

Anti-inflammatory Drugs

NSAIDs & Anti-arthritis
Drugs



anti-inflammatory drugs

- steroids
- NSAIDs
- anti-arthritic drugs
- odds & ends



anti-inflammatory drugs

- steroids
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- odds & ends



NSAID effects

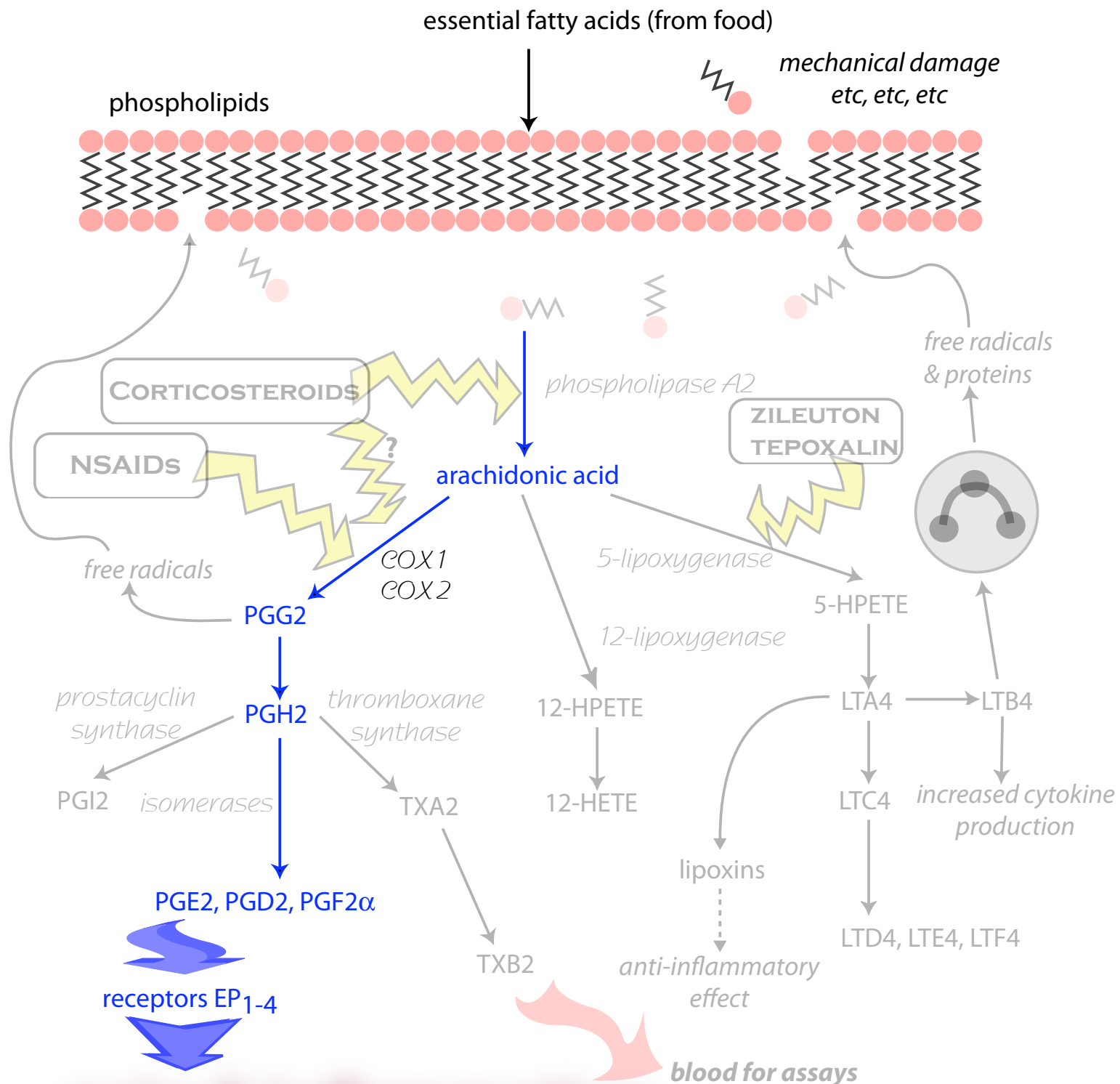
- analgesic
- anti-inflammatory
- anti-pyretic
- anti-thrombotic
- anti-endotoxaemic?



