

A close-up photograph of a red mushroom with white spots, likely a fly agaric, growing on a bed of dry pine needles. The mushroom is the central focus, with its bright red cap and white spots contrasting sharply with the brown, needle-covered ground. The text 'Analgesics' is overlaid in yellow on the mushroom's cap.

**Analgesics**

**Other Drugs**

A close-up photograph of a mushroom with a red cap and a yellowish-orange base, speckled with white spots. It is growing on a bed of dry, brown grass. The image is dimly lit, with the text overlaid in bright yellow and orange colors.

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

- **formulate a balanced analgesia plan for  
any animal**

# What would you do?

- fractured metacarpal
- needs a splint
- analgesia?



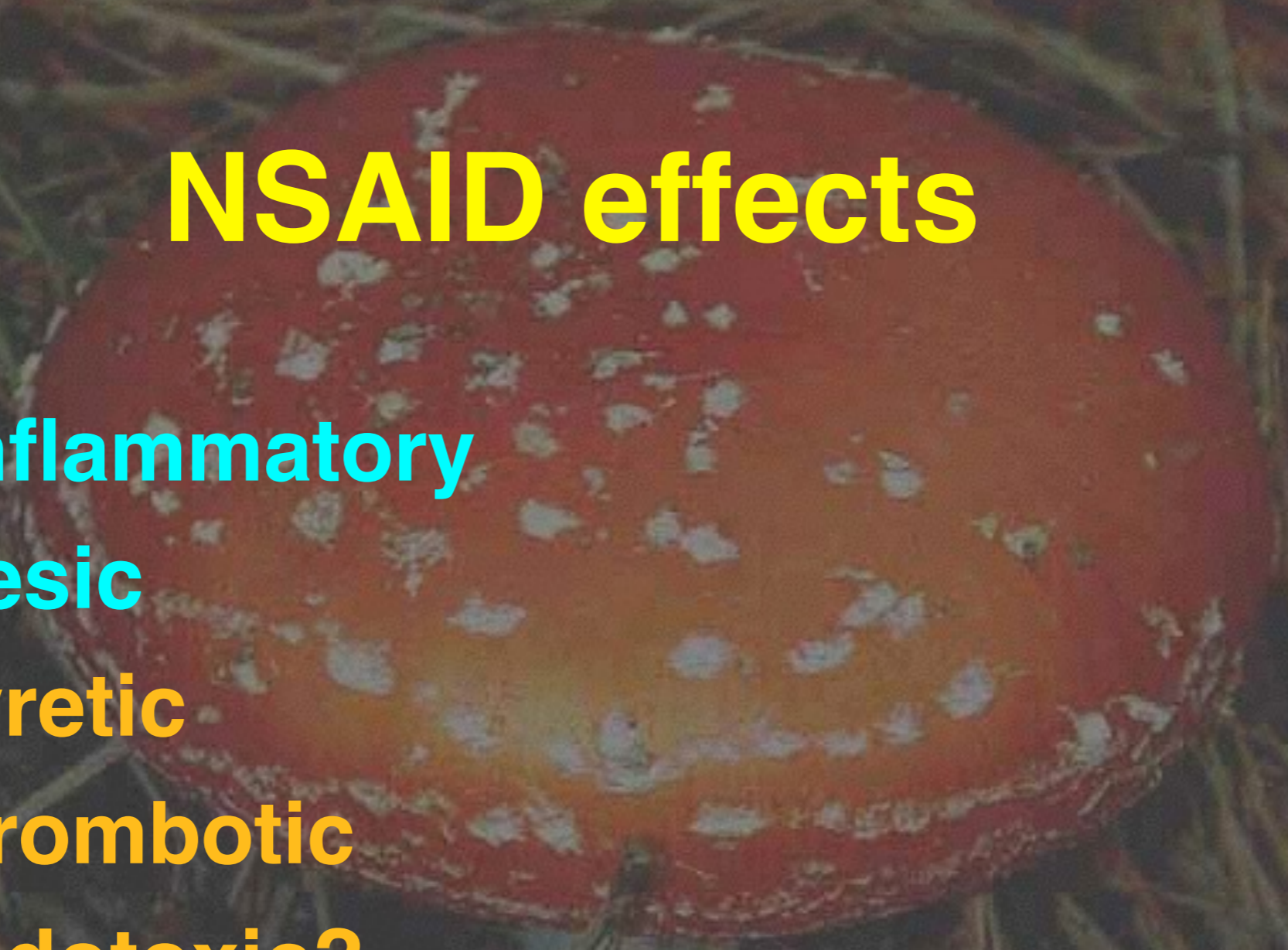
# analgesics

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.

- **opioids**
- **local analgesics**
- **NSAIDs**
- **$\alpha$ 2 adrenergic agonists**
- **odds & sods**

