

# Diuretics

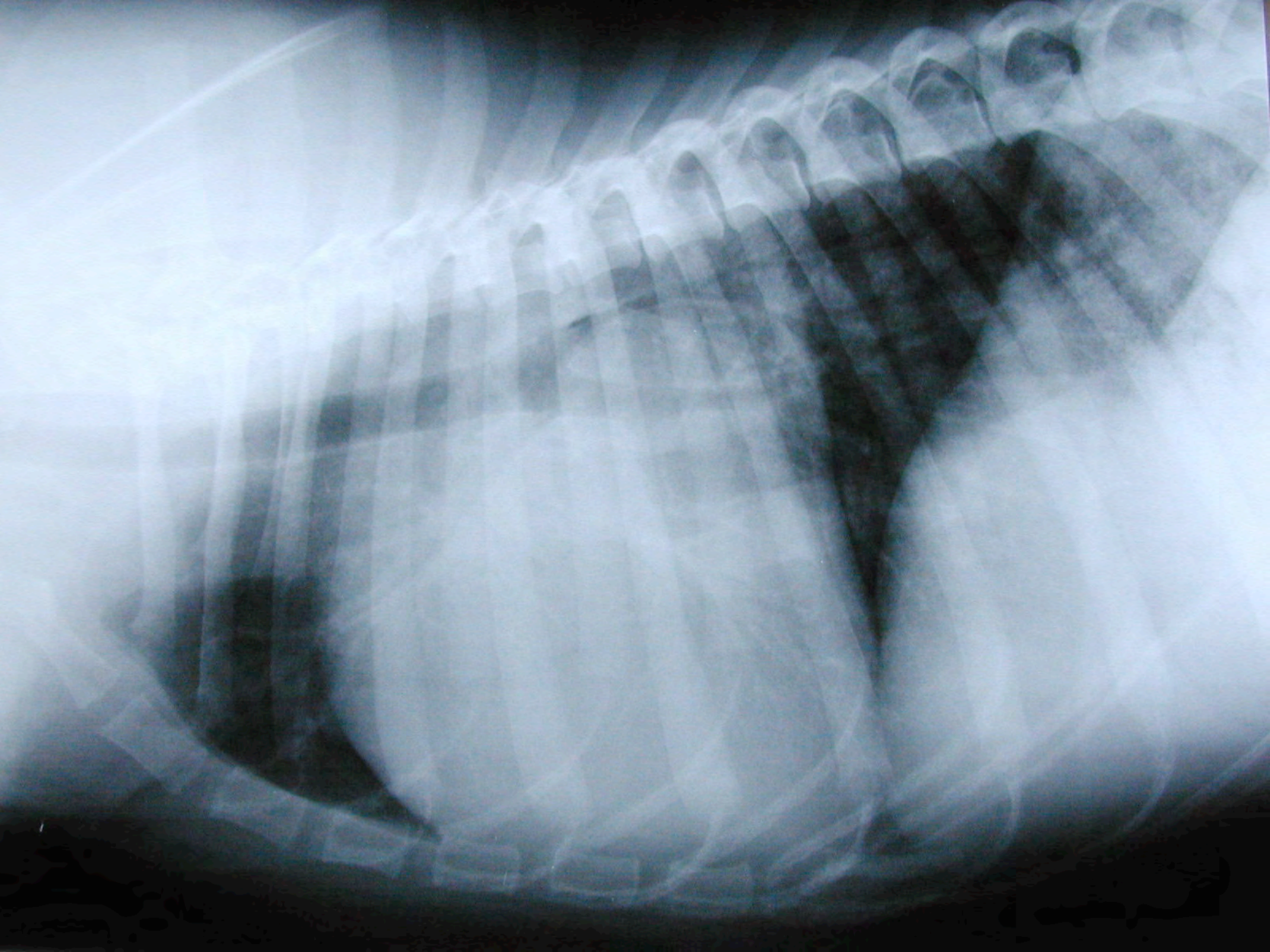


# diuretics

- act on the kidney to increase urine flow
- most block reabsorption of ions from tubules
- water kept in tubules by osmotic pressure



