

Blood



1 yr old labrador

- being spayed
- ovarian artery ruptures
- massive bleeding



things that can go wrong

- **bleeding**
 - surgery
 - fluids
 - blood
 - plasma / substitutes
 - coagulants / anticoagulant antidotes
- **clotting in blood vessels**
 - anticoagulants
- **anaemia**



clotting

- blood vessel damage
- platelet clot
- fibrin clot
- fibrinolysis

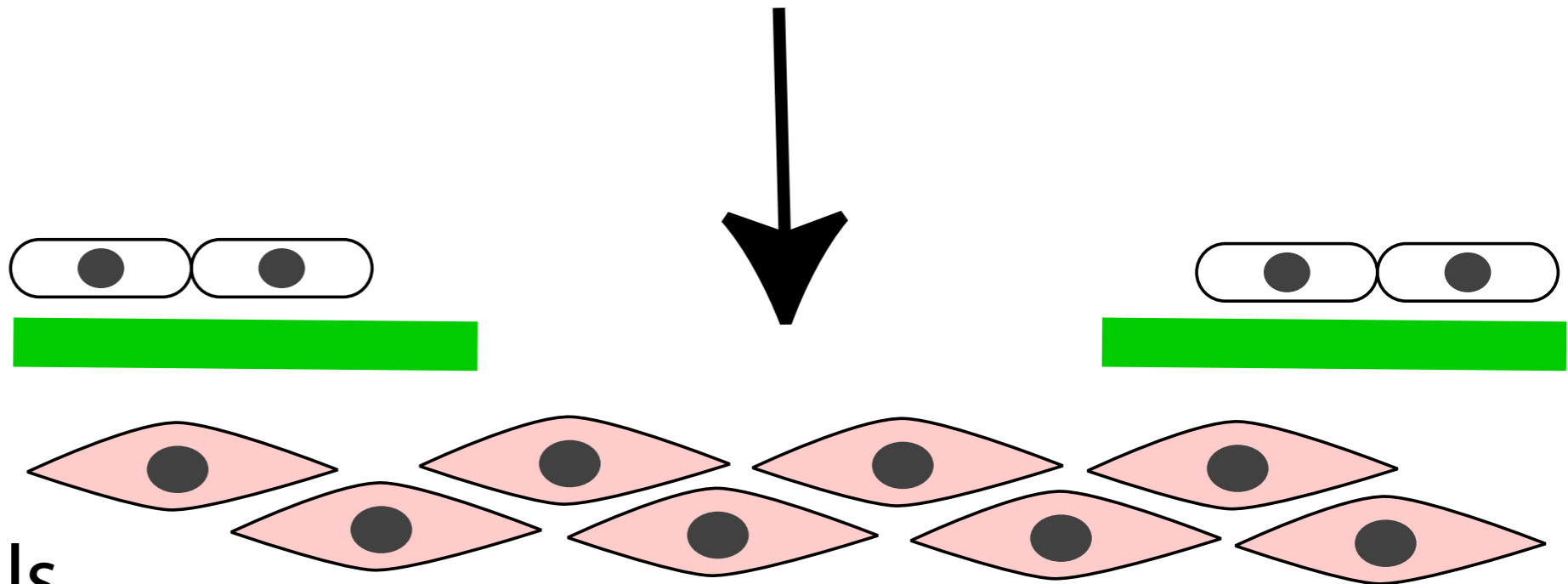


lumen

hole

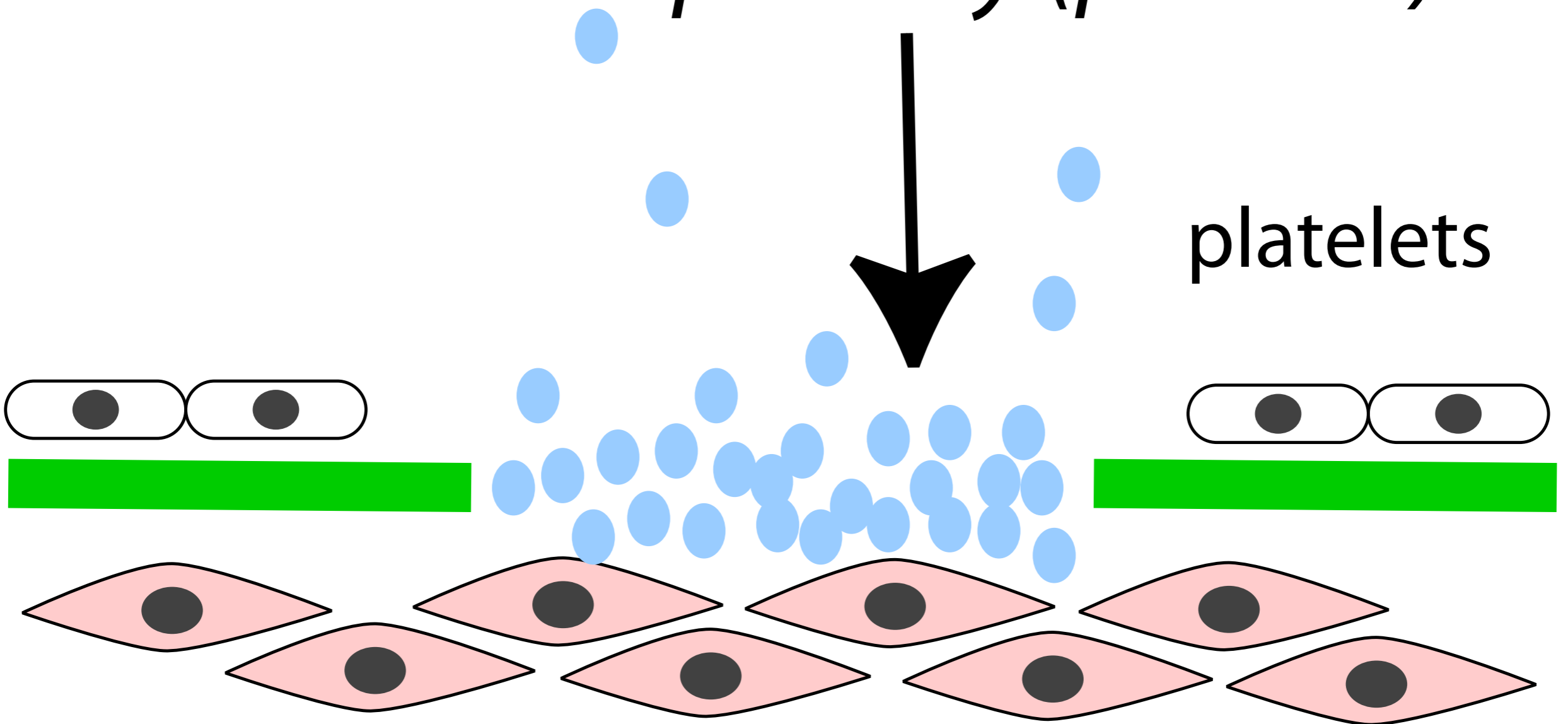
endothelial cells
collagen

smooth muscle cells

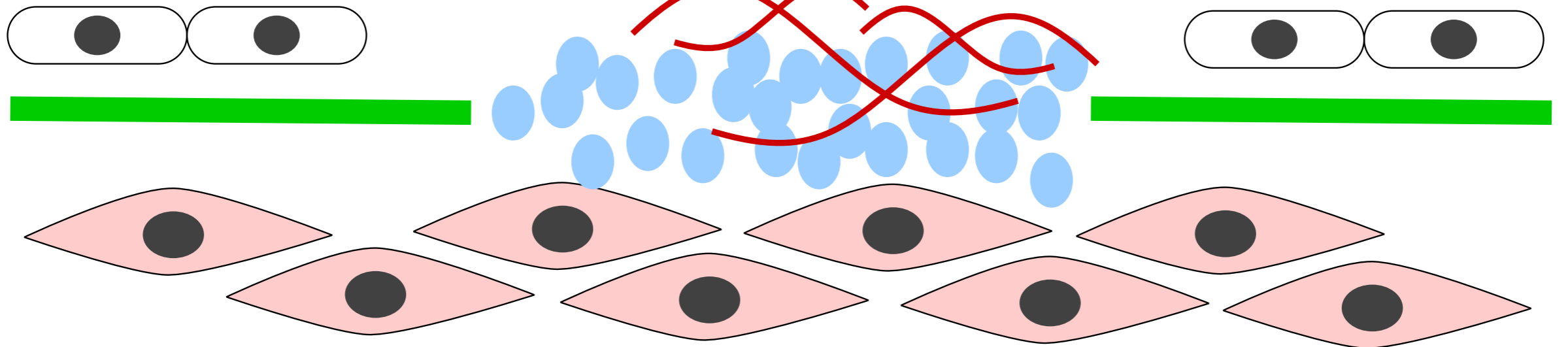
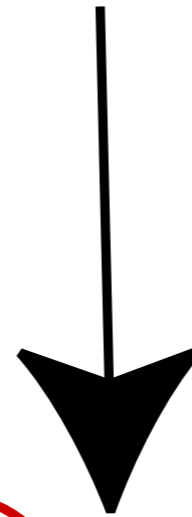


