Inhalation Anaesthetic Agents

by the end of this lecture you should be able to

- plan an appropriate inhalation anaesthetic protocol for any animal

What would you do?

- 14 year old dog
- fibrosarcoma on jaw
- recurred after surgery
- in for radiotherapy

inhalation anaesthesia

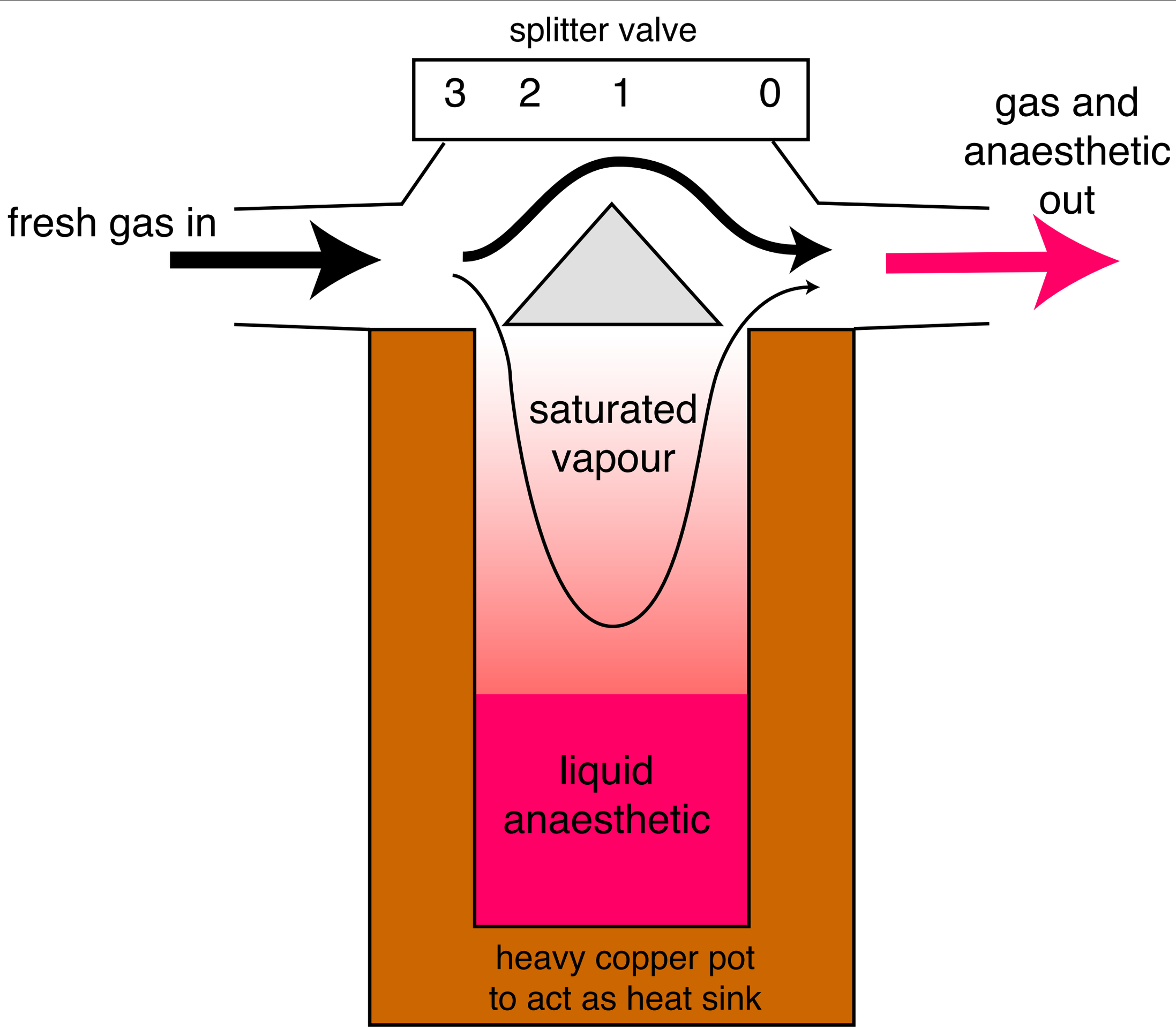
- control of
  - airway
  - ventilation
  - drugs going in and out
- expensive machinery
- equipment failure

administration

- effects are dose dependant
- understand how equipment works!
  - 90% of anaesthetic equipment in practice in NZ has faults!!!

