A close-up photograph of a large, red mushroom with white spots, resting on a bed of dry, brown grass. The mushroom's cap is the central focus, showing a vibrant red color with irregular white patches. The background is a dense layer of dry grass, creating a textured, natural setting. The overall lighting is soft, highlighting the texture of the mushroom and the surrounding vegetation.

Injection Anaesthetics

A red mushroom with white spots is the central focus of the image, resting on a bed of dry, brown grass. The mushroom has a textured, slightly cracked surface. The background is a dense field of dry grass, creating a natural, outdoor setting. The overall lighting is soft, highlighting the vibrant red of the mushroom against the muted tones of the grass.

**by the end of this lecture you
should be able to**

- **formulate a plan to induce (and if necessary, maintain) anaesthesia with an injectable drug**

9 month old cat for spay



What would you use for induction?

definitions

- **general anaesthesia**
- **local anaesthesia**
- **regional anaesthesia**
- **neuroleptanalgesia**
- **dissociative anaesthesia**

typical anaesthetic

- **premed**
 - **sedative and analgesic**
- **induction**
 - **injection anaesthetic**
- **maintenance**
 - **inhalation anaesthetic & oxygen**
 - **muscle relaxant?**
- **recovery**
 - **analgesic**

induction agent

- **unconsciousness**
- **muscle relaxation**
- **(analgesia)**



A large, bright red mushroom with white spots, growing in a field of dry grass. The mushroom is the central focus of the image, with its cap showing a gradient from red to orange and yellow. The background is a dense field of dry, brown grass.

consider

- **age**
- **temperament**
- **health**
- **species**
- **breed**
- **venous access**
- **cost**

A large, flat, reddish-orange mushroom with white spots, growing on a bed of dry pine needles. The mushroom has a slightly convex top and a thick, pale stem. The background is a dense layer of dry, brown pine needles.

age

- **very young & very old**
– **slower metabolism**

temperament

- control with premed
- treat pain in premed



A large, bright red mushroom with white spots on its cap, growing in a field of dry grass. The mushroom is the central focus of the image, with its cap showing a gradient from red to orange and yellow. The background is a dense field of dry, brown grass.

health

- **liver function**
- **kidney function**
- **anaemia**
- **debilitation**
- **shock**



consider

- **age**
- **temperament**
- **health**
- **species**
- **breed**
- **venous access**
- **cost**

pharmacokinetics

- given iv usually
- cross blood brain barrier
- act in one circulation time
- redistributed
- animal wakes up before drug metabolised

dose required depends on

- rate of administration
- concentration
- redistribution
- protein binding
- ionisation
- stimulation / sedation
- (metabolism)
- (acute tolerance)

infusion for maintenance

- **continuous iv infusion**
- **rapidly metabolised drugs only**
- **expensive equipment best**
 - **drip set can be used**

single drugs

- thiopentone
- propofol
- alphaxalone
- (ketamine)
- (m)etomidate)



barbiturates

- **thiopentone**
- **methohexitone**
- **pentobarbitone**
- **(thiamylal)**
- **phenobarbitone**
 - **anticonvulsant**
 - **enzyme induction**

thiopentone

- $t_{1/2\alpha}$ 7 minutes
- $t_{1/2\beta}$ 4.5 hours
- redistributed to muscle then fat