primary (platelet) clot

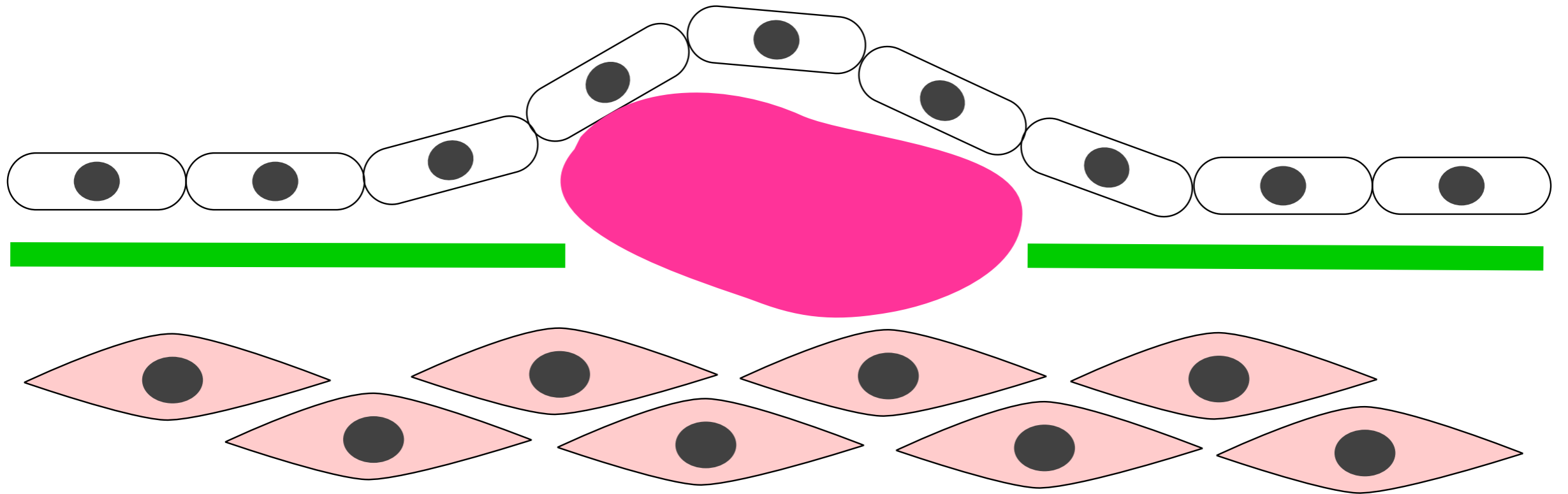
platelets

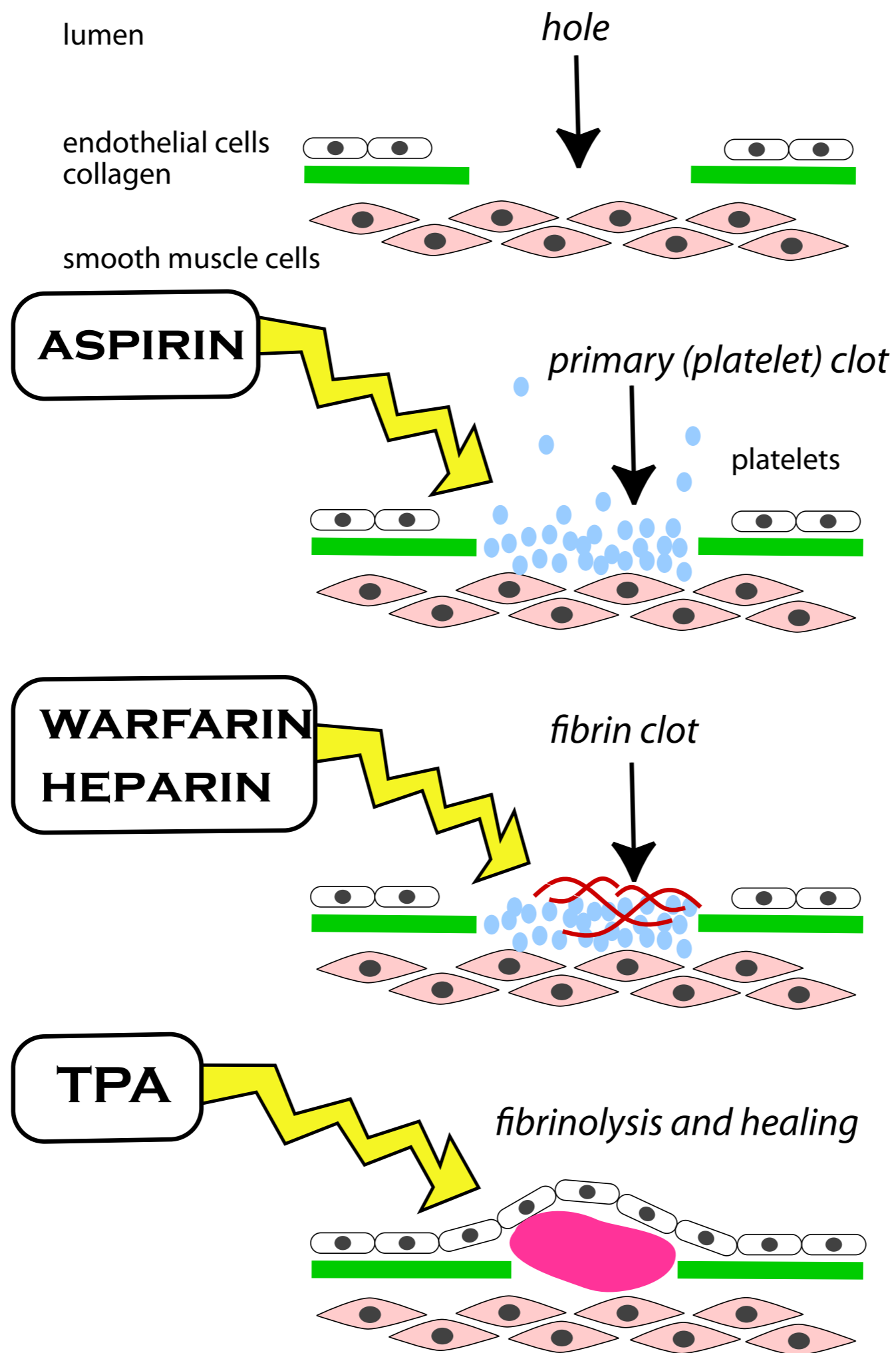


fibrin clot



fibrinolysis and healing





aims of treatment

- encourage clotting at site of injury
- prevent clotting in circulation



haemostasis

- good surgical technique
- pressure