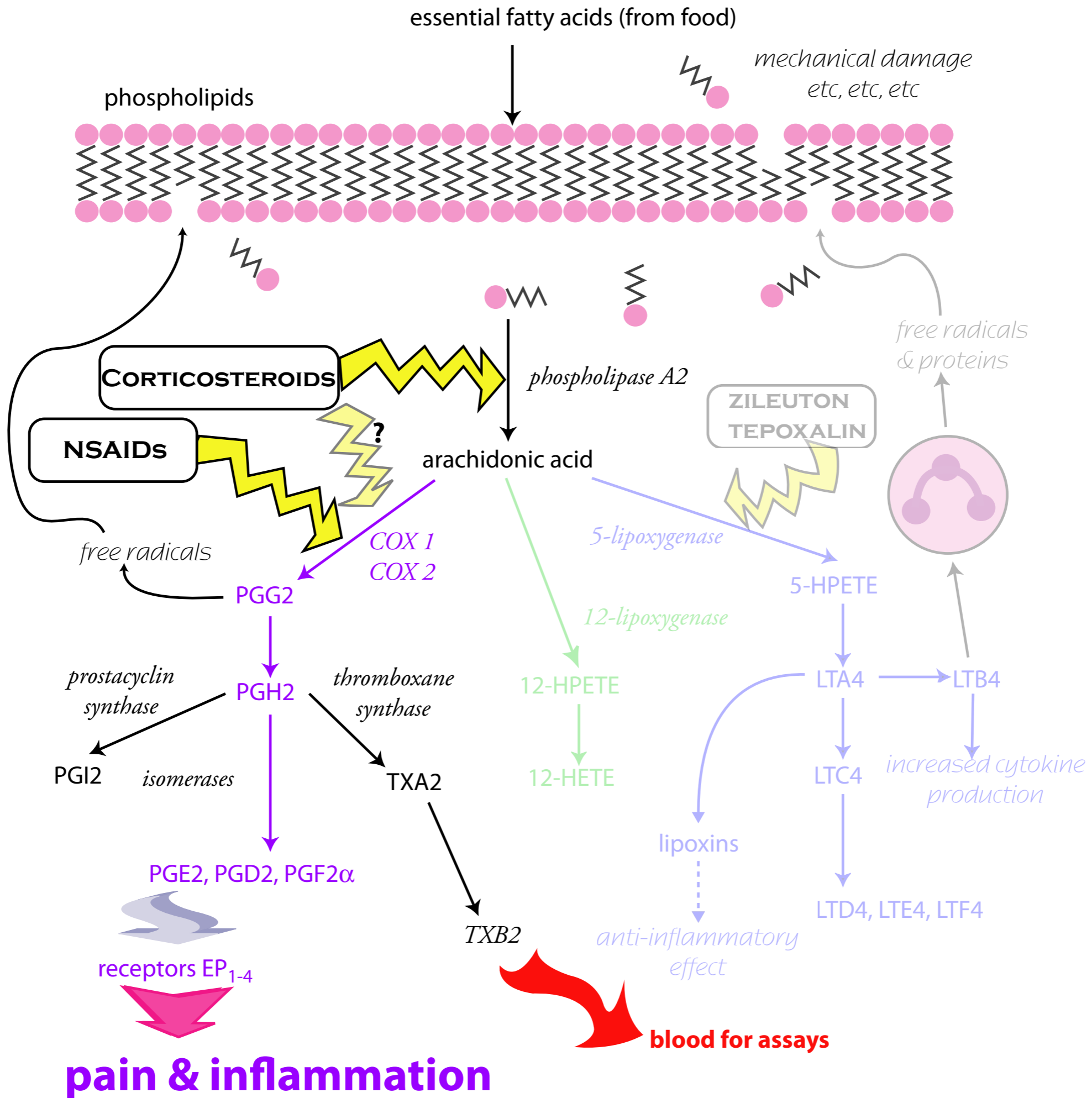
# NSAID effects

- **anti-inflammatory**
- **analgesic**
- **antipyretic**
- **antithrombotic**
- **antiendotoxic?**



# NSAID mechanism

- **COX inhibition**
- **free radical scavenging**
- **receptor antagonism**
- **lipoxxygenase inhibition**
- **etc**



# cyclo-oxygenase

A photograph of a red mushroom with white spots, likely a species of