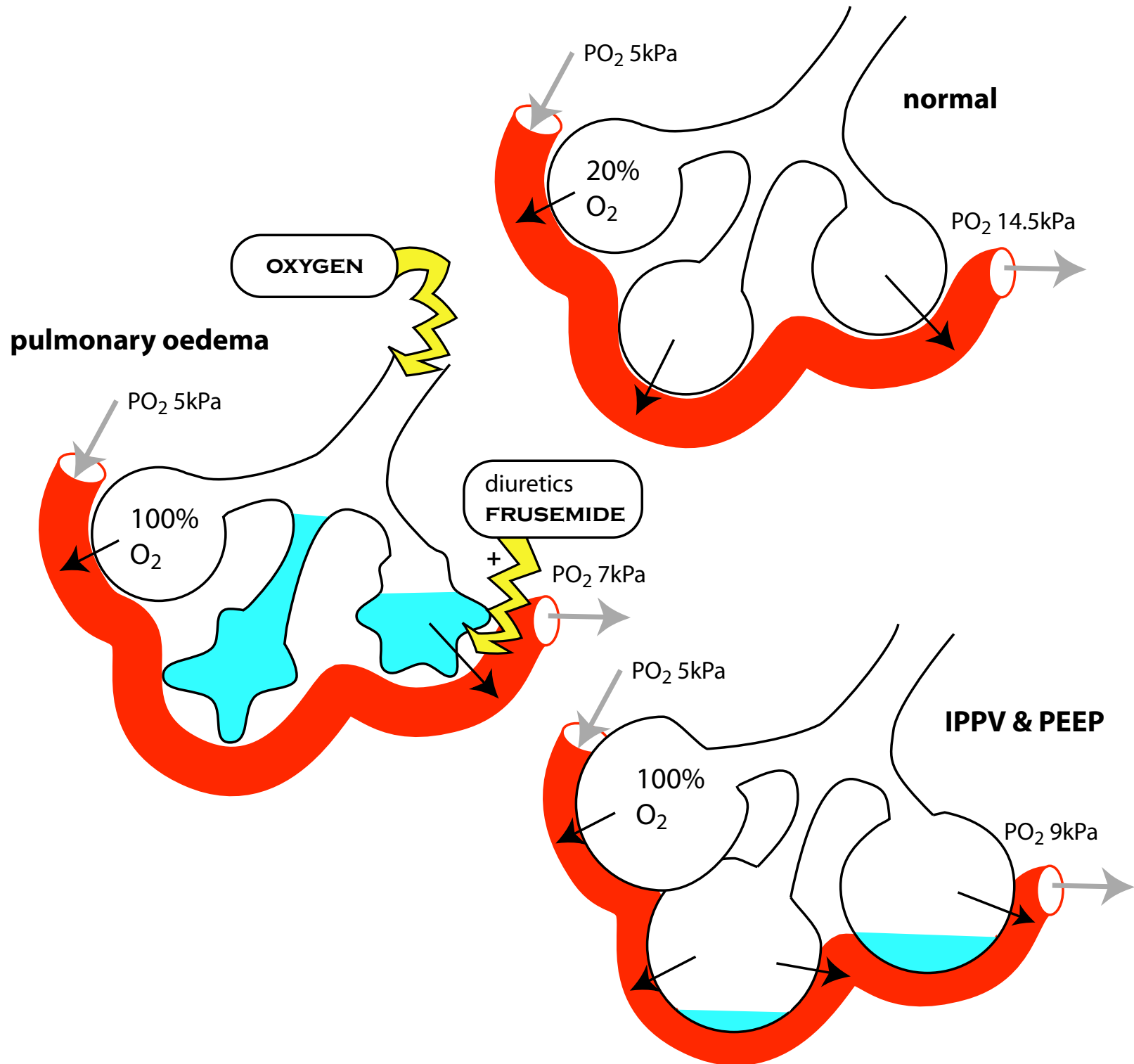




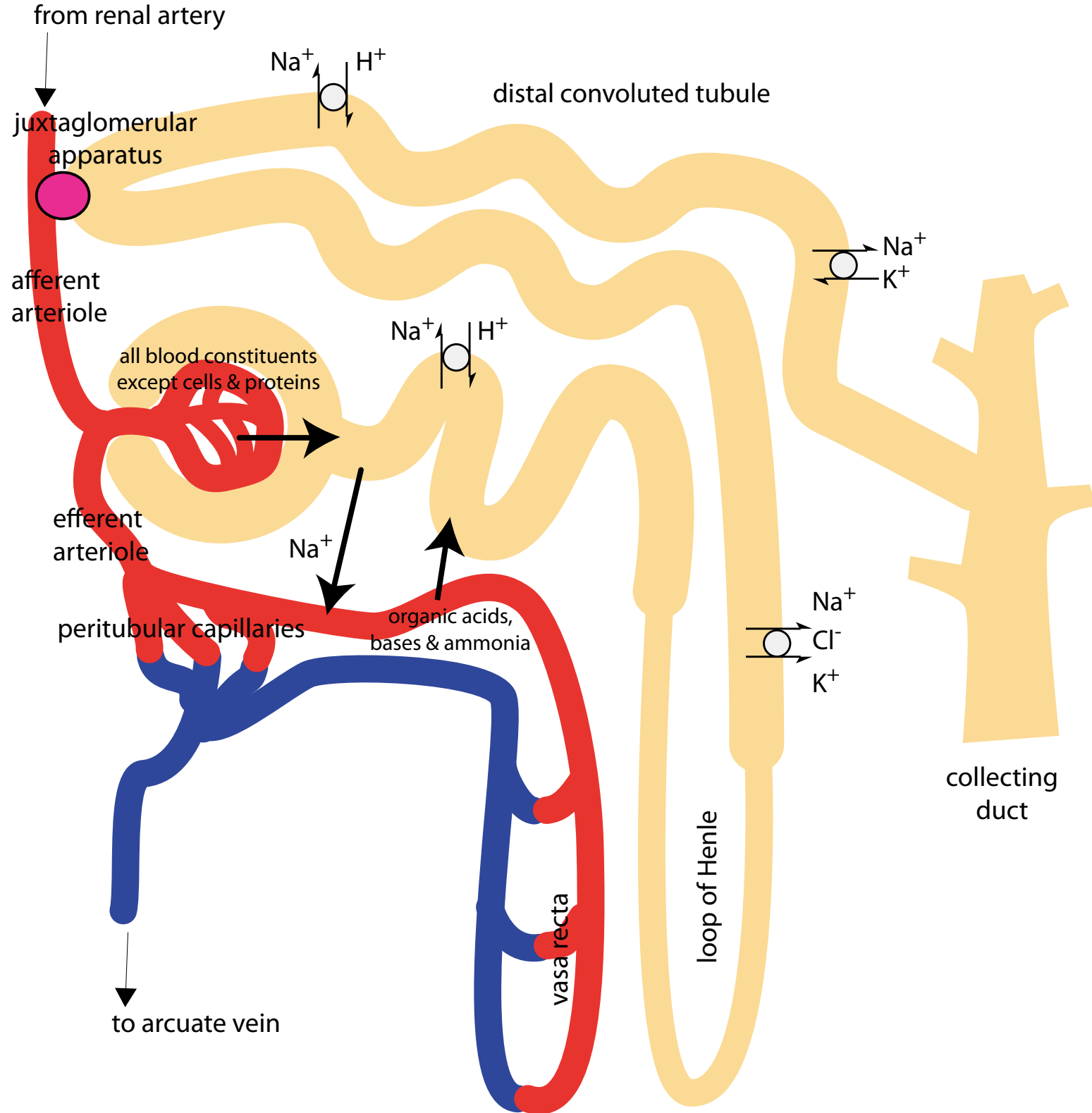
# diuretics & CHF

- reduce pulmonary oedema
- reduce preload









# groups of drugs

- loop diuretics
- thiazides
- osmotic diuretics
- potassium sparing diuretics
- carbonic anhydrase inhibitors
- (mercurials)