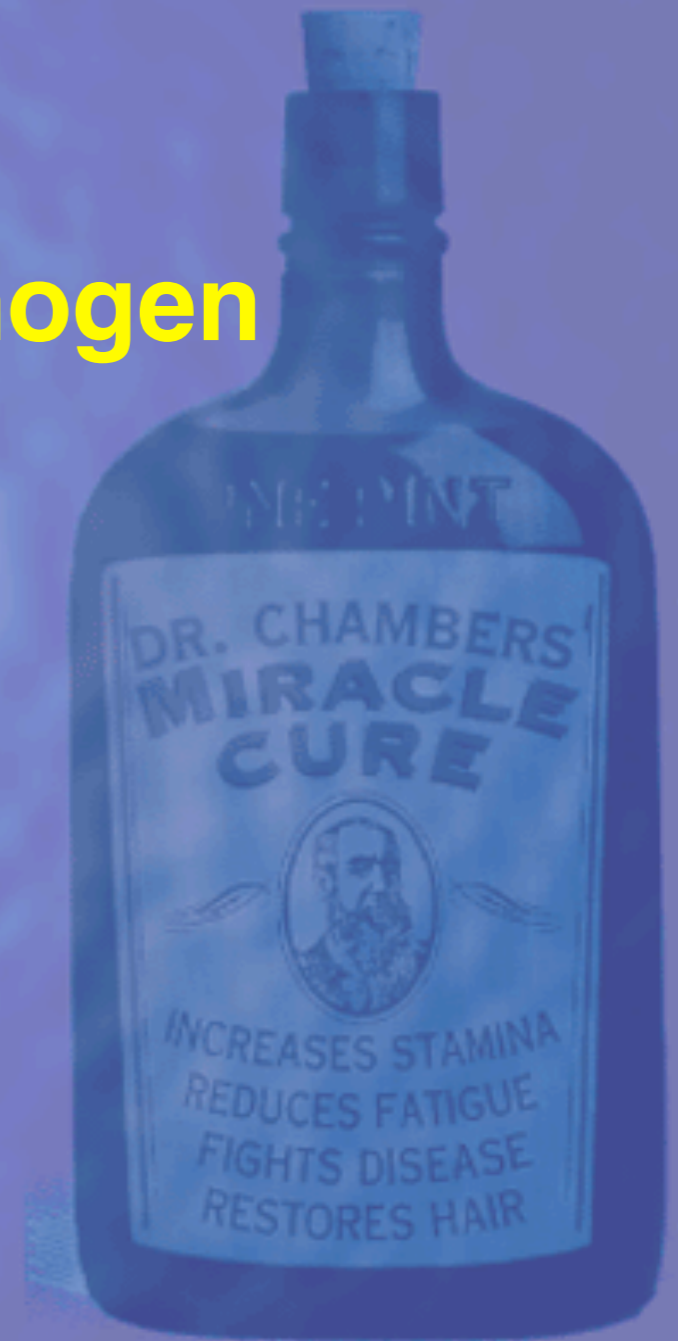
haemostasis

- **blood vessels**
 - topical vasoconstrictors
- **platelets**
 - artificial substrates
- **clotting factors**
 - fresh frozen plasma
 - fresh whole blood



parenteral haemostatics

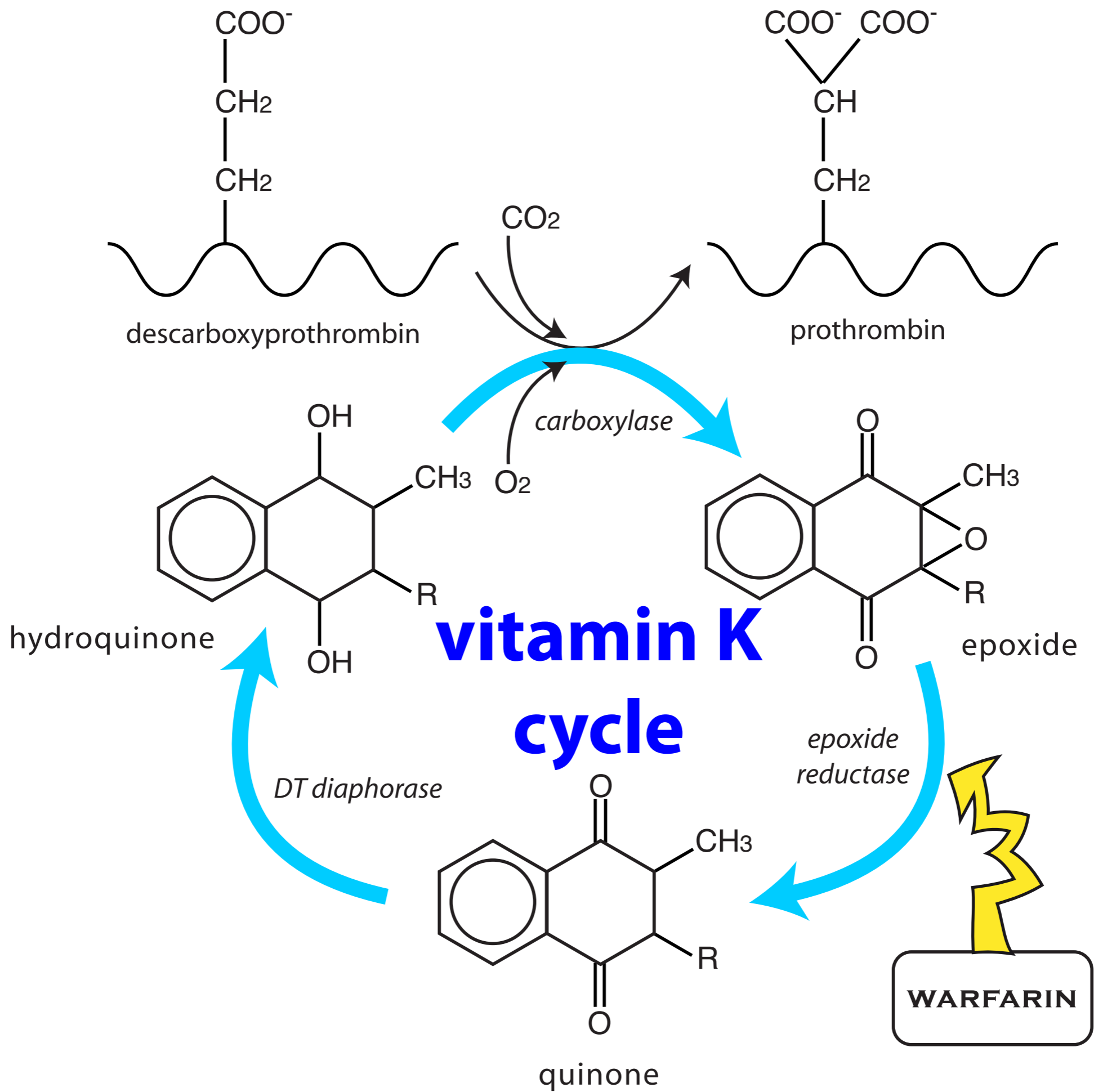
- **generally useless**
 - tranexamic acid for plasminogen overdose