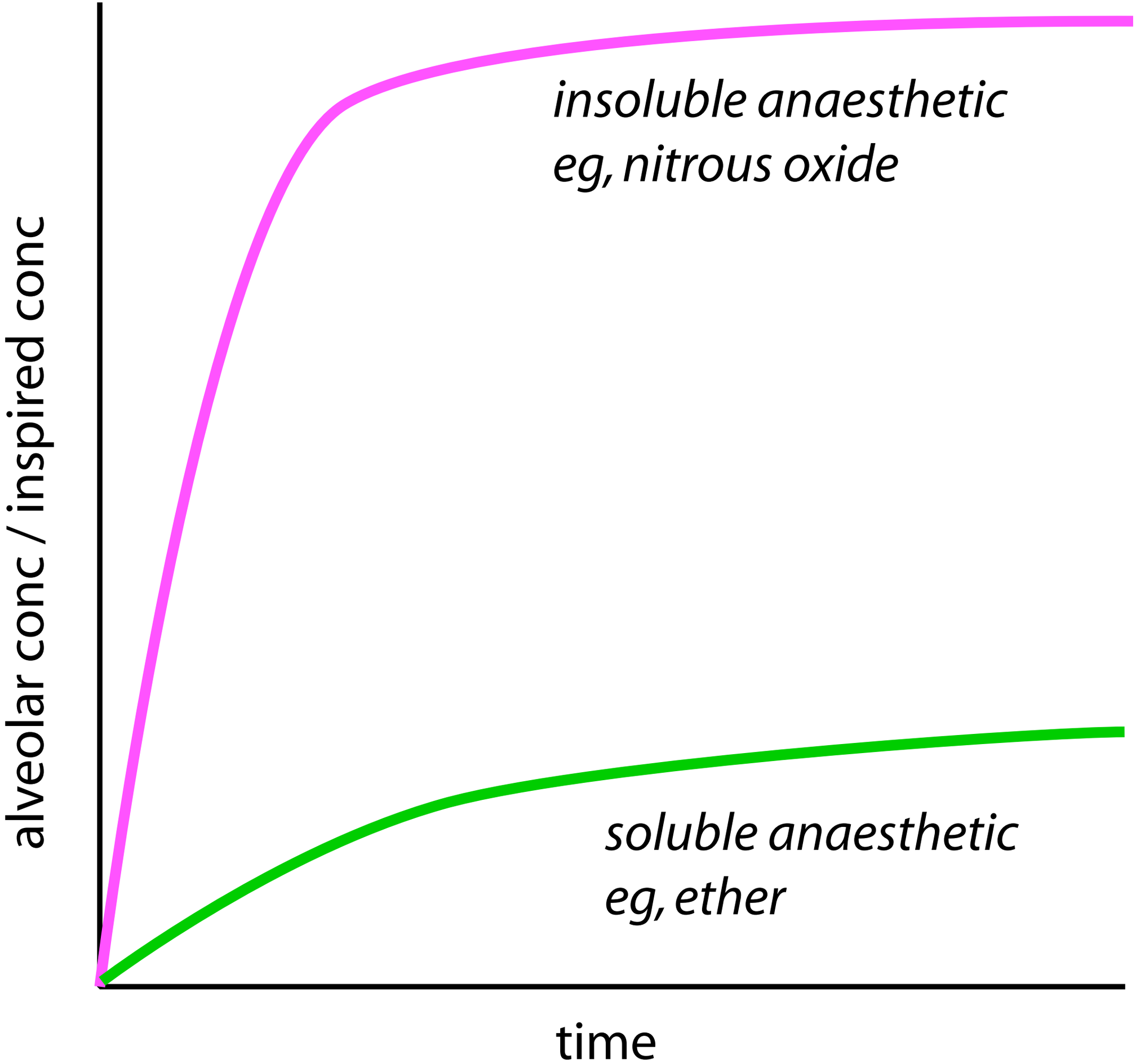
uptake & elimination

- physical factors
  - saturated vapour pressure
  - rubber solubility
  - blood gas coefficient
  - blood brain coefficient


splitter valve
3
2
1
0
fresh gas in
gas and
anaesthetic
out
saturated
vapour
liquid
anaesthetic
heavy copper pot
to act as heat sink

