

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.

**General Anaesthetics
&
Sedatives**

A red mushroom with white spots on a bed of dry grass. The mushroom is the central focus, with its cap showing a vibrant red color and several white, irregular spots. The background is a dense layer of dry, brownish grass, creating a textured and natural setting. The overall lighting is somewhat dim, giving the scene a slightly somber or mysterious atmosphere.

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

- **formulate an appropriate sedative plan
for any animal**

4 yr old cattle dog

- wobbly on hind legs
- for hip x rays



anaesthesia



- **no feeling**
 - **unconsciousness**
 - **does not respond to stimuli**
 - **pain**
 - **surrounding activity**
 - **appears relaxed!**

A red octagonal stop sign is centered in the image, surrounded by a dense field of dry, brown grass. The sign has white text overlaid on it, which is arranged in a vertical list. The text is color-coded: 'excitement' and 'death' are in pink, 'awake & normal' is in orange, 'light sedation', 'deep sedation', and 'general anaesthesia' are in yellow, and 'death' is in pink.

excitement

awake & normal

light sedation

deep sedation

general anaesthesia

death

anxiolytics
tranquillisers
light sedatives
heavy sedatives
neuroleptanalgesics
general anaesthetics



benzodiazepines

butyrophenones

phenothiazines

α_2 agonists

opioid & sedative

barbiturates, isoflurane, etc



sedative indications

- **restraint**
- **(analgesia)**
- **potentiation of other drugs**
- **useful side effects**
 - **antiemetic**

anaesthetic indications

- **restraint**
- **analgesia**
- **euthanasia**



balanced anaesthesia

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, yellowish-brown grass.

- **unconsciousness**
- **analgesia**
- **muscle relaxation**

balanced anaesthesia

- **3 different drugs**
 - **hypnotic**
 - eg isoflurane
 - **analgesic**
 - eg morphine
 - **neuromuscular blocker**
 - eg atracurium
- **large doses of 1 drug**
 - eg isoflurane