Amanita, growing on a bed of dry, brown grass. The mushroom is the central focus, with its cap showing a vibrant red color and scattered white patches. The background is a dense layer of dry grass, creating a textured, natural setting.

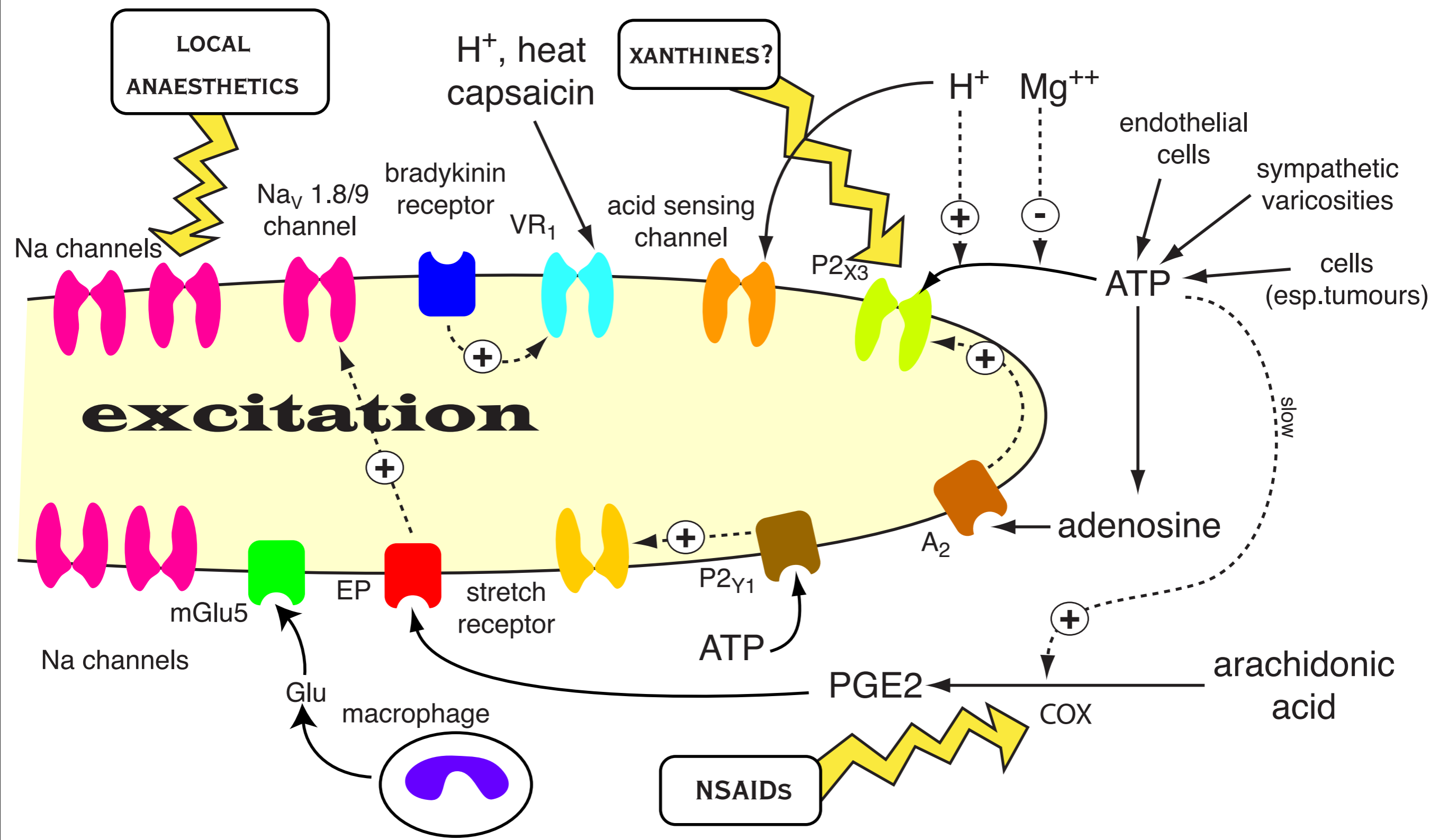
- **COX inhibition**
- **free radical scavenging**
- **receptor antagonism**
- **lipoxxygenase inhibition**
- **etc**