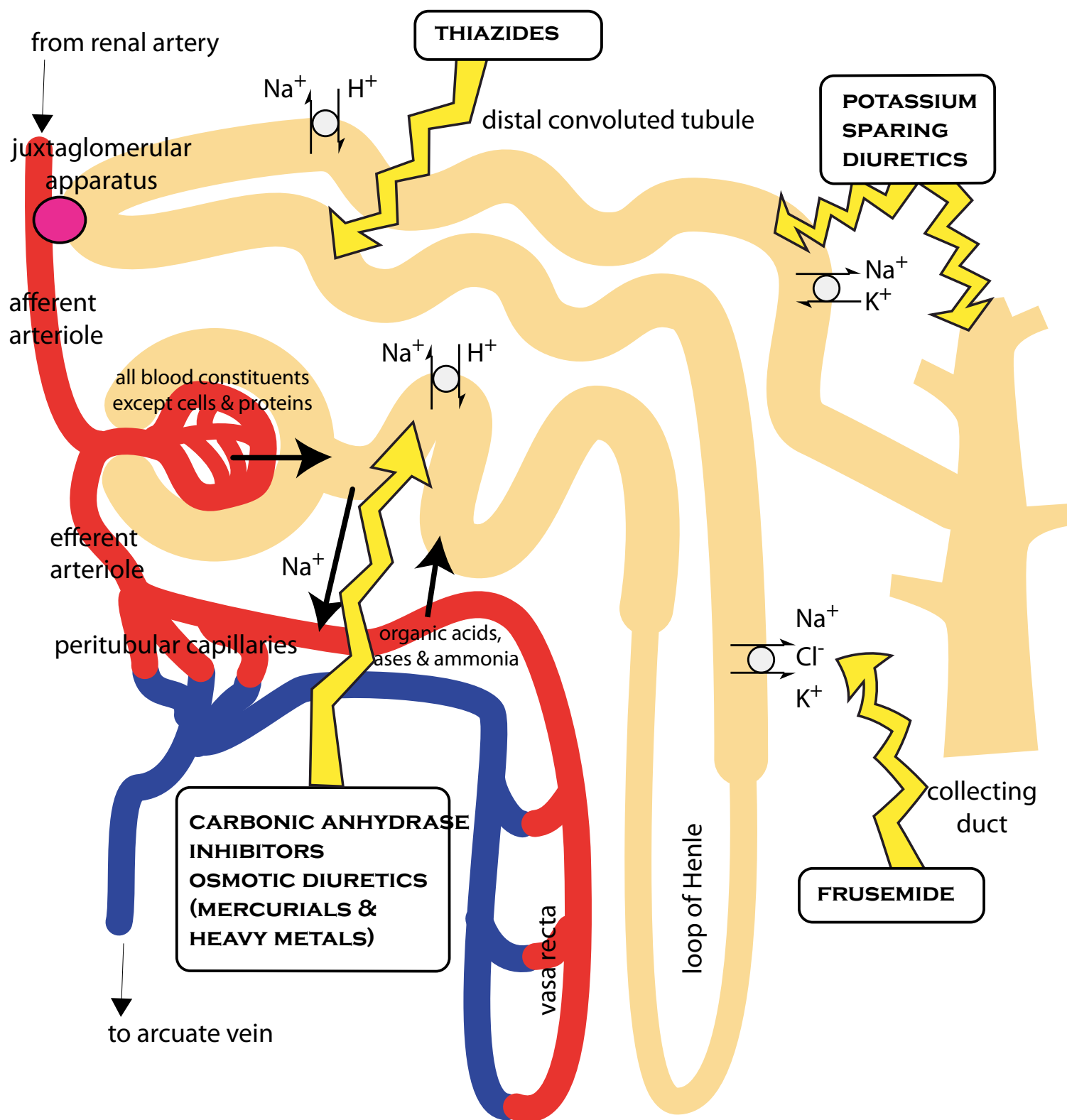


# common drugs

- frusemide
- (hydrochlorthiazide)
- (mannitol)