thiopentone

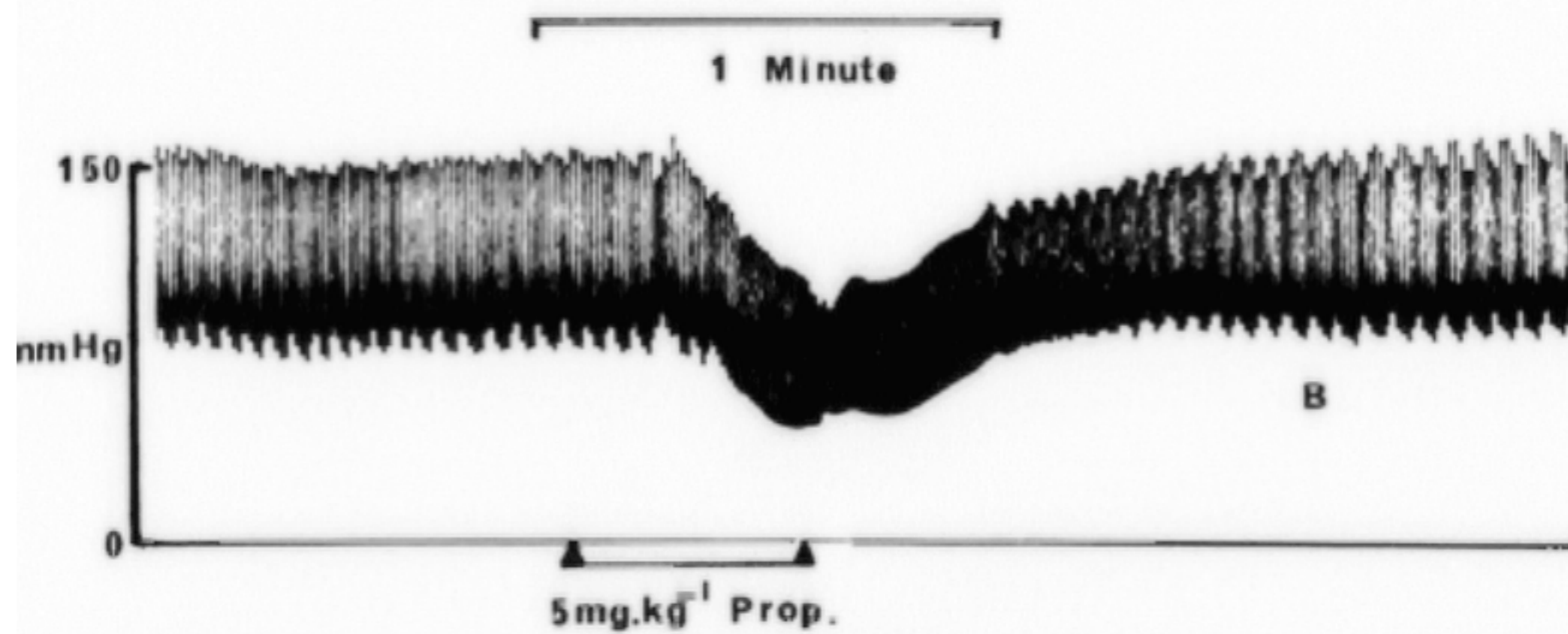
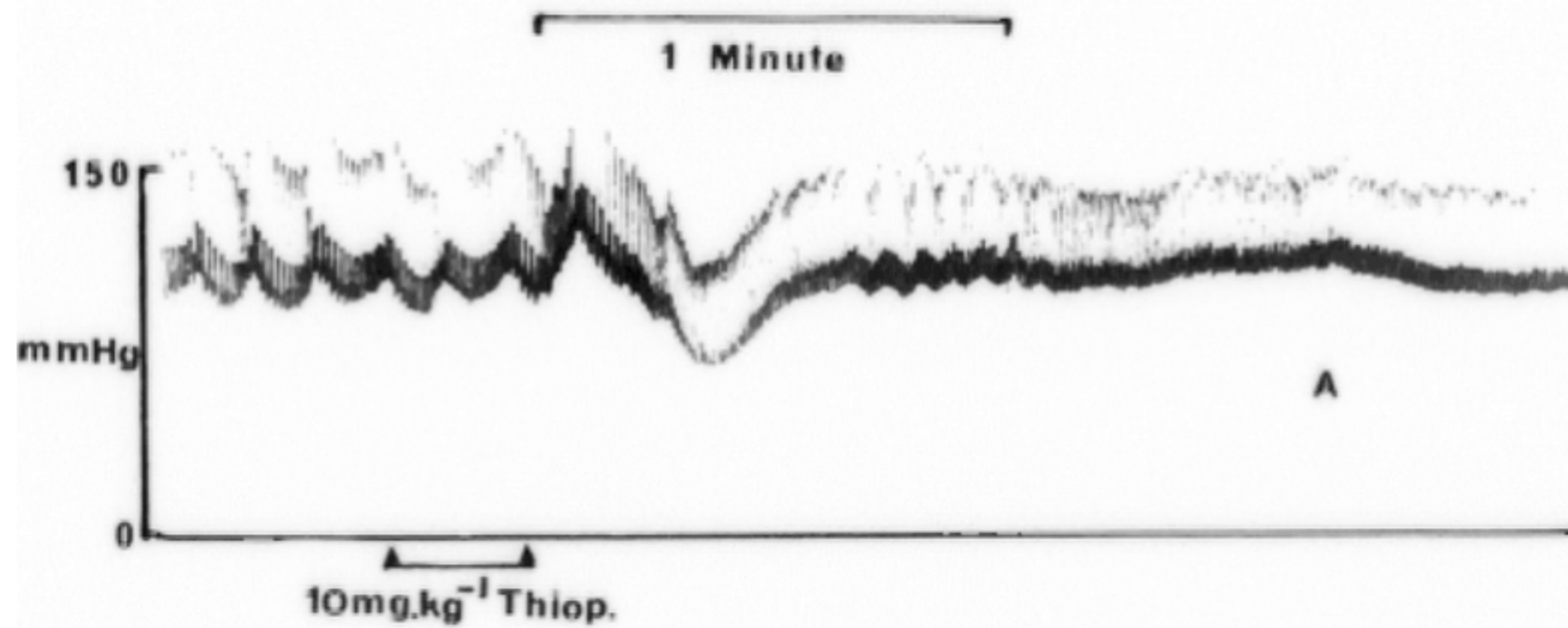
- **reliable**
- **cheap**
- **works in all species with veins**
- **but...**
- **side effects**
 - **respiratory depression**
 - **transient cardiovascular depression**
 - **accumulates if topped up**
 - **irritant outside vein**