# prostaglandins

A photograph of a red mushroom with white spots, likely a fly agaric, growing on a bed of dry grass. The mushroom is the central focus, with its bright red cap and white spots contrasting against the brown, textured background of the grass. The lighting is somewhat dim, giving the scene a natural, slightly somber feel.

- **peripheral**
  - PGs sensitise nociceptors
- **central**
  - PGs used as neuromodulators?



# NSAID side effects

- **gastric ulceration**
  - common - not usually serious
  - limits use to about 5 days
- **kidney failure**
  - rare - often fatal
  - occurs when blood pressure drops
- **lots of minor side effects**

# analgesic NSAIDs

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

- **carprofen**
- **flunixin**
- **ketoprofen**
- **meloxicam**

# indications

A large, red, gilled mushroom with white spots on its cap, growing on a bed of dry pine needles. The mushroom is the central focus of the image, with its cap showing a gradient from red to orange and yellow. The gills are visible on the underside of the cap. The background is a dense layer of dry, brown pine needles.

- muscle damage
- mild pain
- osteoarthritis
- post op pain
- colic

# pharmacokinetics

- **extreme variation between species!!!**
  - **aspirin half life**
    - **cat 22 hours**
    - **cattle 25 minutes**



# beware

- **cats**
  - aspirin & paracetamol
- **cattle**
  - phenylbutazone
- **dogs**
  - naproxen

# What would you do?

- 7 year old mare
- went lame after heavy work
- now reluctant to use right fore





# analgesics



- **opioids**
- **local analgesics**
- **NSAIDs**
- **$\alpha 2$  adrenergic agonists**
- **odds & sods**

# $\alpha_2$ effects

- analgesia
- sedation
- bradycardia
- spasm then relaxation of smooth muscle
- skeletal muscle relaxation
- vomiting
- hypothermia



# drugs

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

# $\alpha_2$ side effects

- bradycardia
- spasm then relaxation of smooth muscle
  - blood vessels
  - gut
  - uterus
- skeletal muscle relaxation
- vomiting
- hypothermia