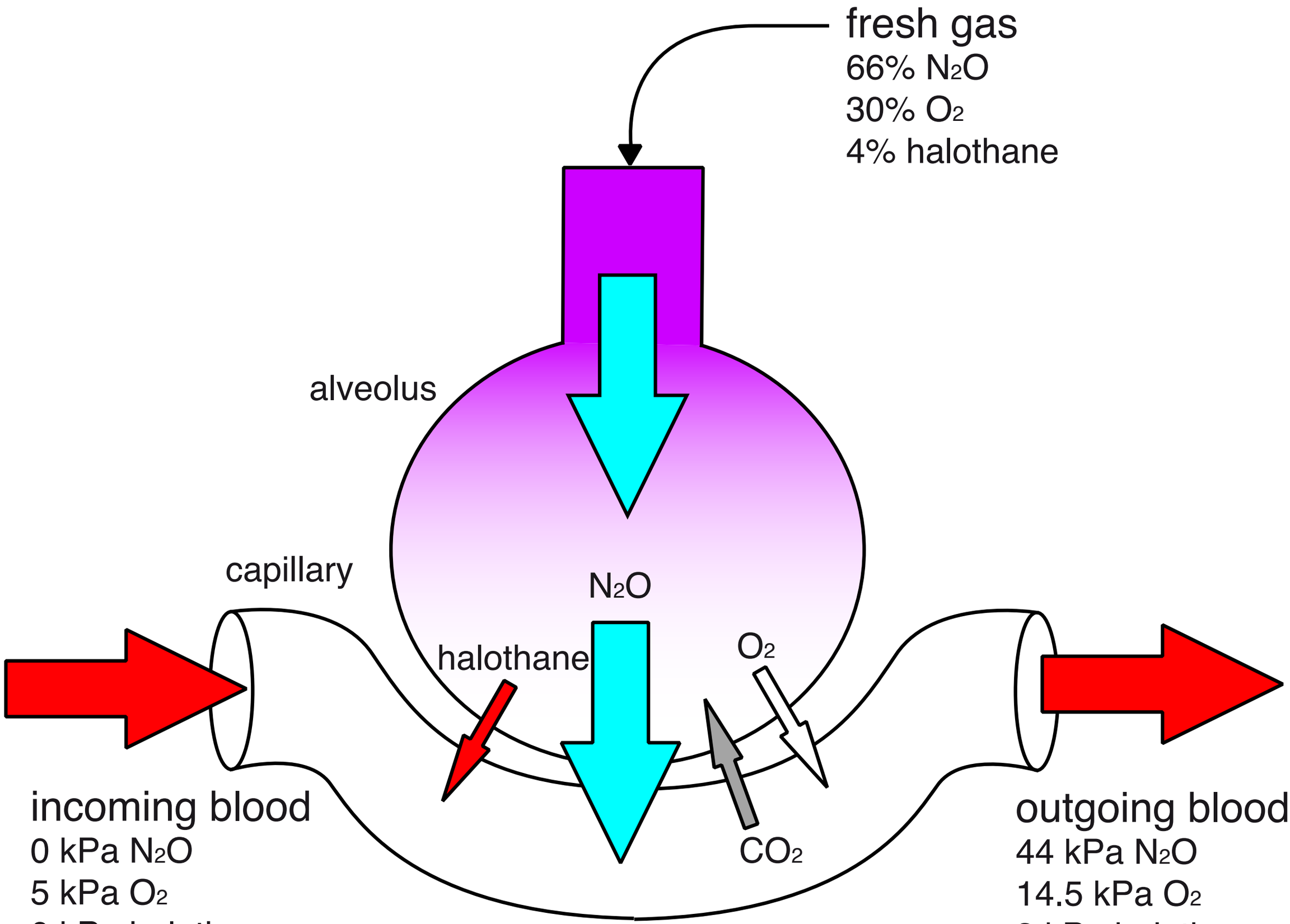
uptake & elimination

- physical factors
  - saturated vapour pressure
  - rubber solubility
  - blood gas coefficient
  - blood brain coefficient