chemistry

- weak acid in NaCO_3
- used as
 - 10% soln in horses - pH 12
 - 2.5% soln in dogs - pH 11
 - 1.25% soln in cats - pH 9.5
- short shelf life once made up



A close-up photograph of a red mushroom with white spots, likely a fly agaric, resting on a bed of dry pine needles. The mushroom's cap is bright red with numerous white, irregular spots. The stem is thick and white. The background is a dense layer of dry, brown pine needles.

care

- **greyhound type dogs**
– **slow recovery**

pentobarbitone

- usually only used for euthanasia
 - metabolised slowly
- can be useful in sheep and goats
 - metabolised rapidly
 - do not use euthanasia formulations!!!
- metaldehyde poisoning
 - anticonvulsant

A large, red, spotted mushroom with a white stem, growing in a field of dry grass. The mushroom has a bright red cap with numerous white spots. The stem is thick and white. The background is a dense field of dry, brown grass.

propofol

- **clinically similar to thio**
- **less hangover**

propofol

- $t_{1/2\alpha}$ 7 minutes
- $t_{1/2\beta}$ 37 minutes
- redistributed to muscle then fat

propofol

- **non water soluble**
 - coconut oil / lethicin emulsion
 - polysorbate solution
- **opened vials must be thrown away**
 - ideal bacterial growth medium

side effects

- **same as thiopentone**
 - **greater respiratory depression?**
- **suitable for greyhounds**
- **slow metabolism in some cats**
- **twitching in some dogs**
- **rough recoveries in some cats**
- **occasional pain on injection**

propofol

- **standard induction drug in people**
- **can be infused for maintenance**
- **currently cheapest**

alphaxalone

- **Alfaxan**
- **(Saffan)**
- **(Althesin)**



Saffan / Althesin

- mixture of alphaxalone & alphadalone
- solubilised in polyethoxylated castor oil (Cremaphore EL)



Alfaxan

- **alphaxalone alone**
- **solublised in cyclodextrin**



A photograph of a red mushroom with white spots, likely a fly agaric, growing in a field of dry grass. The mushroom is the central focus, with its bright red cap and white spots contrasting against the brownish-yellow grass. The text 'alphaxalone' is overlaid on the mushroom in a bold, yellow font.

alphaxalone

- **good anaesthetic**
- **rapidly metabolised, even in cats**

alphaxalone side effects

- **hypotension in combinations**
 - **vehicle?**
- **rough recovery if disturbed**
 - **can be very rapid recovery**

Saffan side effects

- **allergic reactions**
 - **dogs - massive histamine release**
 - **cats - cutaneous oedema**
 - **other spp - rarely anaphylactoid reactions**

ketamine

- “dissociative” anaesthetic
- blocks NMDA receptors
- analgesic?
- usually used in combinations

ketamine alone

- **pro**
 - no net CV depression
 - swallowing reflexes partially retained
 - works by any route
- **con**
 - unpleasant dreams???
 - increased muscle tone / convulsions
 - pain on injection (pH4.5)

(m)etomidate

- no CVS depression
- no analgesia
- excitement on induction
- adrenal suppression
- use something else

injectable combinations

- **α 2 agonist & ketamine**
- **benzodiazepine & ketamine**
- **zolazepam & tiletamine**
- **potent opioid & propofol**
- **potent opioid & sedative**

euthanasia

A large, red, spotted mushroom with a white stem, growing on a bed of dry pine needles. The mushroom has a convex, slightly flattened cap with numerous white, irregular spots. The stem is thick and white. The background is a dense layer of dry, brown pine needles.

- **pentobarbitone ±**
 - cinchocaine
 - KCl
 - MgSO₄
- (T61)

9 month old cat for spay



What would you use?

injection anaesthetics

- usually only used for induction
- thiopentone / propofol used for induction
- side effects respiratory and CV depression
- animals wake up from redistribution - metabolism takes much longer
- Saffan used only in cats, Alfaxan can be used in dogs
- ketamine useful in combination, usually with diazepam
- overdose caused transient apnoea
- all drugs are potentially lethal if used incorrectly