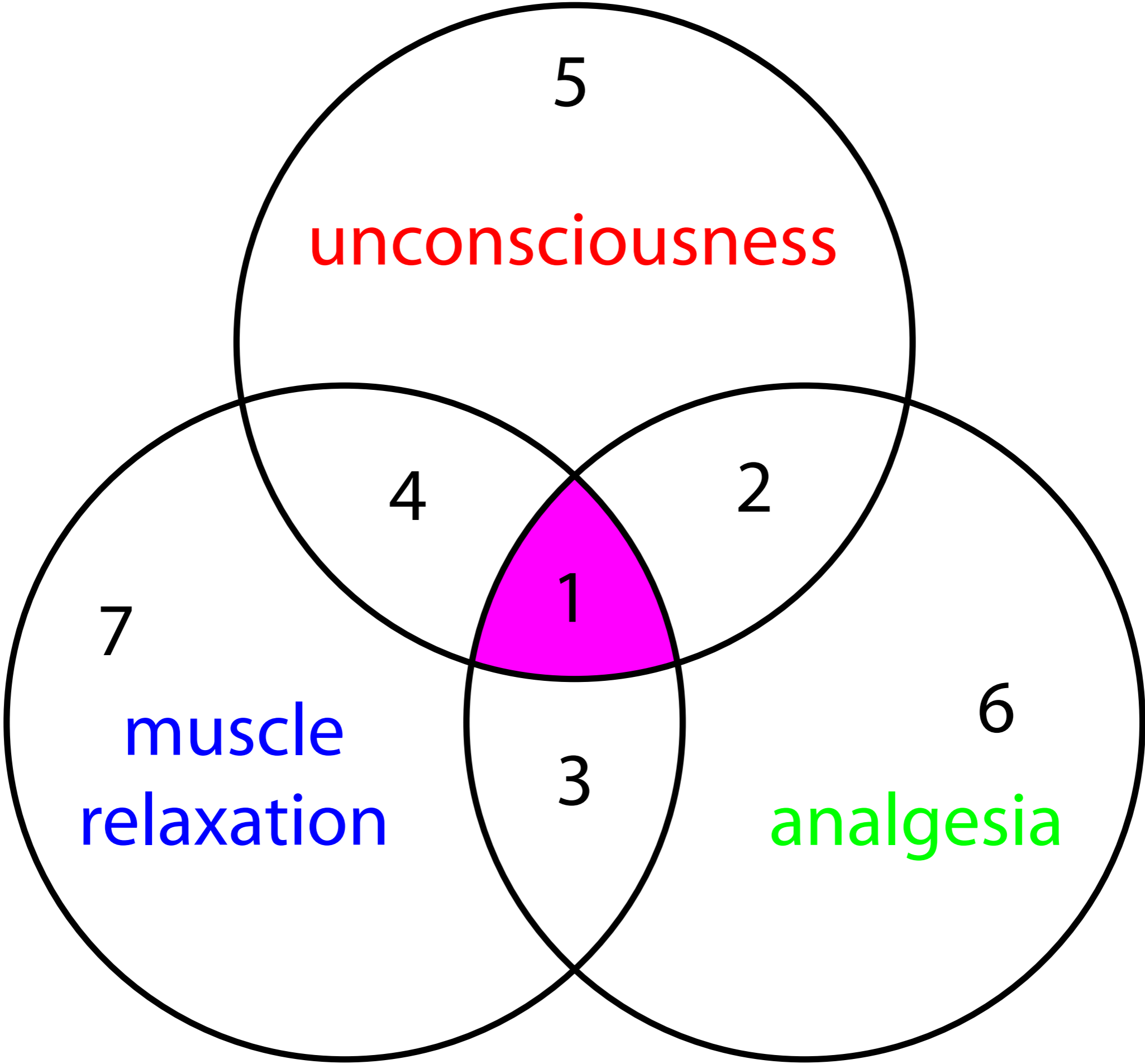
balanced anaesthesia

- unconsciousness
- analgesia
- muscle relaxation

} neurolept
analgesia

sedation {

choose drugs to produce correct balance for each animal



unconsciousness

- **ascending reticular formation ?**
- **inputs from**
 - **nociceptors via spinal cord**
 - **proprioceptors**
 - **cortex**
 - **lots of others?**

anaesthetic mechanisms

A large, red, mushroom-shaped fungus with white spots, growing on a bed of dry pine needles. The fungus has a broad, flat top and a thick, white stem. The background is a dense layer of dry, brown pine needles.