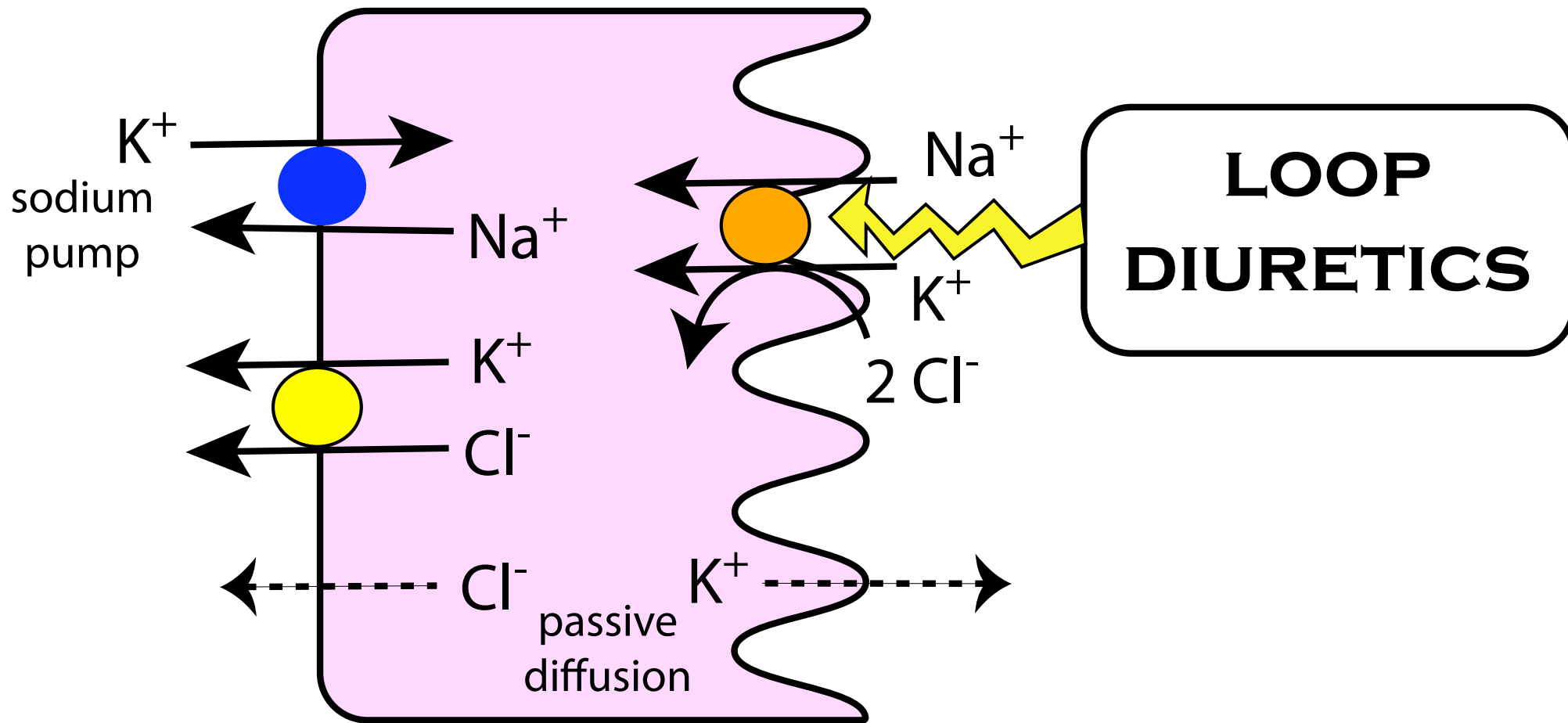




# loop of Henle

**ECF**

**urine**



# frusemide

- **potent**
  - up to 20% of filtered  $\text{Na}^+$  excreted
- **cheap**
- **very widely used**



# frusemide indications

- reduce oedema
- reduce cardiac preload
- (acute renal failure)





# minor indications

- hyperkalaemia
- hypercalcaemia
- uraemia
- epistaxis
- hypertension



# abuse

- speeding up / slowing racehorses



# pharmacokinetics

- **iv**

- onset minutes
- peak 30 mins
- duration 2 hours

- **po**

- onset 30 - 60 mins
- peak 2 hours
- duration 4 - 6 hours



# pharmacokinetics

- **metabolism**
  - negligible
- **elimination**
  - secreted into PCT by anion pump
  - passes out in urine
    - horses which eat their bedding may take it in again





# side effects

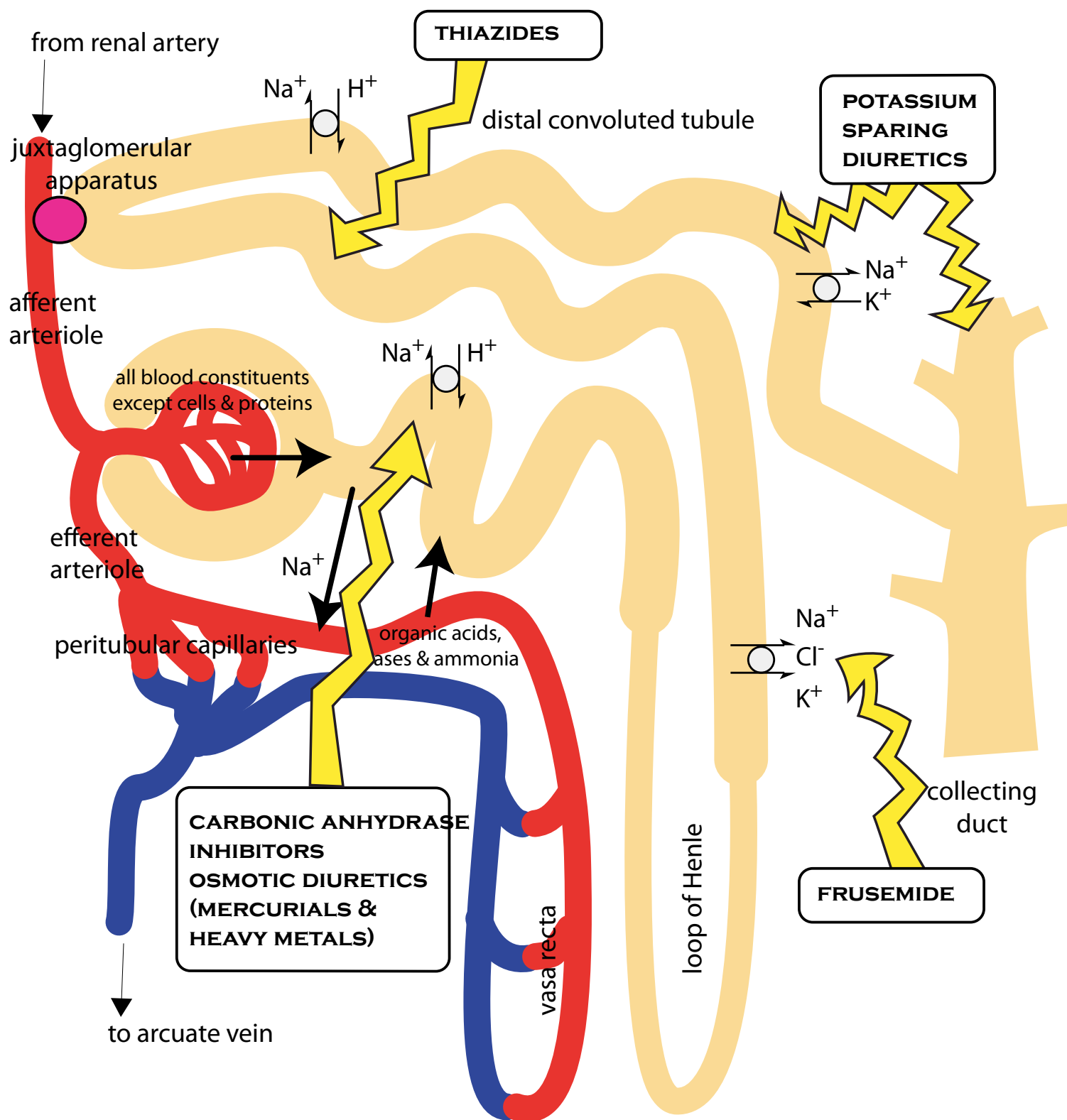
- hypovolaemia
  - reduced glomerular filtration
  - reduced excretion of other drugs
  - collapse
  - direct vasodilatation?
- hypokalaemia
- metabolic alkalosis
- hypocalcaemia / hypomagnesaemia