# $\alpha 2$ side effects

- **ruminants**
  - grunting respiration
  - hypoxia
  - rarely death



# mechanism

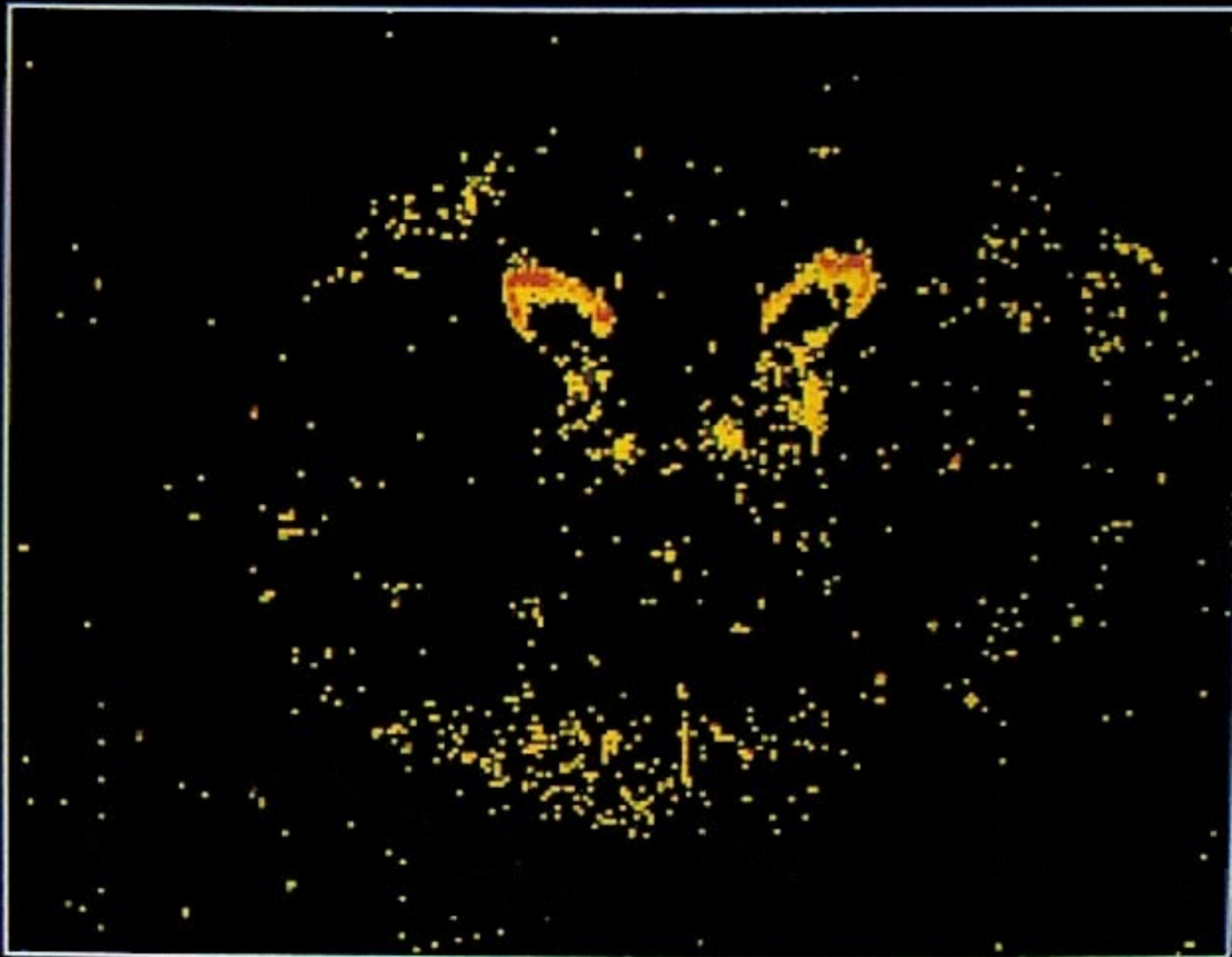
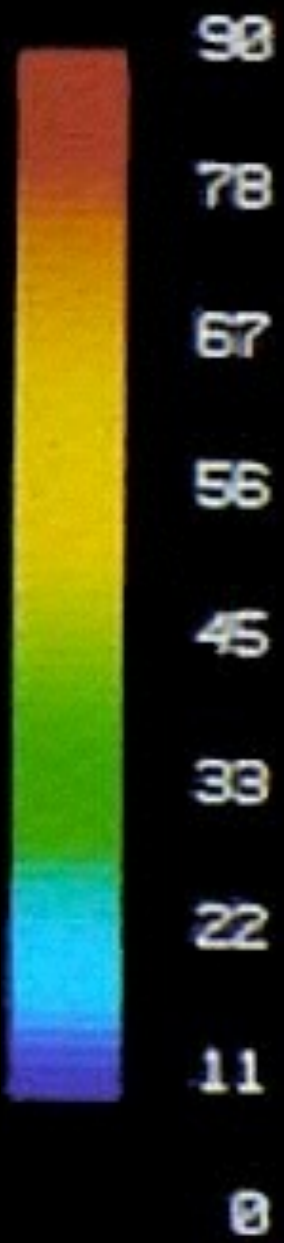
- **G protein coupled receptors**
- **same effectors as opioids?**
- **increase  $K^+$  conduction**
- **hyperpolarise neurones**
- **also bind to imidazoline Rs**