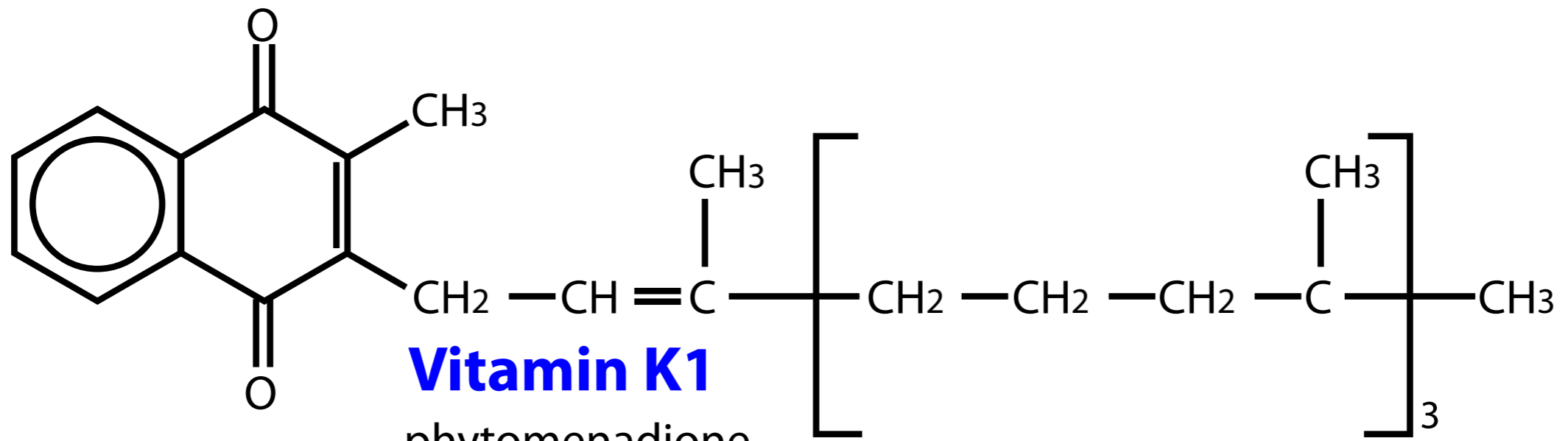


preventing clots

- **anti platelet drugs**
 - aspirin
- **parenteral anticoagulants**
 - heparin - antidote protamine
- **oral anticoagulants**
 - warfarin
 - antidote vit K1 - phytomenadione