# side effects

- hypovolaemia
- hypokalaemia
  - digoxin!!!
- metabolic alkalosis
- hypocalcaemia /  
hypomagnesaemia
- tolerance





# side effects

- hypovolaemia
- hypokalaemia
- metabolic alkalosis
- hypocalcaemia / hypomagnesaemia
- tolerance





# interactions

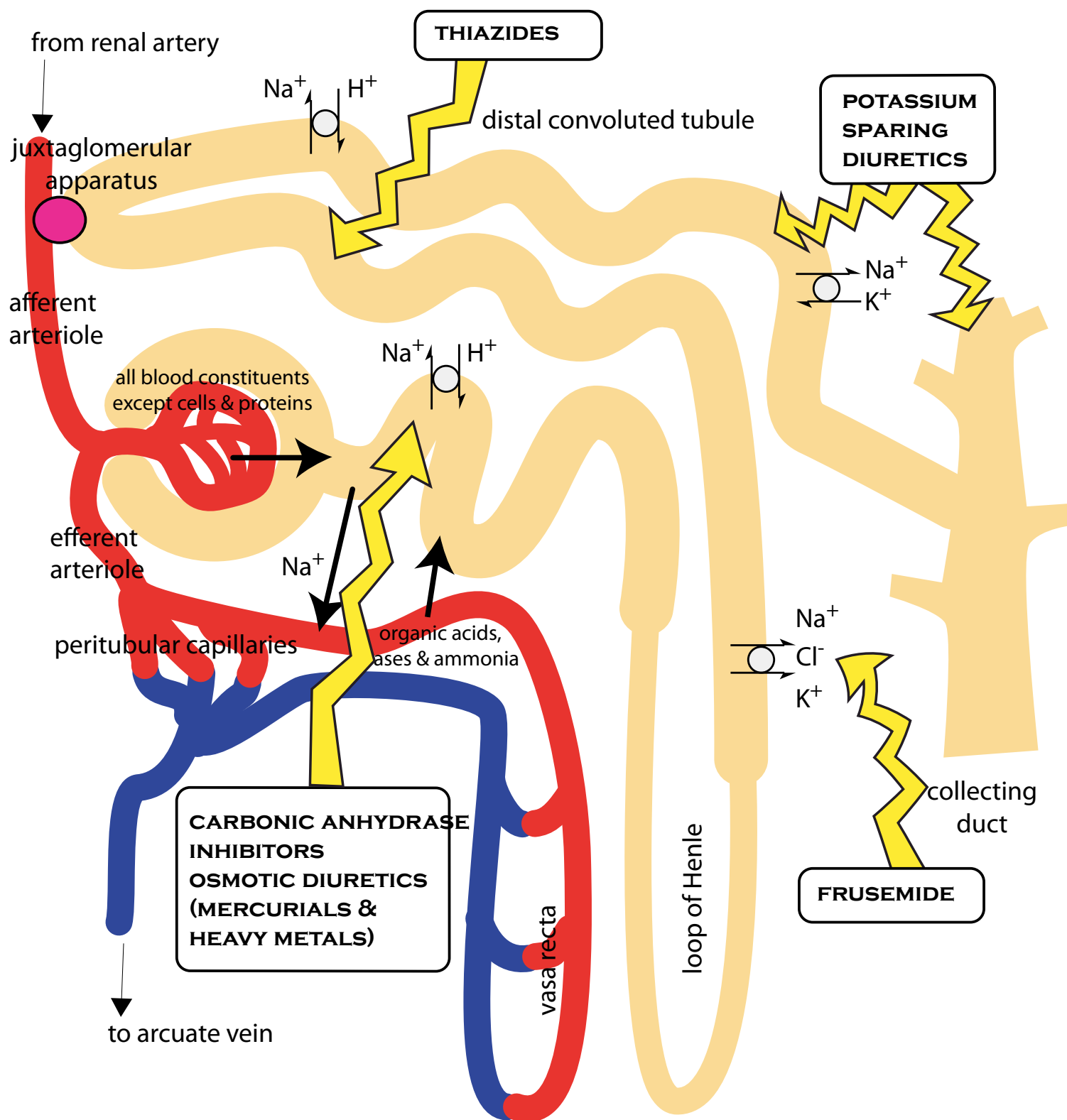
- **increased PCT toxicity**
  - aminoglycosides
  - out of date tetracyclines
  - some obsolete cephalosporins
- **potentiates digoxin**
- **ACE inhibitors?**