- **interactions with???**

- **water**

- **Pauling, 1960**

- **lipids**

- **Meyer & Overton, 1900**

- **proteins**

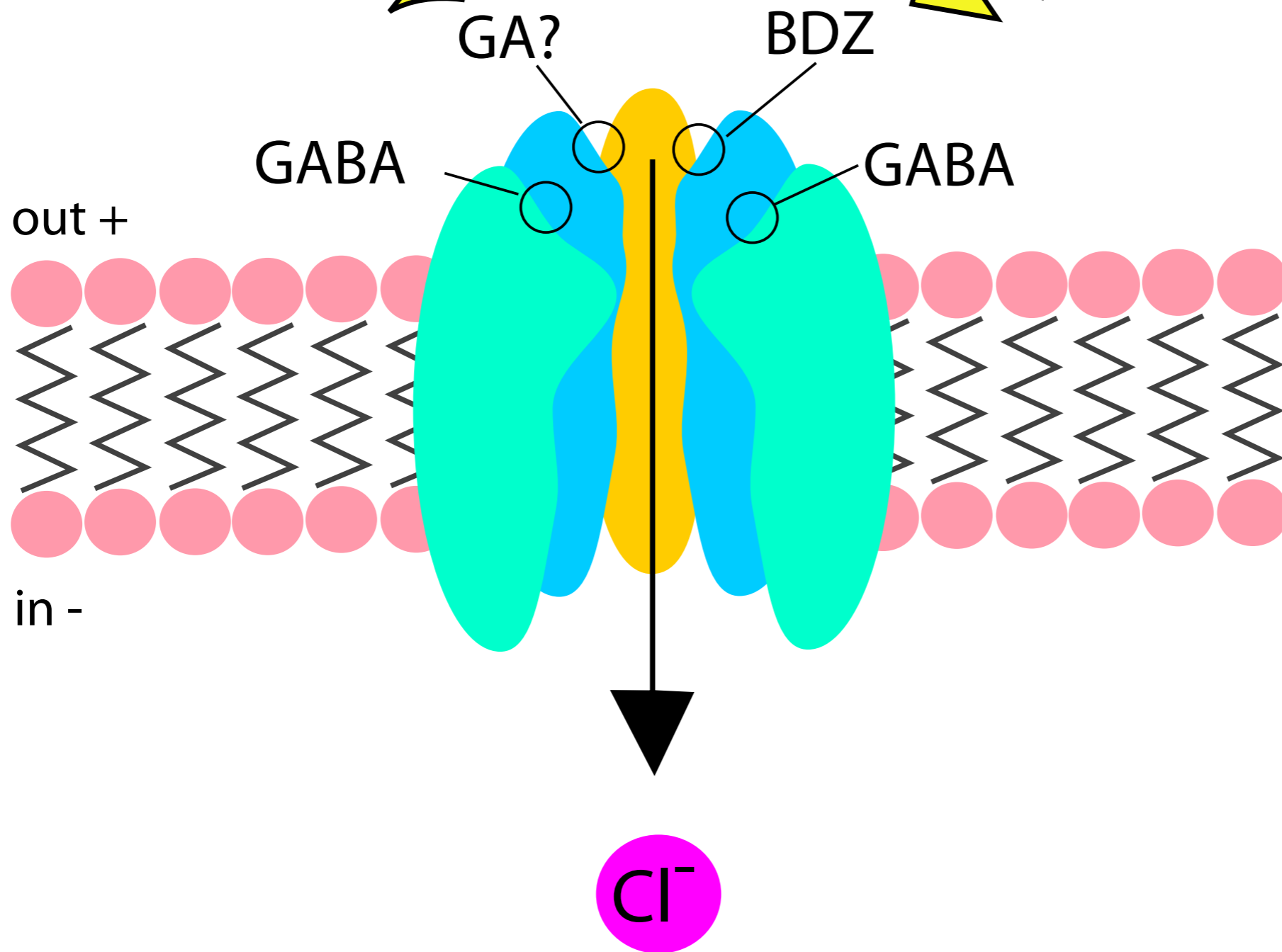
- **current theories**

anaesthetic mechanisms

- **GABA_A R potentiation**
- **glycine R potentiation**
- **nAChR blockade**
- **NMDA R blockade**
- **5HT₃ R blockade**
- **Ca channel blockade**
- **Na channel blockade**

BARBITURATES
OTHER INJECTION ANAESTHETICS?
INHALATION ANAESTHETICS?
ALCOHOL?