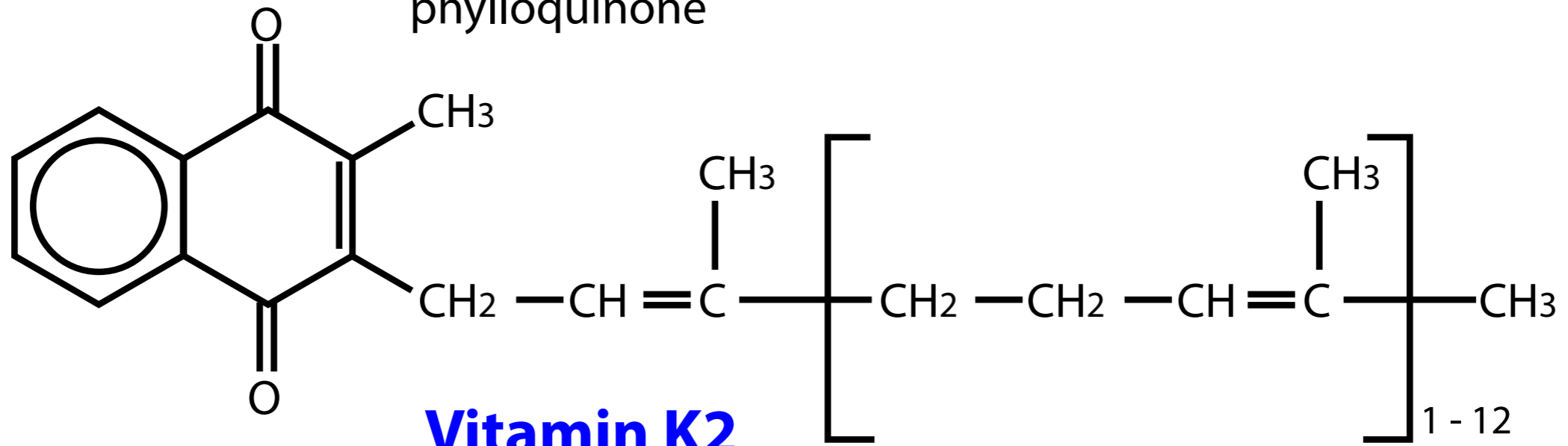






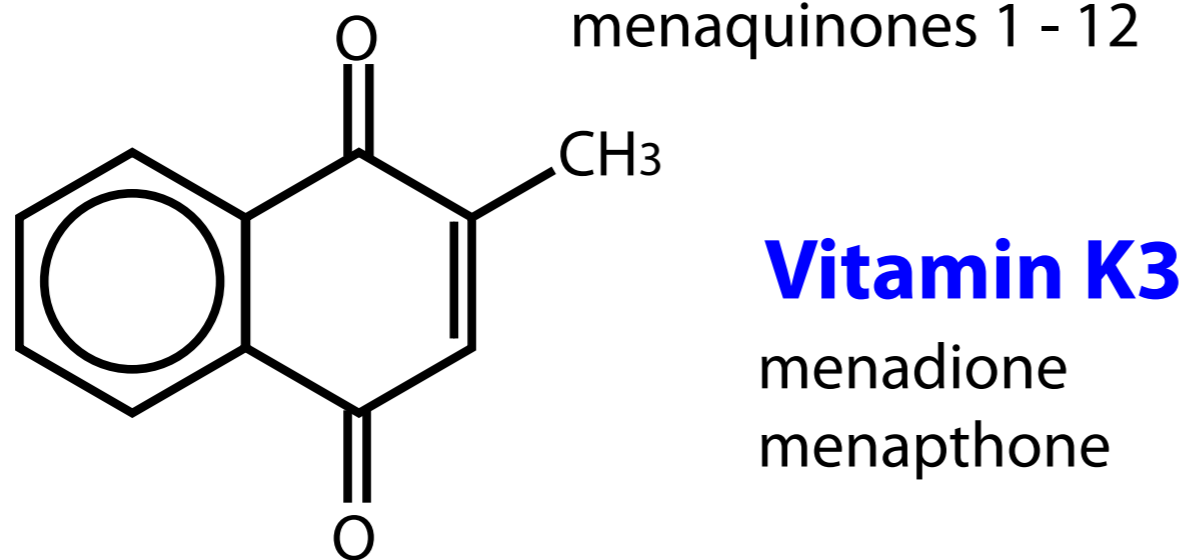
Vitamin K1

phytomenadione
 phytonadione
 phylloquinone



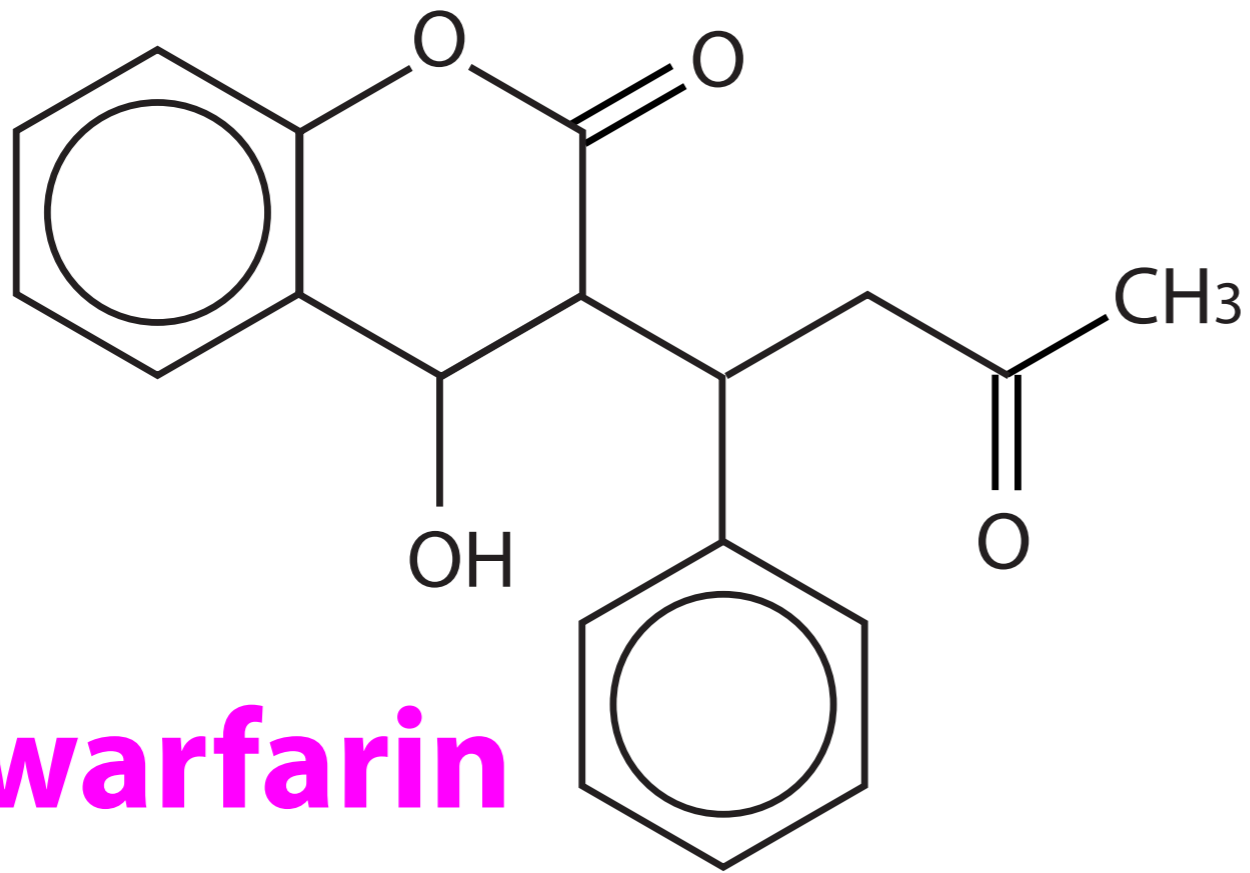
Vitamin K2

menaquinones 1 - 12