# common drugs

- frusemide
- (hydrochlorthiazide)
- (mannitol)

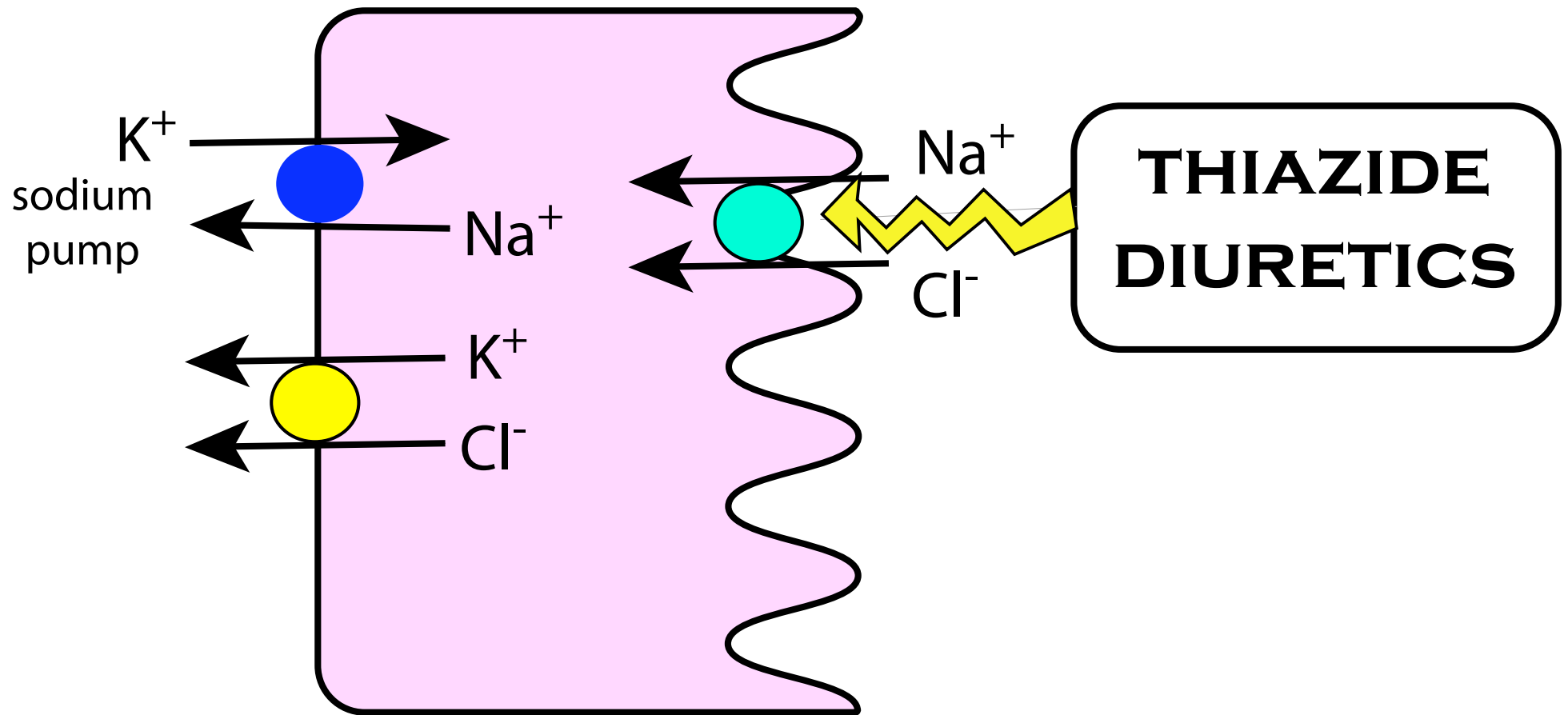




# early DCT

**ECF**

**urine**





# thiazides

- many drugs available
  - hydrochlorothiazide
  - bendrofluazide, etc
- moderately potent
- cheap



# thiazide side effects

- hypokalaemia
  - digoxin!!
- metabolic alkalosis
- increased plasma uric acid
- hyperglycaemia



# kinetics

- always given po
- onset 1 - 2 hours
- peak effect 4 - 6 h
- duration 8 - 12 h



# indications

- mild / moderate heart failure
- (diabetes insipidus)