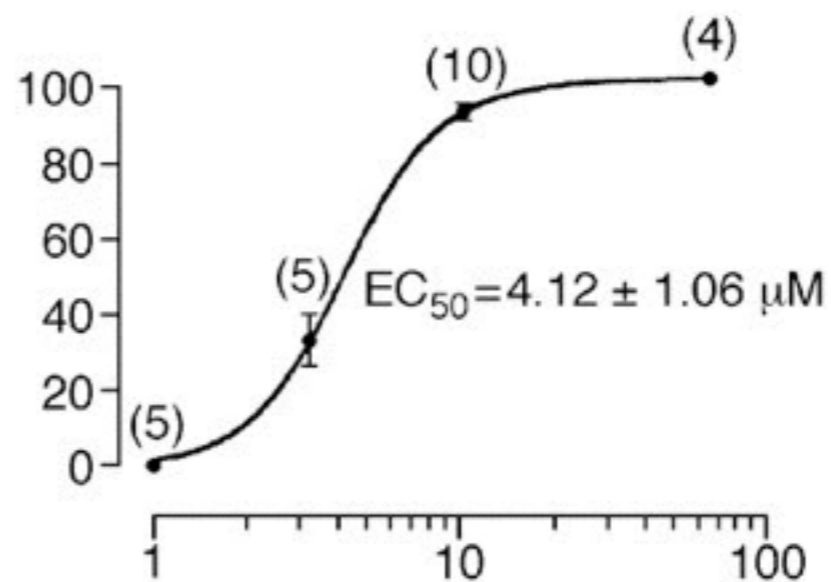
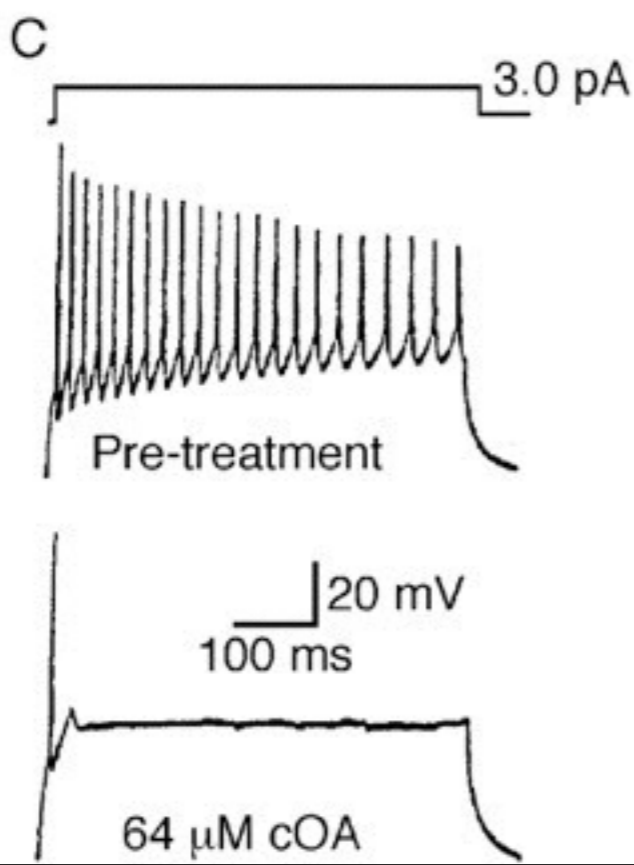
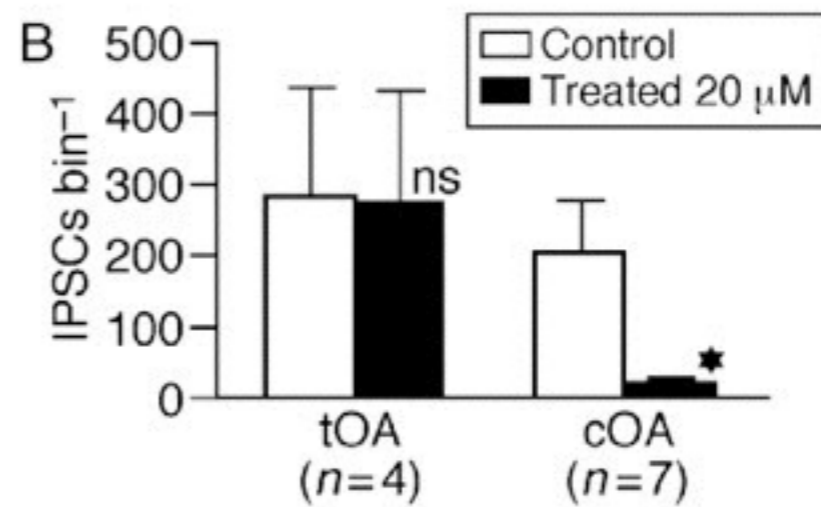
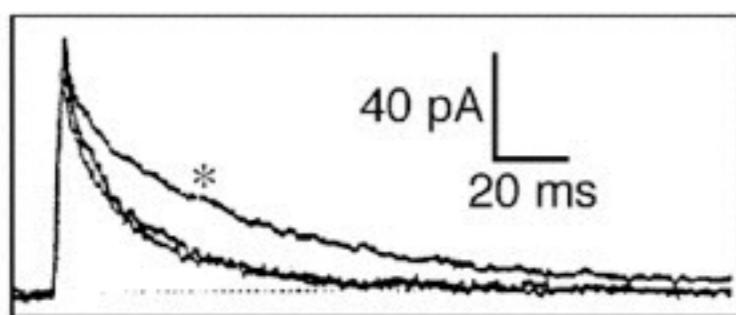
