The Anesthetic gases

College of Health and Medical Techniques

Department of Anesthesiology

2nd Grade

https://sawauniversity.edu.iq

6074

Lecture 3

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APPLICATION TO ANAESTHETIC GASES AND VAPOURS

- Anaesthetic gases are supplied in cylinders and via pipelines from the central gas supply in each hospital.
- Each cylinder is painted a colour according to the gas it contains.

APPLICATION TO ANAESTHETIC GASES AND VAPOURS

- **Oxygen**
- Oxygen has a boiling point of -183°C and **a critical temperature** of -119°C, which means that **at room temperature it is above its critical temperature** and always **exists as a gas**, obeying the gas laws.
- The importance of this is that Boyle's law can be applied to oxygen, which means that the reading on the pressure gauge of an oxygen cylinder gives a true indication of the volume remaining. However, inaccuracies may arise in this respect if large alterations in ambient temperature occur.
- Oxygen cylinders come in various sizes, the most common used in operating theatres being sizes D (360 L at one bar) and E (680 L at one bar).
- In the liquid form, a very large quantity of oxygen can be transported or stored in a low volume.

APPLICATION TO ANAESTHETIC GASES AND VAPOURS

- Nitrous Oxide
- The boiling point of nitrous oxide is –88.6°C and the critical temperature is +36°C.
- nitrous oxide exists as a vapour in equilibrium with its liquid phase because nitrous oxide is below its critical temperature at room temperature, and is dependent upon the pressure applied to it.
- Therefore, under normal circumstances, the gas laws do not apply to nitrous oxide.

APPLICATION TO ANAESTHETIC GASES AND VAPOURS

- **Unlike oxygen, the pressure gauge on a nitrous oxide cylinder tells you nothing about the amount of nitrous oxide remaining in the cylinder – it always reads around 52bar at room temperature.. In a cylinder at room temperature, nitrous oxide exists as a liquid in equilibrium with its vapour**.
- As vapour is drawn off, nitrous oxide moves from the liquid to the vapour phase, maintaining the equilibrium between the phases, and the vapour pressure within the cylinder.
- To determine how much nitrous oxide is left in a cylinder it must be weighed, the weight of the empty cylinder subtracted, and then the number of moles of nitrous oxide in the cylinder calculated using Avagadro's number.

APPLICATION TO ANAESTHETIC GASES AND VAPOURS

- The ideal gas law can then be used to calculate the approximate volume of gas remaining.
- Given this, it is easy to understand why nitrous oxide cylinders are not filled to a given pressure. A value called the filling ratio is used instead. This is the ratio of the weight of the cylinder filled with nitrous oxide to the weight of the cylinder when filled with water.
- In the UK the filling ratio of nitrous oxide cylinders is 0.75, however this is reduced to 0.67 in hotter climates.

APPLICATION TO ANAESTHETIC GASES AND VAPOURS

- Nitrous oxide (N_2O), commonly known as **laughing gas or happy gas**, was first discovered in 1793 by the English scientist Joseph Priestly and has been used for more than 150 years. It has remained one of the most widely used anesthetics in both **dental and medical applications**.

- Nitrous oxide is small inorganic chemical molecule and may also be known as **dinitrogen oxide** or **dinitrogen monoxide**. It is a colorless and nonflammable gas with a slightly sweet odor.

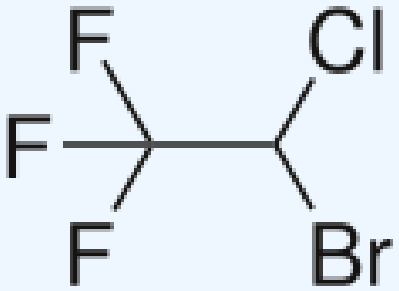
- Nitrous oxide is administered by inhalation, absorbed by diffusion through the lungs, and eliminated via respiration. The elimination half life of nitrous oxide is approximately **5 minutes**.
- It is excreted essentially unchanged (ie, nonmetabolized) via the lungs; less than 0.004% is actually metabolized in humans.

APPLICATION TO ANAESTHETIC GASES AND VAPOURS

- As a general anesthetic, **it is very weak** and is generally **not used as a single agent**. It may be used as a carrier gas with oxygen in combination with more potent general inhalational gases for surgical anesthesia.
- In dentistry, it is commonly used as a single agent (with oxygen) for partial sedation, most commonly in pediatric dental populations.