alveolar conc / inspired conc
insoluble anaesthetic
eg, nitrous oxide
soluble anaesthetic
eg, ether
time

uptake & elimination

- other factors
  - ventilation
  - cardiac output
  - lung disease
  - second gas effect


fresh gas
66% N_2O
30% O_2
4% halothane
alveolus
capillary
N_2O
halothane
O_2
CO_2
incoming blood
0 kPa N_2O
5 kPa O_2
0 kPa halothane
9 kPa CO_2
outgoing blood
44 kPa N_2O
14.5 kPa O_2
3 kPa halothane
4.5 kPa CO_2

distribution

- all are fat soluble
  - penetrate most tissues
  - fat reservoirs
  - cross placenta

MAC

- minimum alveolar concentration
  - the concentration in the alveolus at a steady state which will prevent purposeful movement in response to a supramaximal stimulus in 50% of animals

drugs

- gases
- halogenated hydrocarbons
- ethers

gases

- nitrous oxide
- xenon
- cyclopropane

oxides of nitrogen

- NO
  - nitric oxide - vasodilator
- N_2O
  - nitrous oxide - anaesthetic
- NO_2
  - nitrogen dioxide - environmental pollutant

nitrous oxide

- MAC = 110 - 250%
- BG = 0.47
- induction & maint - 66%

nitrous oxide

- pro
  - good analgesic
  - fast induction
- con
  - diffusion into gas filled spaces
  - Fink effect
  - circle systems
  - folate metabolism

gases

- nitrous oxide
- xenon
  - good anaesthetic but too expensive to use
- cyclopropane
  - explosive
  - avoid!!!

hydrocarbons

- halothane
- chloroform
- trichloroethylene

halothane

- MAC = 0.9
- BG = 2.4
- svp = 33 kPa
- induction - 2 - 5%
- maintenance - 0.5 - 2%

halothane side effects

- respiratory depression
- reduced cardiac output
- vasodilatation
- sensitises heart to adrenaline
- (halothane hepatitis)
- (malignant hyperthermia)

halothane hepatitis

- about 1:10,000 people
- more likely if previously exposed
- not confined to halothane

malignant hyperthermia

- mainly pigs
- rarely horses
- recorded in dogs

MH treatment

- turn off halothane
- provide 100% oxygen
- cool down
- give dantrolene

hydrocarbons

- halothane
- chloroform
- trichloroethylene

ethers

- diethylether
- isoflurane
- enflurane
- methoxyflurane
- sevoflurane
- desflurane

isoflurane

- MAC = 1.9%
- BG = 1.4
- svp = 32 kPa
- induction - 2 - 3%
- maintenance - 0.5 - 2.5%

sevoflurane

- MAC = 2.5%
- BG = 0.6
- svp = 21 kPa
- induction - 5 - 7%
- maintenance - 0.5 - 3%

ether

- mac = 3%
- BG = 12
- svp = 59 kPa
- induction - as much as possible
- maintenance - 3 - 10%
- inflammable in air, explosive in oxygen

ethers

- diethylether
- isoflurane
- enflurane
- methoxyflurane
- sevoflurane
- desflurane


Datex-Ohmeda
Tec 6 Plus
Plus
DESFLURANE
OPERATIONAL
NO OUTPUT
LOW AGENT
WARM-UP
ALARM
BATTERY LOW
Penlon
ZERO
LOCK
FILL ONLY WITH Halothane

monitoring

- end tidal vapour concentration
- cardiovascular depression
  - blood pressure
- respiratory depression
  - ET CO_2