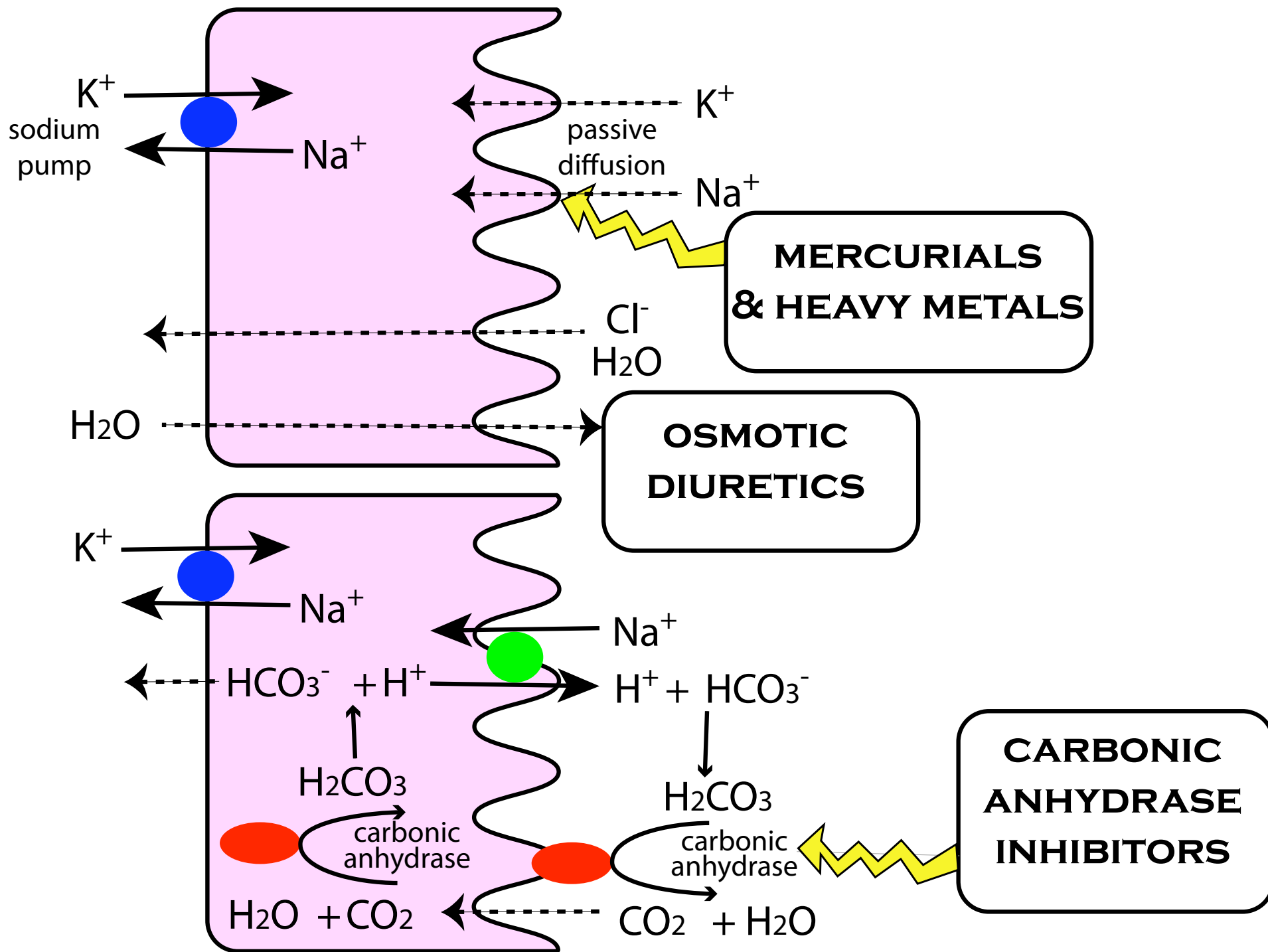
# osmotic diuretics

- mannitol
- glycerol
- glucose



**ECF**

**urine**



# mannitol

- **indications**
  - glaucoma
  - cerebral oedema
  - acute renal failure
- **contraindications**
  - heart disease
- **caution**
  - **must** be given iv