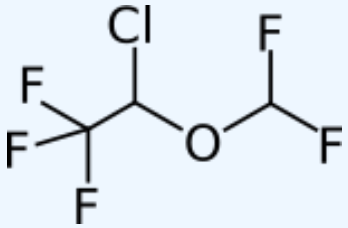
APPLICATION TO ANAESTHETIC GASES AND VAPOURS

- Halothane, sold under the brand name Fluothane among others, is a general anaesthetic It can be used to induce or maintain anaesthesia.
- One of its benefits is that
  - **it does not increase the production of saliva,**
  - **can be particularly useful in those who are difficult to intubate**.
- It is given by **inhalation**



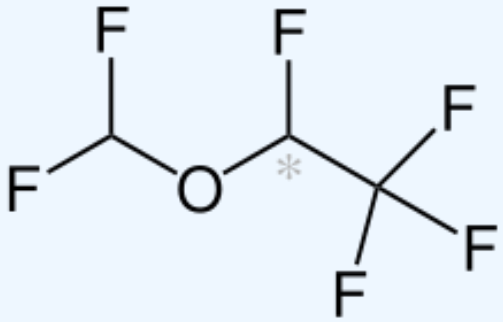
APPLICATION TO ANAESTHETIC GASES AND VAPOURS

- Soflurane, sold under the brand name Forane among others,
- is a general anesthetic It can be used to start or maintain anesthesia; however,
- **other medications are often used to start anesthesia, due to airway irritation with isoflurane**
- Isoflurane is given via inhalation.



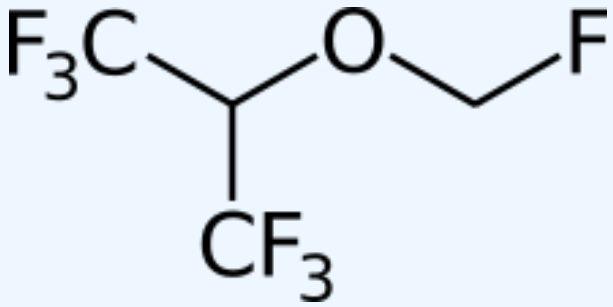
APPLICATION TO ANAESTHETIC GASES AND VAPOURS

- Desflurane (1,2,2,2-tetrafluoroethyl difluoromethyl ether) is a highly fluorinated methyl ethyl ether **used for maintenance of general anesthesia**.

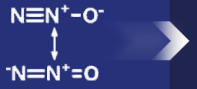


APPLICATION TO ANAESTHETIC GASES AND VAPOURS

- Sevoflurane, sold under the brand name Sevorane, among others, is a sweet-smelling, nonflammable, highly fluorinated methyl isopropyl ether **used as an inhalational anaesthetic for induction and maintenance of general anesthesia. .**



1844

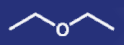


Nitrous Oxide

Colorless gas with sweet odor and taste

Weakest general anesthetic

1846



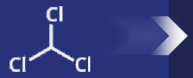
Diethyl Ether

Colorless, volatile, highly flammable liquid

Used with chloroform or alcohol

Harsh side effects: nausea & vomiting

1847



Chloroform

Colorless, sweet smelling, dense liquid.

Stopped for usage due to toxicity & death.

1925

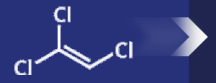
Cyclopropane

Colorless, highly flammable gas with a sweet, petrol-like odor

When O2 added, gives rapid onset of anesthesia

High cost and explosive nature.

1930

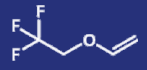


Trichloroethene

Colorless, nonflammable liquid with sweet smell

Dyed blue to avoid confusion with chloroform

1951



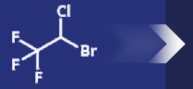
Fluoroxene

Colorless liquid with a less pungent smell

Does not provide distinct advantages

Minimizes respiratory irritation

1956



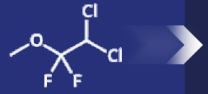
Halothene

Colorless liquid with a sweet smell

Unstable in light

Potent anesthetic

1960



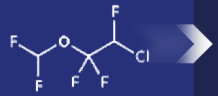
Methoxyflurane

Colorless liquid with a strong fruity odor

Extremely potent

Slow onset and offset times

1973

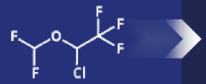


Enflurane

Rapid induction and recovery from Anesthesia

Volatile, colorless liquid with sweet smell, light sensitive

1981

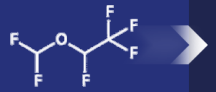


Isoflurane

Colorless, nonflammable liquid with a pungent odor

Always administered with O2

1992



Desflurane

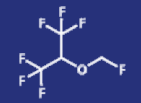
Colorless, nonflammable liquid with a pungent odor

Highest onset and offset action.

Low potency

High cost

1994



Sevoflurane

Colorless, non-flammable liquid with a mildly unpleasant sweet odor

Often administered with O2 and NO2

Onset and offset are slower

Mild irritation of the mucous membrane

Scan to get the lecture