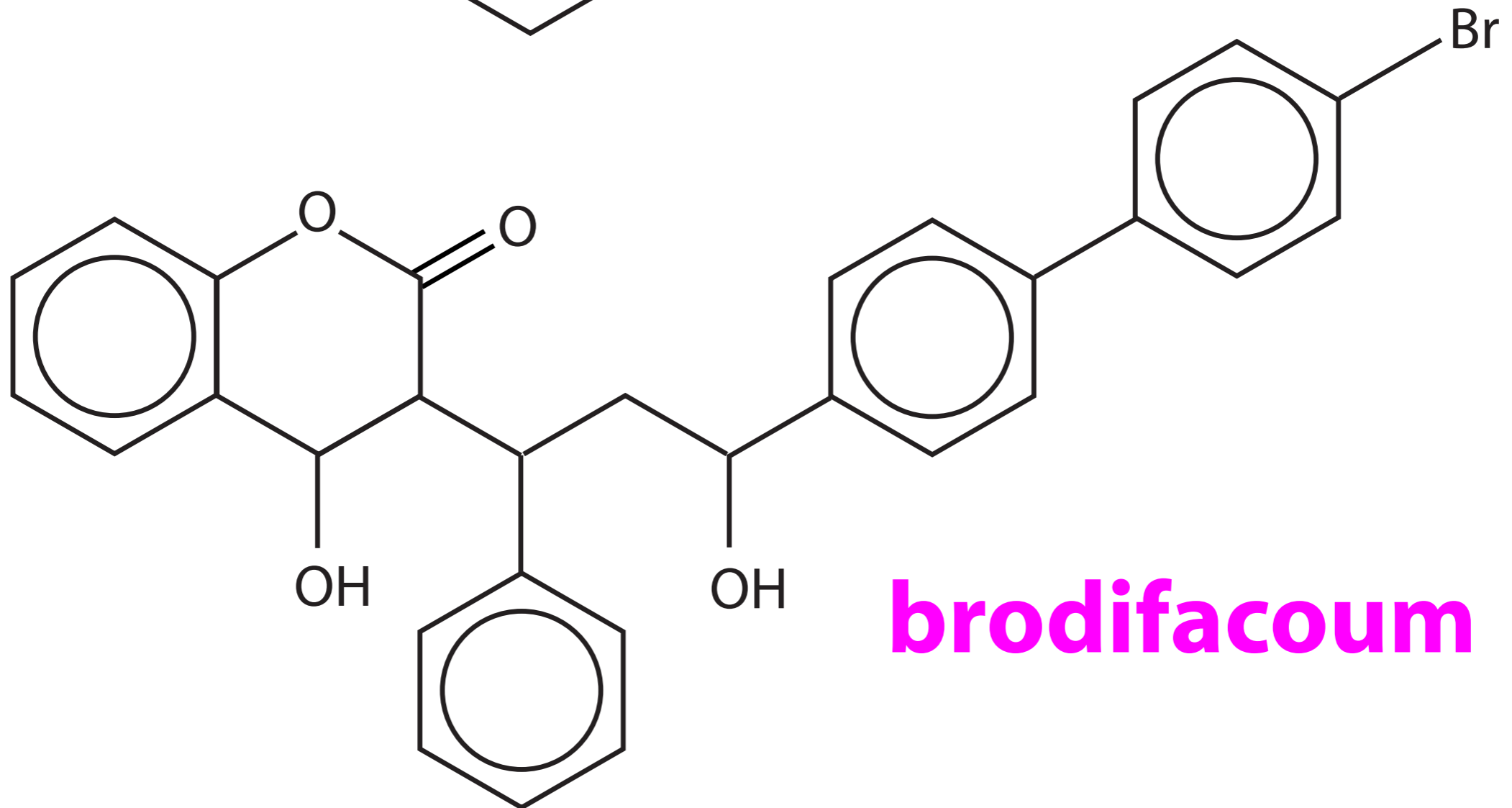


Vitamin K3

menadione
 menaphthone



warfarin



brodifacoum

treating clots

- alteplase (rTPA)
- streptokinase
- urokinase
- must be given within minutes
- overdose fatal
- too expensive to use