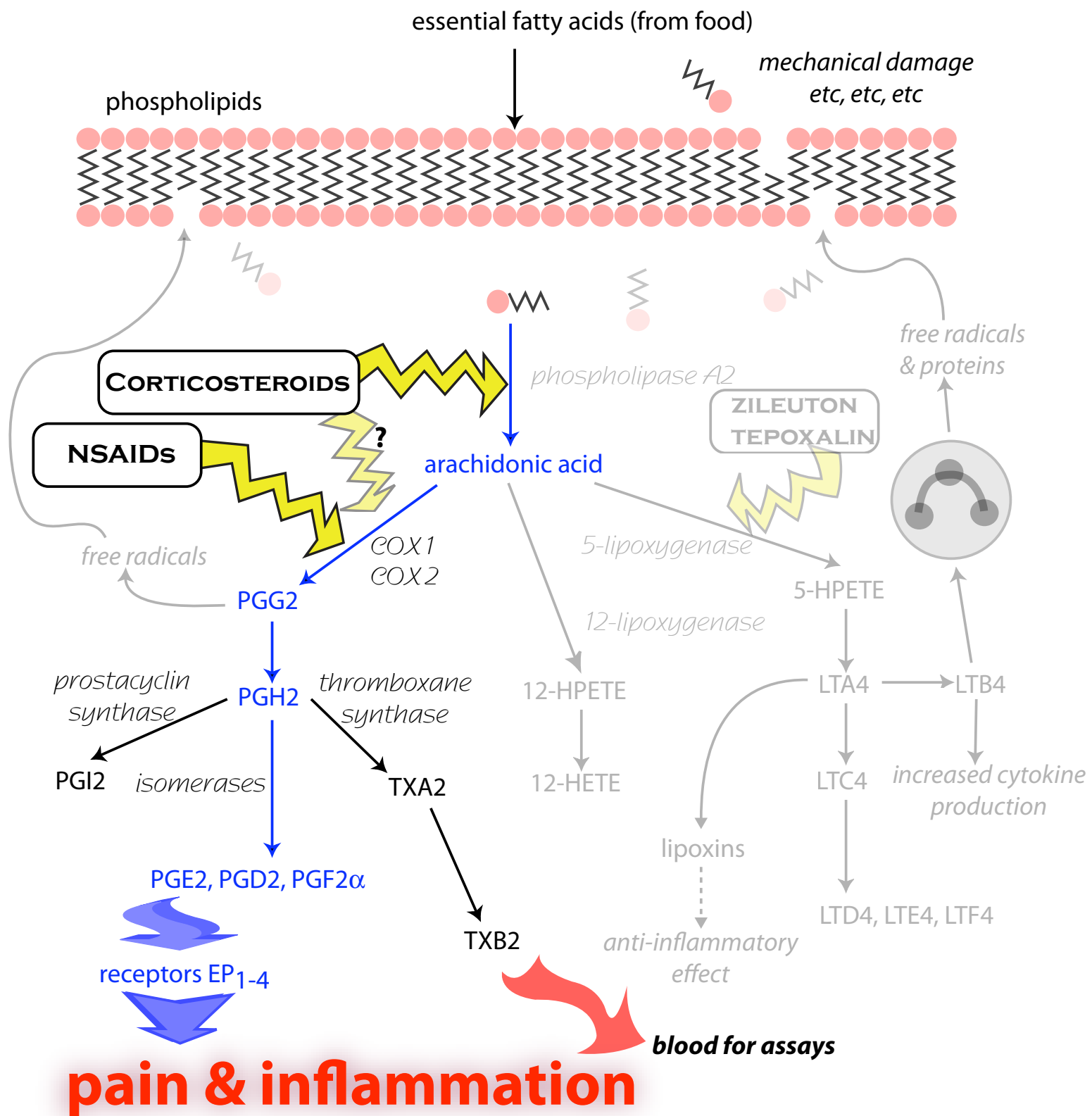
mechanisms

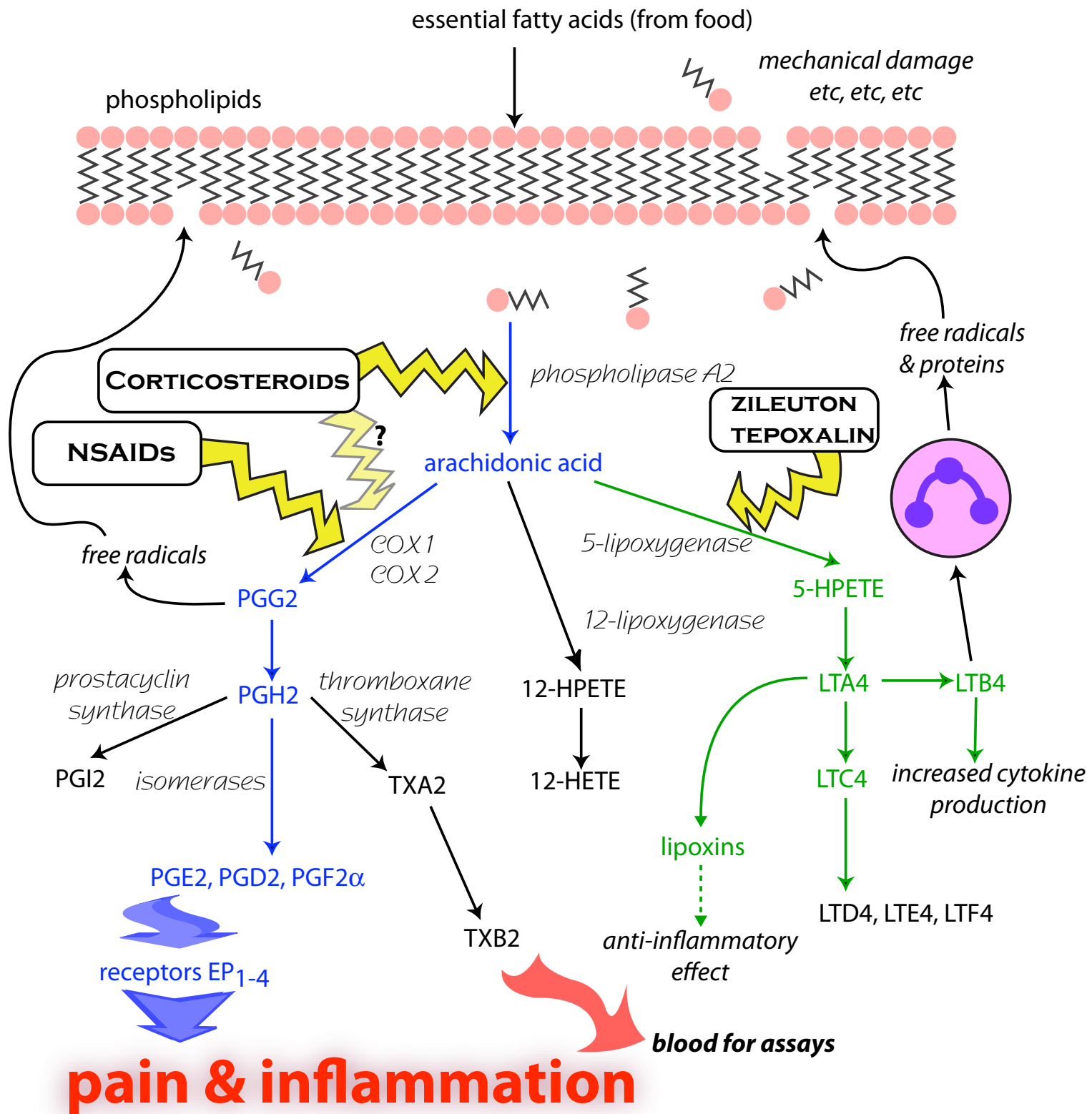
- block PG production
- scavenge free radicals
- PG receptor antagonism
- interfere with neuropeptide signalling





pain & inflammation





cyclo-oxygenase

- **COX 1 constitutive**
 - physiological
- **COX 2 inducible**
 - mainly in response to inflammation
- **COX 3 neuronal???**



analgesic NSAIDs

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



anti-inflammatory NSAIDs

- horses
 - phenylbutazone
 - flunixin
 - ketoprofen
 - fenamates
 - (dipyrone)



colic

- ketoprofen
- flunixin



anti-inflammatory NSAIDs

- **cattle**
 - flunixin
 - ketoprofen
 - tolfenamate



anti-arthritis NSAIDs

- dogs
 - meloxicam
 - carprofen
 - flunixin
 - ketoprofen
 - fenamates etc



anti-thrombotic

- aspirin



COX 2 inhibitors

- celecoxib
- rofecoxib
- etoricoxib
- valdecoxib
- parecoxib
- firocoxib
- (deracoxib)



pharmacokinetics

- extreme variation between species
- eg, aspirin half life
 - cat 22 hours
 - cattle 25 minutes