# K<sup>+</sup> sparing diuretics

- amiloride
- triamterene
- spironolactone

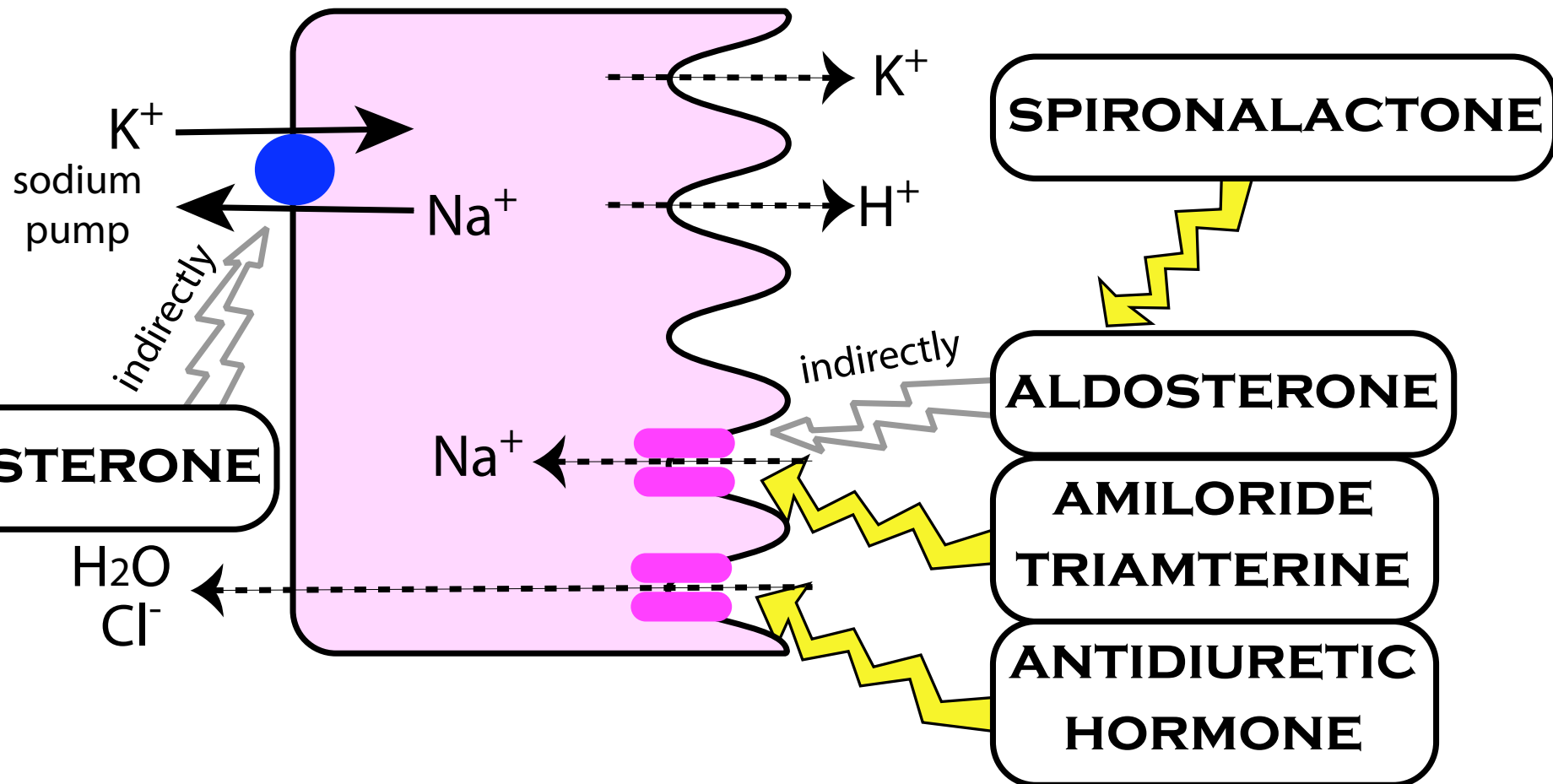




# late DCT

**ECF**

**urine**



# K<sup>+</sup> sparing diuretics

- weak diuretics
- expensive
- caution with ACE inhibitors
- rarely used in animals



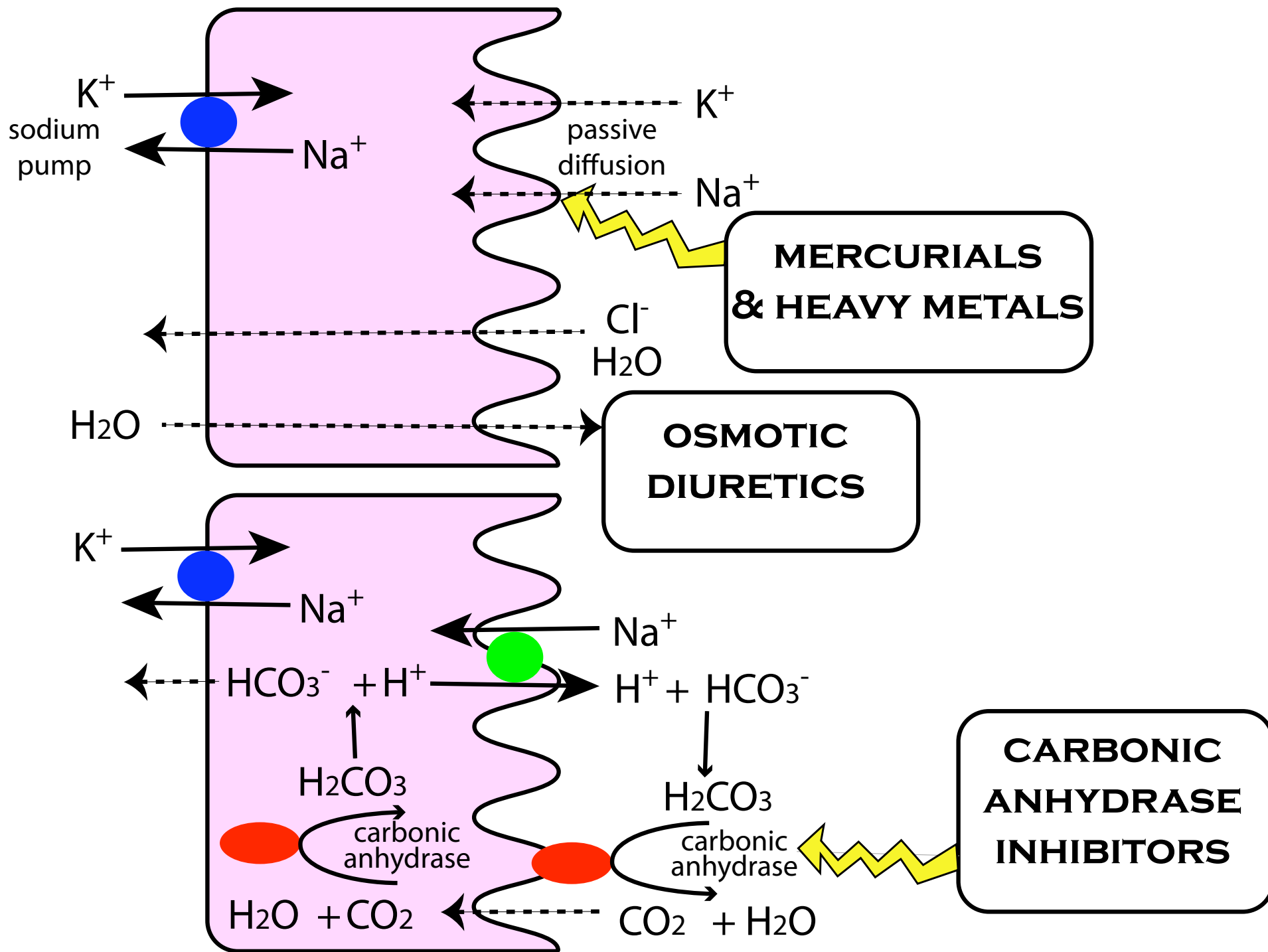
# CA inhibitors

- acetazolamide
- (dorzolamide - eye drops only)



**ECF**

**urine**





# CA inhibitors

- weak diuretics
- rarely used as diuretics
  - used for glaucoma
- cause mild metabolic acidosis



# diuretics

- frusemide most important
- main indication - oedema
- very potent - beware overdose
- hypokalaemia potentiates digoxin
- do not use in horses about to race
- mannitol - beware accidental perivascular injection

