 Gases (such as anesthetics) with poor warning properties will provide no indication (such as odor) if the filters become overloaded or otherwise leak.

3.1.2.7 Long term, ducting to the outside tends to be less expensive and more effective than changing filters.

### 3.1.3 操作人員的防護裝備

手套、實驗衣和護目鏡或面罩應該穿戴，為了避免接觸到液態麻醉氣體。

### 3.1.4 工作規範

氣體麻醉劑應該儲存在室溫、通風的區域、避免陽光直射和靠近火源。

## 3.2 徵狀和症狀(Sings & Symptoms)

3.2.1 Acute Exposure: nausea(噁心), vomiting, skin irritation, nose/throat/ respiratory irritation, headache, dizziness(頭暈目眩), and drowsiness(昏昏欲睡)

3.2.2 Chronic Exposure: hypotension, tachycardia(心悸), respiratory depression, and elevated blood glucose levels.

## 3.3 緊急處理程序(EMERGENCY EXPOSURE PROCEDURES)

3.3.1 Eye Care: If anesthetic gases come in contact with eyes, immediately flush them with copious amounts of water(大量清水) for at least 15 minutes, preferably in an emergency eyewash(沖眼器).

3.3.2 Skin Care: In the event of skin exposure, remove contaminated clothing and immediately wash the affected area with soap and water.

3.3.3 If Swallowed or Inhaled: In the case of ingestion, obtain medical attention immediately. If anesthetic gases are inhaled, move the victim to a source of fresh air.

**3. 參考資料:**

4.1 Federal OSHA Fact Sheet Number 91-38 (Waste Anesthetic Gases)

4.2 OSHA Guidance Document-ANESTHETIC GASES: Guidelines for Workplace Exposures