pharmacokinetics

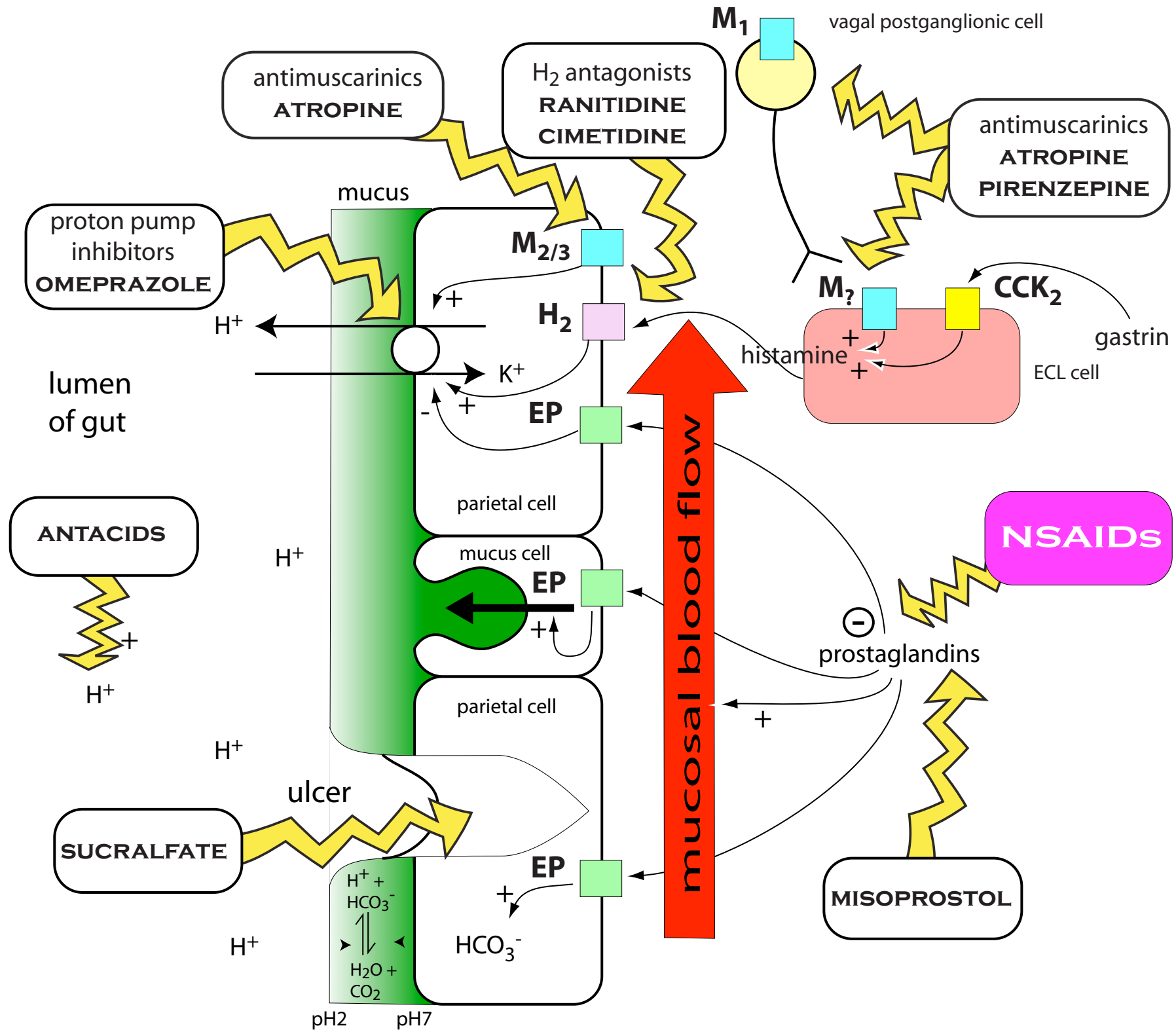
- use only in species for which you have information
- remember protein binding