# sites of action

- spinal cord
- locus coeruleus
- cortex?
- medulla
- thoracic cord
- sympathetic varicosities

ALAN  
CHAMBERS

TOTAL  
BINDING  
fmol/mg





# indications

- **minor operations**
- **deep sedation**
- **anaesthetic premed**
- **(induce vomiting)**

# minor ops

- **mainly large animals**
  - **± local anaesthetic**
- **better analgesia at front end??**
- **ruminants sensitive to xylazine**
- **severe sensitivity in some deer to xylazine**
  - **respiratory problems**
  - **death in extreme cases**

# sedation / premed

- **depth**
- **duration**
- **cardiovascular side effects**
- **interaction with anaesthetics**

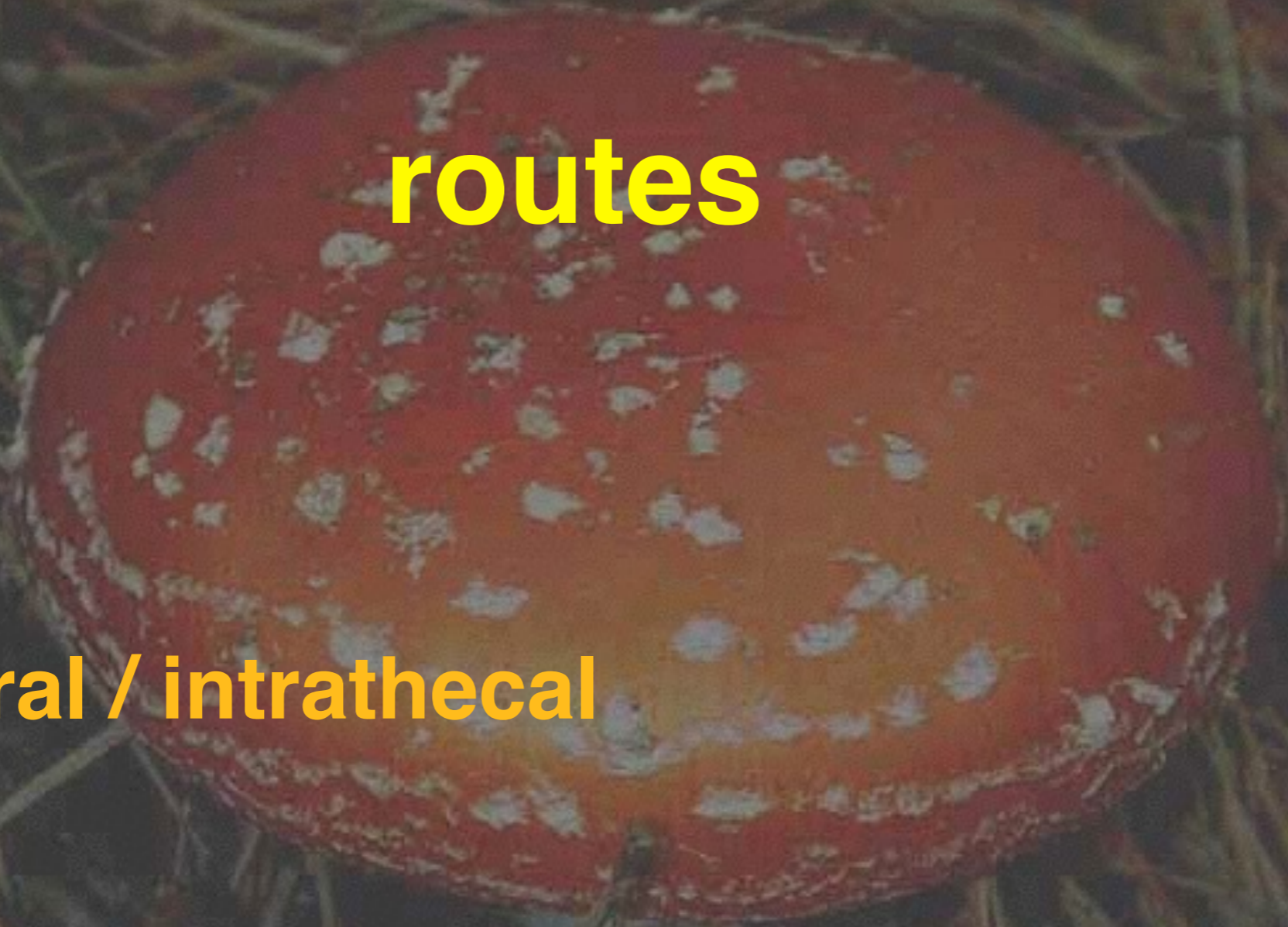
# vomiting

A photograph of a red mushroom with white spots, likely a Amanita muscaria, growing on a bed of pine needles. The mushroom is the central focus, with its bright red cap and white spots contrasting against the dry, brownish-green needles. The text 'vomiting' is overlaid in yellow on the mushroom's cap.

- **30% of dogs**
- **40% of cats**
  - **higher doses - up to 100%**

# routes

- **iv**
- **im**
- **epidural / intrathecal**



# analgesics

- **opioids**
- **local analgesics**
- **NSAIDs**
- **$\alpha$ 2 adrenergic agonists**
- **odds & sods**

# psychotropics

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

- ketamine