in vitro anticoagulants

- **used for blood collection**
 - acid citrate dextrose
 - citrate phosphate dextrose
 - citrate
 - (EDTA)
- **chelate calcium**
 - also after administration



anaemia

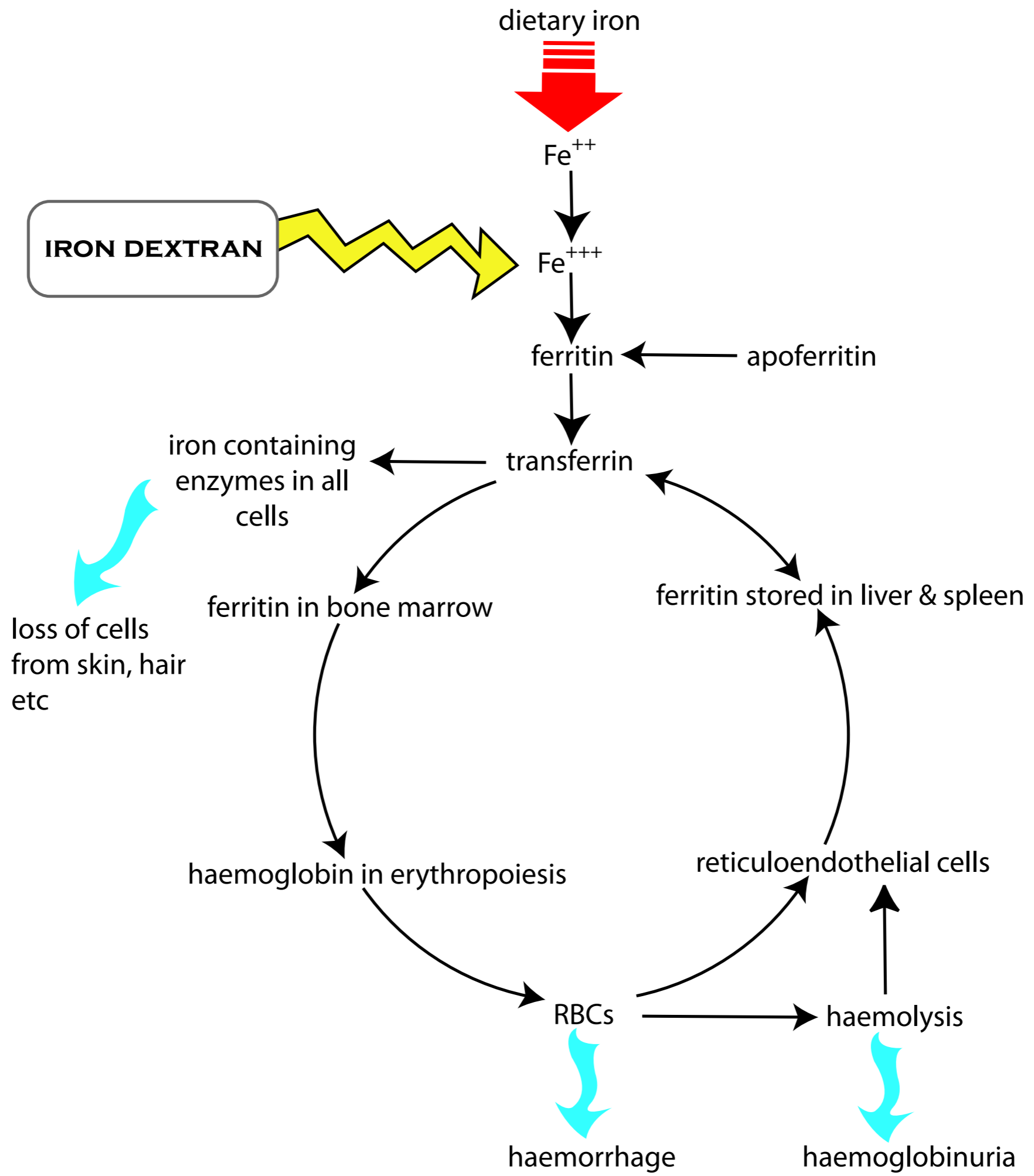
- iron
- vitamin B12 / cobalt
- folic acid



anaemia

- **iron**
 - piglets
 - (chronic bleeding)
 - overdose - give desferrioxamine
- **vitamin B12 / cobalt**
- **folic acid**





anaemia

- iron
- vitamin B12 / cobalt
 - gut disease / antibiotics in small animals
 - Co deficiency in ruminants
- folic acid
 - gut disease



anaemia

- **anabolic steroids**
 - nandrolone etc
 - do not use in food animals
 - abused by people
- **erythropoietin**
 - too expensive to use
 - counterproductive in horses
 - abused by people
- **lithium?**



1 yr old labrador

- being speyed
- ovarian artery ruptures
- massive bleeding



problems

- hypovolaemia



treatment

- surgical ligation
- iv fluids



30 mins later...

- artery finally ligated
- 3L fluids given
- PCV 12%



problems

- anaemia
- diluted clotting factors
- prolonged clotting times



treatment?

- wait and hope
- whole blood
 - ACD / PCD?
- fresh frozen plasma



monitoring

- CVP
- PCV
- clotting times



blood

- **in vivo anticoagulants - aspirin, heparin, warfarin**
- **catheters - heparin**
- **blood collection - ACD / CPD**
- **coumarin poisoning - fresh whole blood & vitamin K1**
- **anaemia - blood, iron, vit B12, anabolic steroids**