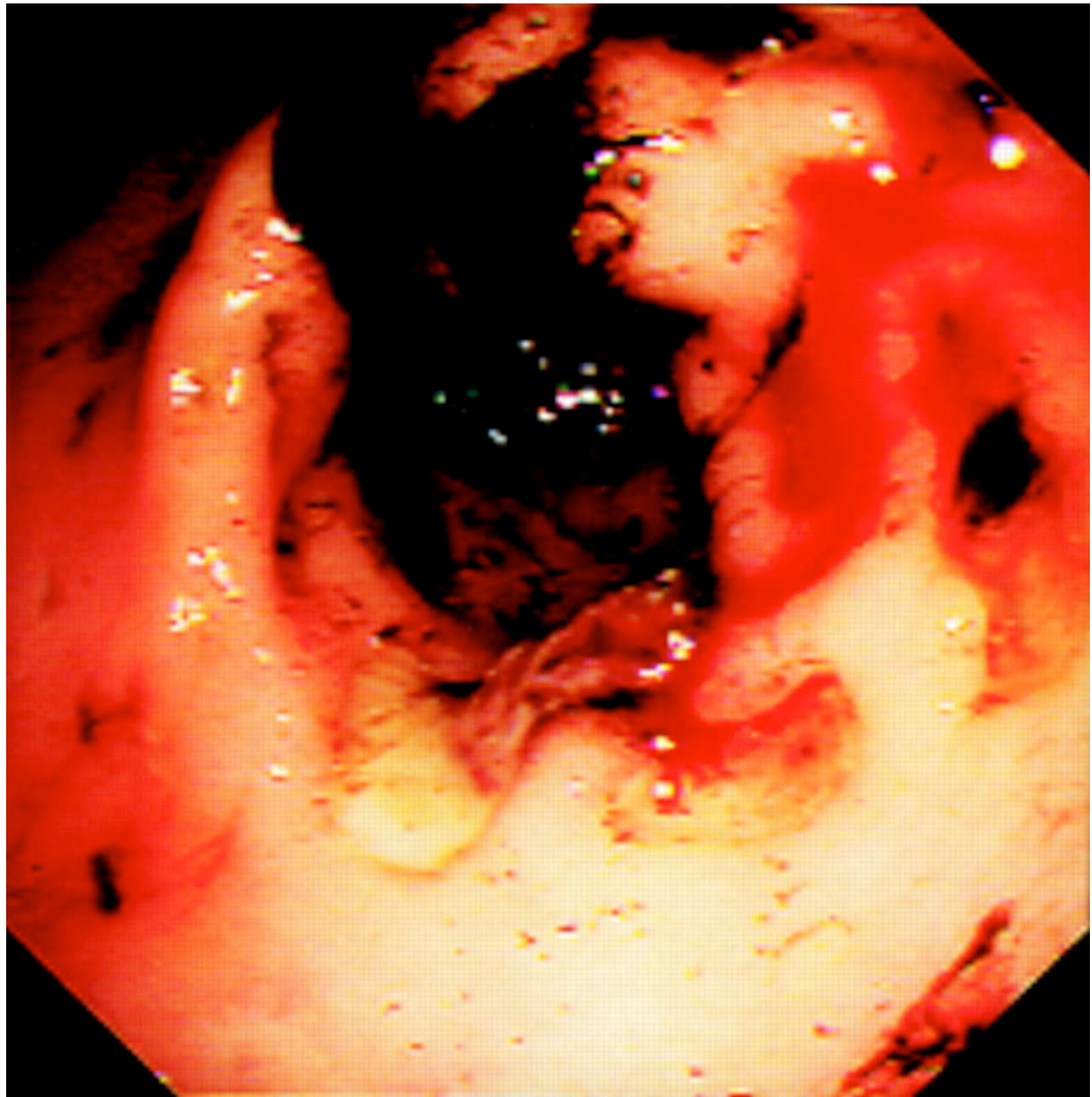


side effects

- gastric ulceration
- kidney failure
- increased bleeding time
- liver damage
- asthma
- agranulocytosis
- dermal reactions