- tricyclic antidepressants
  - NMDA antagonists
  - prevent / stop hyperalgesia
- (amantadine)

# psychotropics



- **anticonvulsants**
  - carbamazepine
  - phenytoin
  - gabapentin
- **inhalation anaesthetics**
  - nitrous oxide
  - (trichloroethylene)
  - (methoxyflurane)



A photograph of a red mushroom with white spots, likely a fly agaric, growing on a bed of pine needles. The mushroom is the central focus, with its bright red cap and white spots contrasting against the dry, brownish-green needles. The text 'others' is overlaid in yellow on the mushroom's cap.

# others

- **capsaicin**
- **NOS inhibitors?**
- **cannabinoids?**

# balanced analgesia

A large, vibrant red mushroom with white spots on its cap, growing on a bed of dry pine needles. 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 layer of dry, brown pine needles.

- **opioids**
- **local analgesics**
- **NSAIDs**
- **$\alpha$ 2 adrenergic agonists**
- **psychotropics**
- **others**

# What would you do?

- fractured metacarpal
- needs a splint
- analgesia?



# other analgesics

- NSAIDs and  $\alpha 2$  agonists most commonly used
- NSAID side effects
  - gastric ulceration
  - kidney failure
- $\alpha 2$  side effects
  - cardiovascular depression
  - vomiting
- combinations, usually with opioids, produce best analgesia with fewest side effects