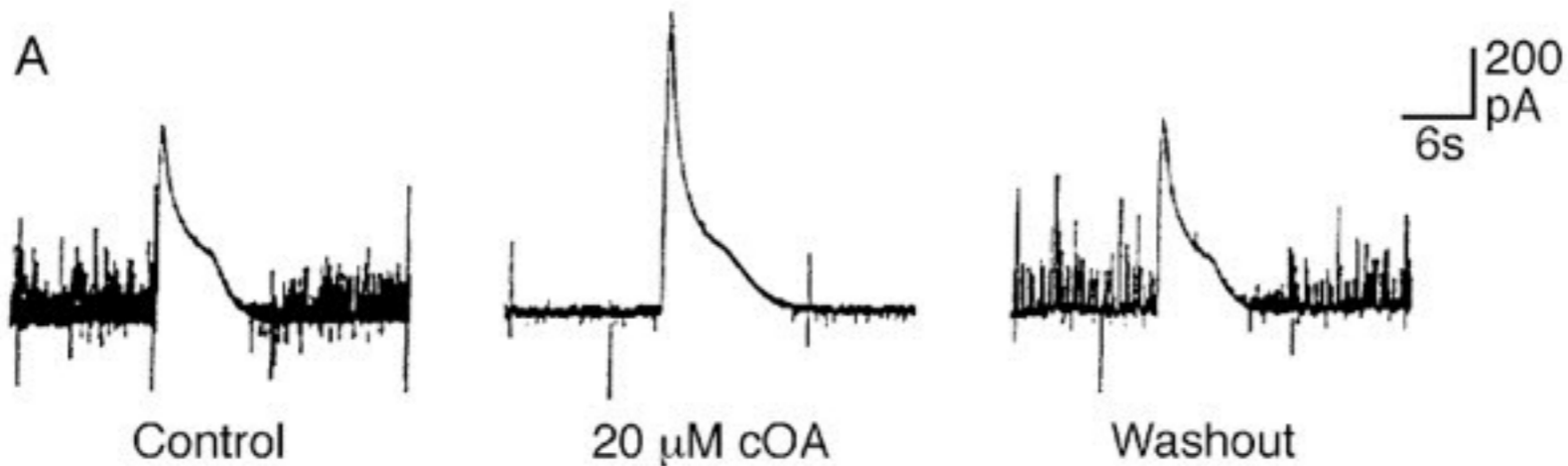
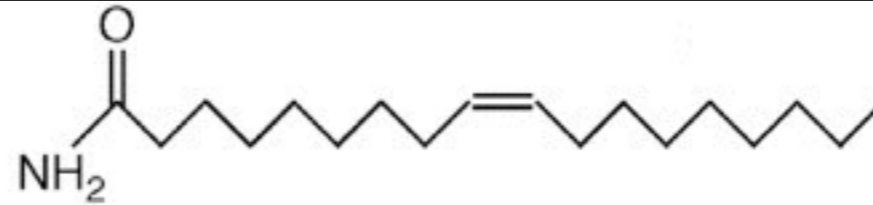
agonist **DIAZEPAM**
antagonist **FLUMAZENIL**
inverse agonist **βCARBOLINE**