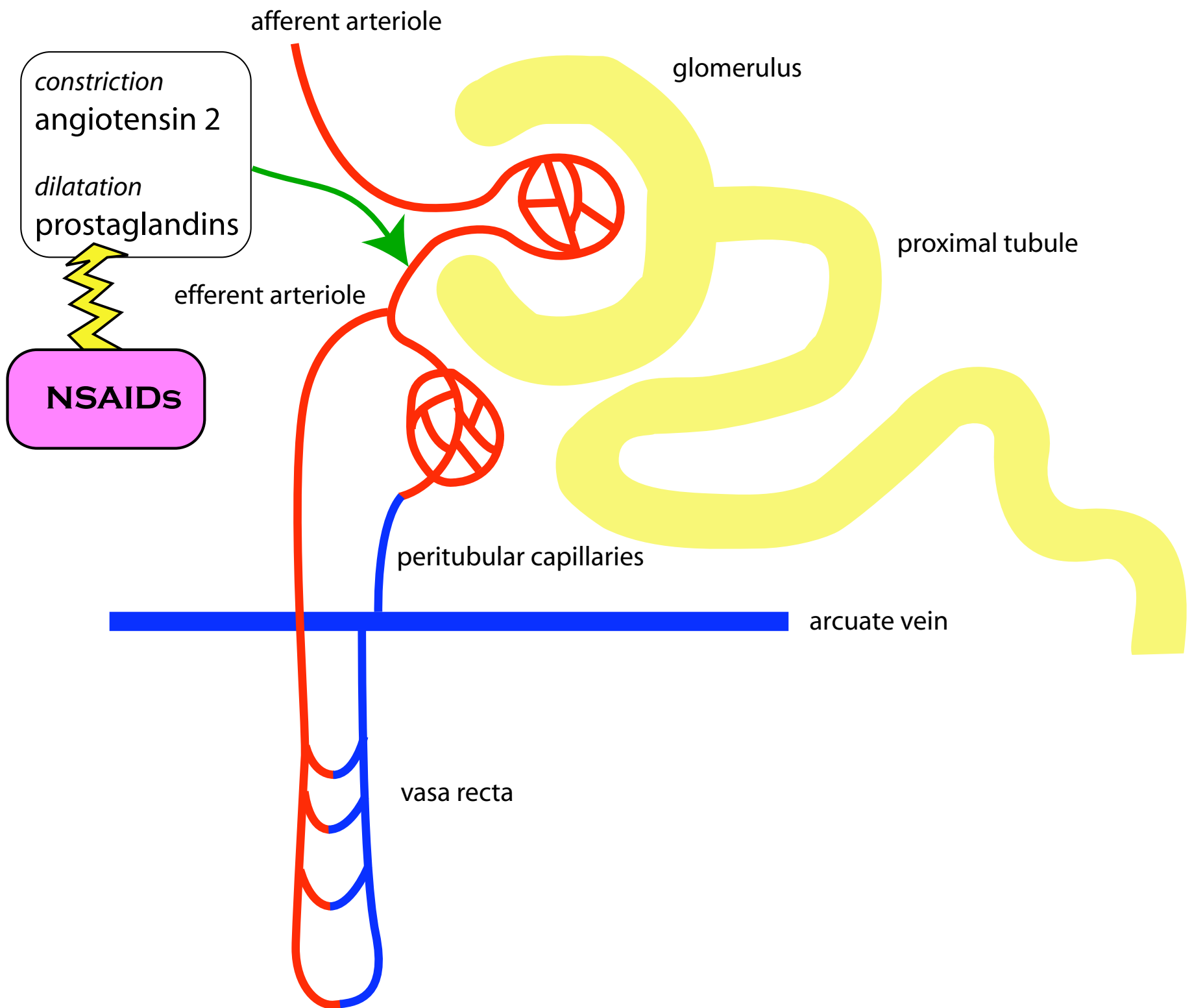




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side effects

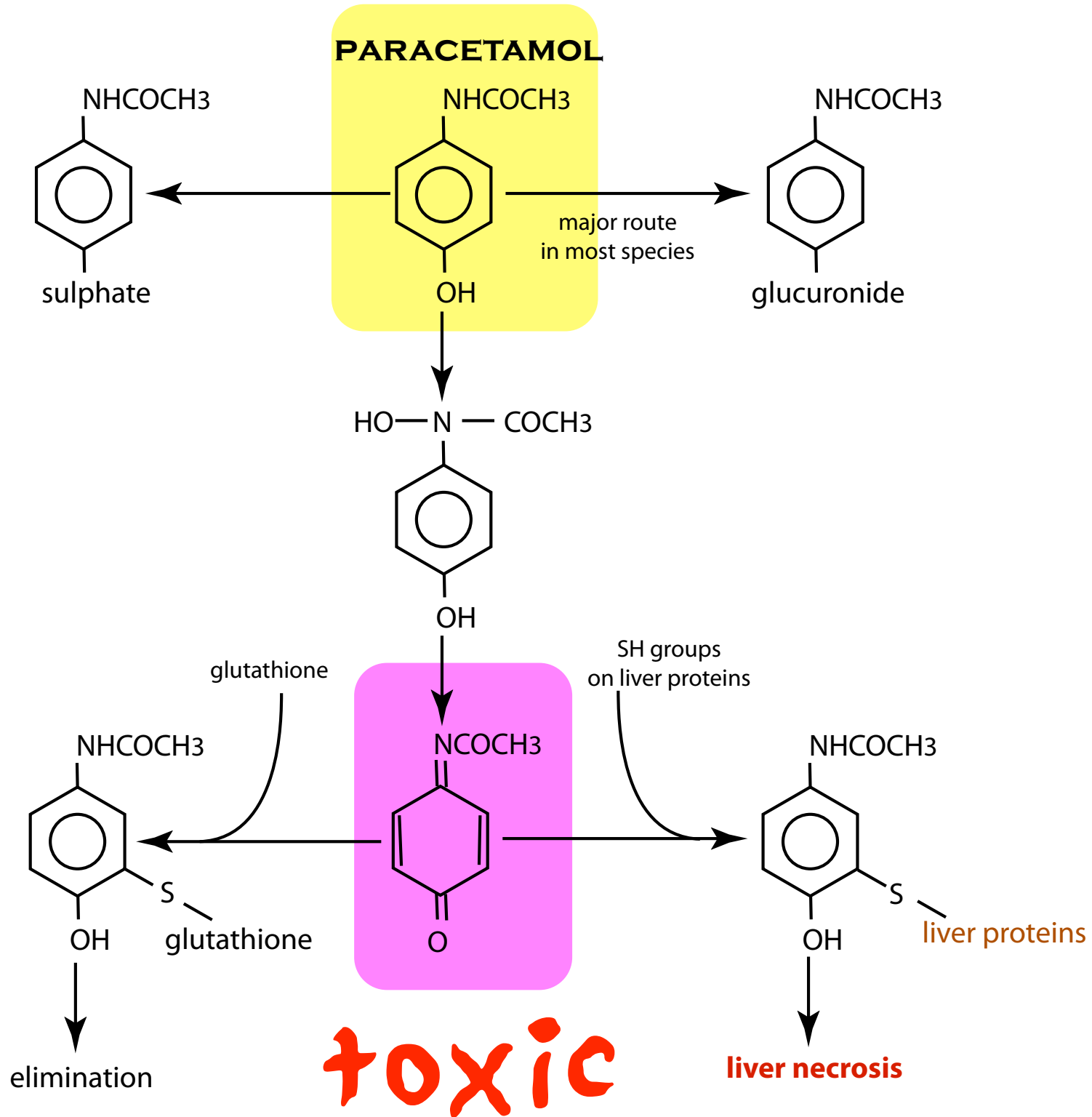
- increased bleeding time
 - aspirin
- liver damage
 - carprofen
- asthma
- agranulocytosis
 - phenylbutazone
- dermal reactions
- heart failure (people)
 - coxibs