interactions

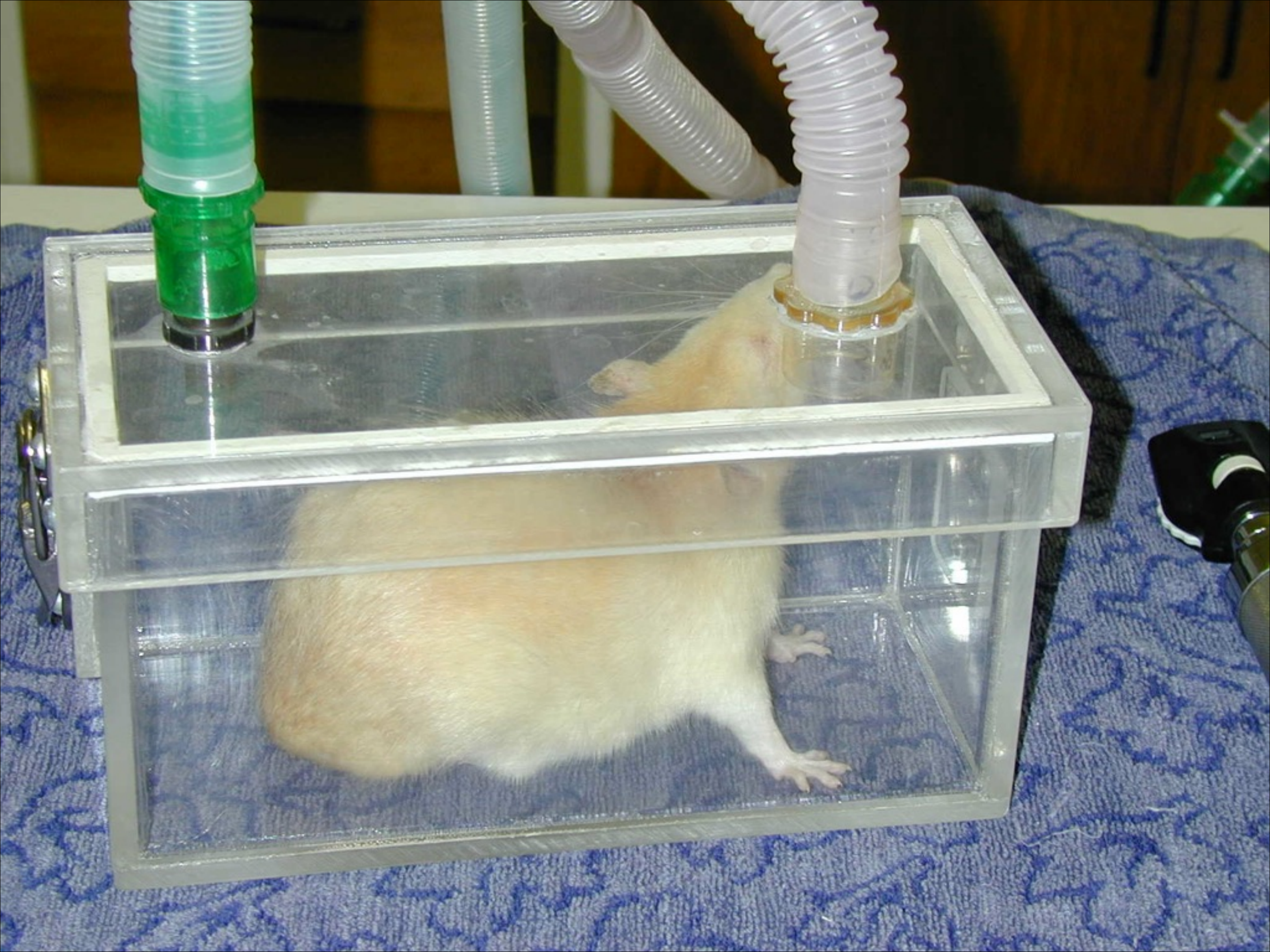
- soda lime
  - trichloroethylene - phosgene
  - isoflurane
  - sevoflurane

inhalation induction

- relatively slow
  - but depends on drug
- long excitement phase
- lots of gas used
- potential for leaks

inhalation induction

- nasty animals
- animals with no veins
- neonatal animals
- (caesarian sections)



scavenging

- use proper scavenging system
  - or ensure adequate ventilation

scavenging

- vaporiser filling
  - use a well ventilated place
  - do not spill any!
  - fill at end of day
- check machine for leaks
- use low fresh gas flows

What would you do?

- 14 year old dog
- fibrosarcoma on jaw
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inhalation anaesthetics

- used to maintain anaesthesia after induction with injectable drug
- relatively insoluble drugs produce a relatively fast induction and recovery
- halothane & isoflurane produce dose dependent respiratory and cardiovascular depression but not much analgesia
- drugs are eliminated by respiration - in overdose, ventilate with 100% oxygen