anaesthetic mechanisms

- GABA_A potentiation
- Ca channel blockade
- Na channel blockade
- nACh blockade

'OLEAMIDE' (cOA)



high pressure nervous syndrome

- high pressures reverse anaesthesia (tadpoles)
- high pressures cause excitation (man)


typical anaesthetic

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

A large, bright red mushroom with white spots, growing on a bed of dry pine needles. The mushroom is the central focus, with its vibrant red color contrasting sharply with the dry, brownish needles. The text is overlaid on the image, with the first line in yellow and the second in cyan.

ie, lots of drugs which interact!

**you need to know your
pharmacology!!!**



effects of drugs depend on state of animal

- excited?
- in pain?
- shocked?

sedative drugs

- **α 2 agonists**
 - **α 2 adrenergic R**
- **phenothiazines**
 - **D2 R, H, α 1 & most others (antagonist)**
- **benzodiazepines**
 - **GABAA R (agonist)**
- **butyrophenones**
 - **D2 R (antagonist)**

α 2 agonists

- **xylazine**
- **detomidine**
- **medetomidine**
- **romifidine**
- **clonidine**



α 2 agonists

- **xylazine**
 - all spp, especially ruminants
 - care in sheep and deer
- **detomidine**
 - horses
- **(dex)medetomidine**
 - dogs & cats (people)
- **romifidine**
 - horses
- **clonidine**
 - people

α 2 agonist effects

- sedation
- analgesia
- hyper / hypotension
- bradycardia
- smooth muscle spasm then relaxation
- vomiting (dog & cat)
- hypoxaemia (ruminants)
- hypothermia

α 2 antagonists

- atipamezole
- yohimbine
- idazoxan



phenothiazines

- **acepromazine**
- **chlorpromazine**
- **methotrimeprazine**
- **promethazine**
- **prochlorperazine**

phenothiazine effects

- **sedation**
- **antiemetic**
- **vasodilatation**
- **antimuscarinic**
- **antihistamine**
- **lowers temperature**
- **extrapyramidal stimulation**
- **analgesic / hyperalgesic**



care

- **stress / shock**
- **convulsions**
- **cardiovascular disease**
- **Boxers**
 - **bradycardia**
- **stallions**
 - **paraphimosis**

benzodiazepines

- midazolam
- diazepam
- hundreds of others in human use
 - main difference is duration of action

benzodiazepine effects

- **sedation / excitement**
- **anticonvulsant**
 - **first line treatment**
 - **safe in overdose**
- **anxiolytic**
- **appetite stimulant**

side effects

- **safe even at high doses**
- **diazepam vehicle?**
 - **propylene glycol**
 - **polyethoxylated castor oil**
 - **coconut oil emulsion**

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benzodiazepine antagonist

- **flumazenil**

- **expensive**

butyrophenones

- **azaperone**
- **droperidol**
- **haloperidol**



butyrophenones

- **sedative???**
- **antiemetic**
- **obsolescent - use something else**



obsolete as sedatives

- chloral hydrate
- guaiphenesin
- phenobarbitone
- reserpine
- magnesium
- do not use

neuroleptanalgesia

- **sedative**
 - **phenothiazine**
 - **acepromazine**
 - **butyrophenone**
 - **droperidol**
- **& analgesic**
 - **opioid**
 - **morphine**
 - **buprenorphine**

4 yr old cattle dog

- wobbly on hind legs
- for hip x rays



sedatives

- chose the sedative protocol for each individual animal
- acepromazine produces mild sedation with cardiovascular depression
- diazepam is unreliable on its own but safe
- $\alpha 2$ agonists used in large animals but cause cardiovascular depression and vomiting in dogs & cats
- combinations of a sedative with an opioid give deeper sedation
- deeply sedated animals need to be monitored as for general anaesthesia