beware

- paracetamol (acetaminophen **USAN**)
in cats

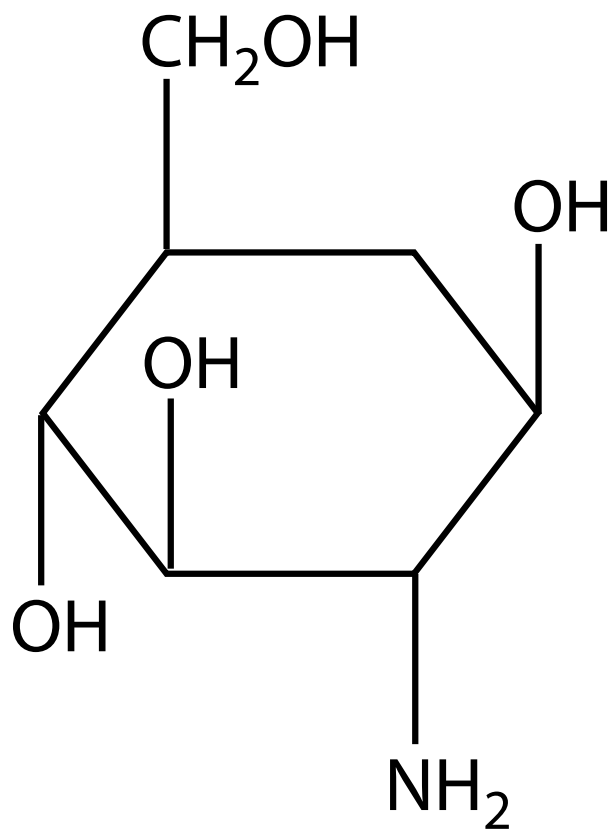




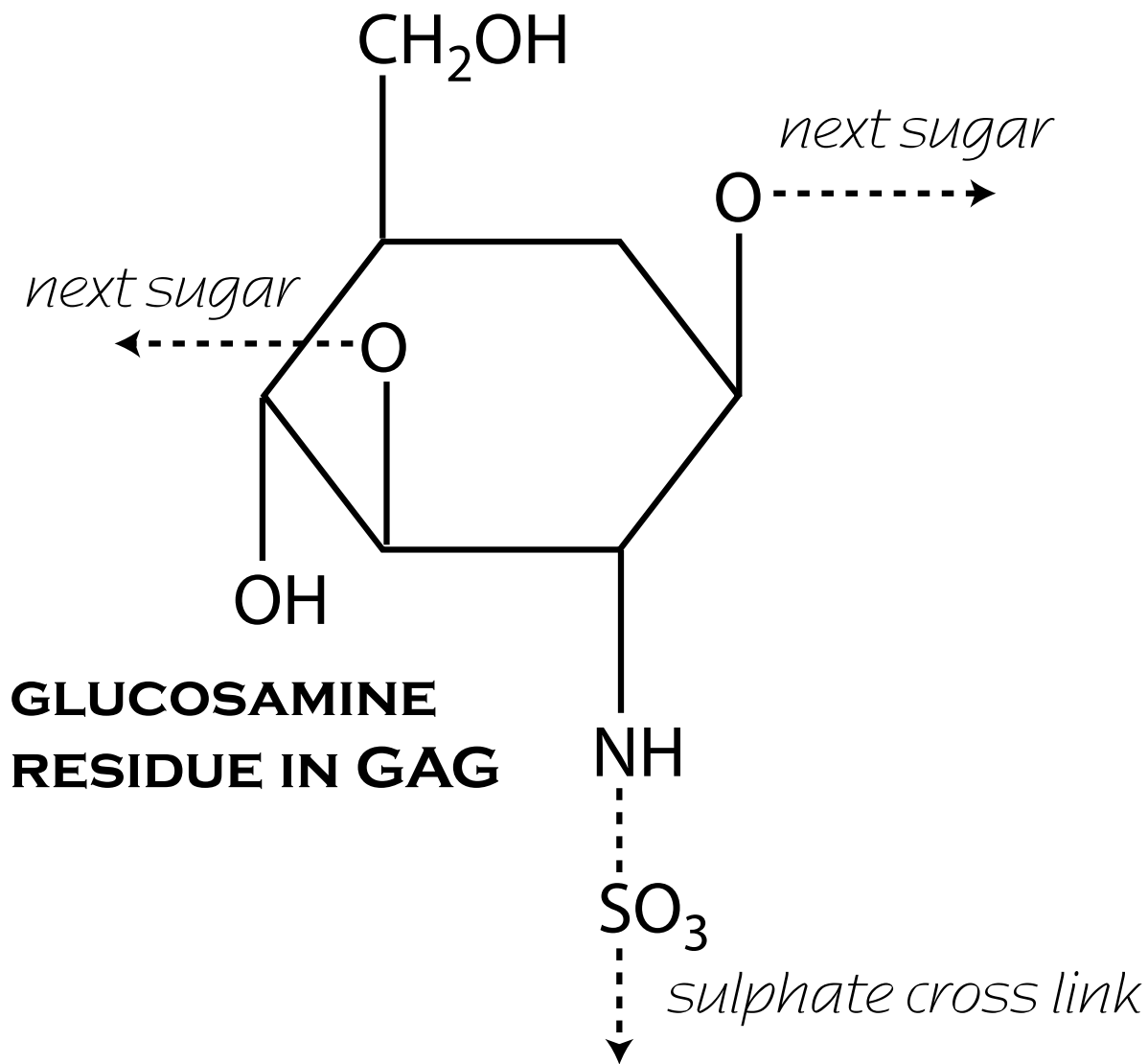
anti-arthritis drugs

- **glycosaminoglycans**
 - chondroitin
 - hyaluronic acid
 - pentosan
 - (heparin)
- **glucosamine**
- **green mussel extract**
- **antioxidants**





GLUCOSAMINE



**GLUCOSAMINE
RESIDUE IN GAG**

mechanisms???

- mechanical effect
- stops proteoglycan breakdown
- increases proteoglycan sythesis
- block PG production
- block several cytokines' production
 - fibroblast growth factor
- anticoagulant



indications

- **horses & dogs**
 - mild osteoarthritis
 - degenerative joint disease?
 - limit growth of tumours?
 - fibroblast growth factor?



administration

- intra-articular
- im
- po?



contra-indications

- infection
- clotting defects / bleeding
- liver or kidney disease



side effects

- local reaction
- infection
- clotting problems
- hypersensitivity
- impoverish owner



antioxidants

- mop up free radicals
- prevent membrane damage
- endogenous systems overloaded
 - superoxide dismutase
 - catalase
 - glutathione peroxidase



antioxidants

- vitamin E
- glutathione
- herbal medicines??



fatty acids

- n-3 fatty acids produce PGE3
- mild anti-inflammatory effect
- no known side effects
- “natural” (in fish anyway)



odds & ends

- copper
- DMSO
- gold
- penicillamine
- chloroquine
- quinine
- sulphasalazine
- antihistamines



dimethylsulphoxide

- solvent for both hydrophobic and hydrophilic drugs
- anti-inflammatory & antimicrobial
- carries other drugs across skin



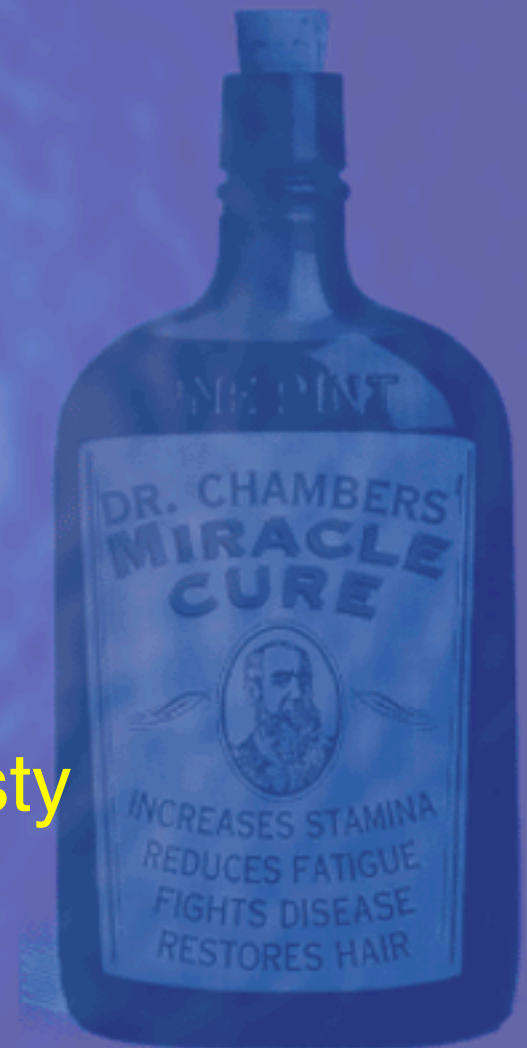
new drugs

- **interleukin antagonists**
- **tumour necrosis factor**
 - antagonists
 - antibodies - infliximab
 - PDE4 inhibitors - thalidomide?
- **transcription factor regulators**
 - mitogen activated protein kinase inhibitors



arthritis

- treat cause if possible
- relieve discomfort
 - rest
 - diet
 - drugs
 - (joint replacement)
 - arthrodesis / excision arthroplasty
 - euthanasia



drugs in arthritis

- NSAIDs
- PSGAGs
- corticosteroids





problems?

- tissue damage
- inflammation
- pain
- loss of function



treatment

- gentle exercise
- NSAIDs



anti-inflammatory drugs

- steroids are the most potent anti-inflammatory drugs
- NSAIDs are useful for both acute and chronic inflammation, but gastric ulceration limits duration of use
- mucopolysaccharides are sometimes used for arthritis in horses and dogs
- many drugs have some anti-inflammatory effect

