

# Congestive Heart Failure

**Vasodilators**



# CHF

- cardiac output down
- blood pressure down
- sympathetic tone up
  - vasoconstriction
  - tachycardia
- salt and water retention up



# congestive heart failure

- rest
- low salt diet
- vasodilators
- diuretics
- long acting inotropes
- (antiarrhythmics)



# 8 yr old mongrel dog





# history

- gradual weight loss
- exercise intolerance
- coughing
- anorexia



# examination

- some lung sounds
- severe systolic murmur
- irregular beat



# further investigations?

- chest x ray
- ECG
- ultrasound





**chest x ray**

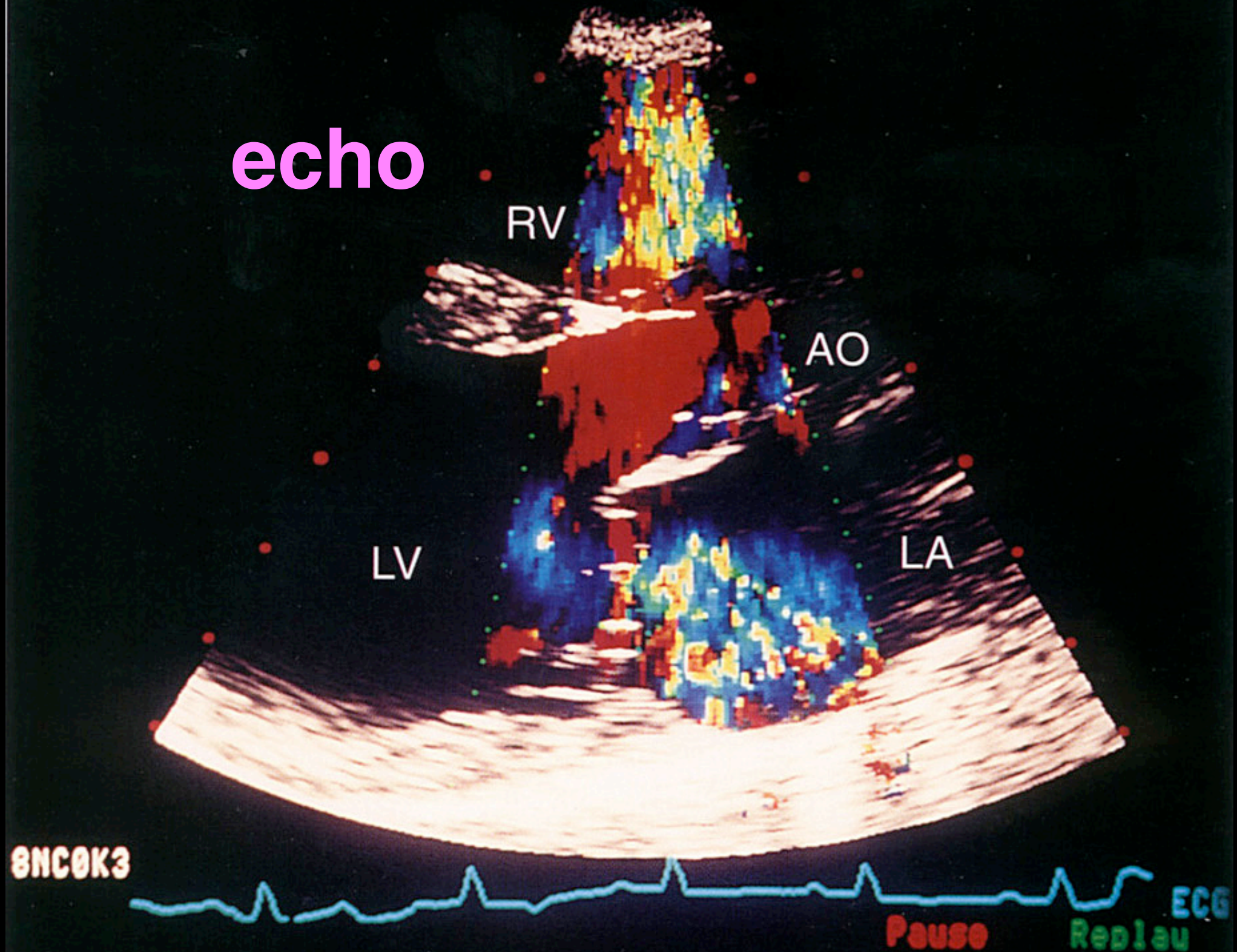




# ECG lead II



echo





# problems

- valvular incompetence
- pulmonary oedema
- ventricular ectopic beats





# priorities

- avoid excitement
- pulmonary oedema
- arrhythmia
- increase forward flow

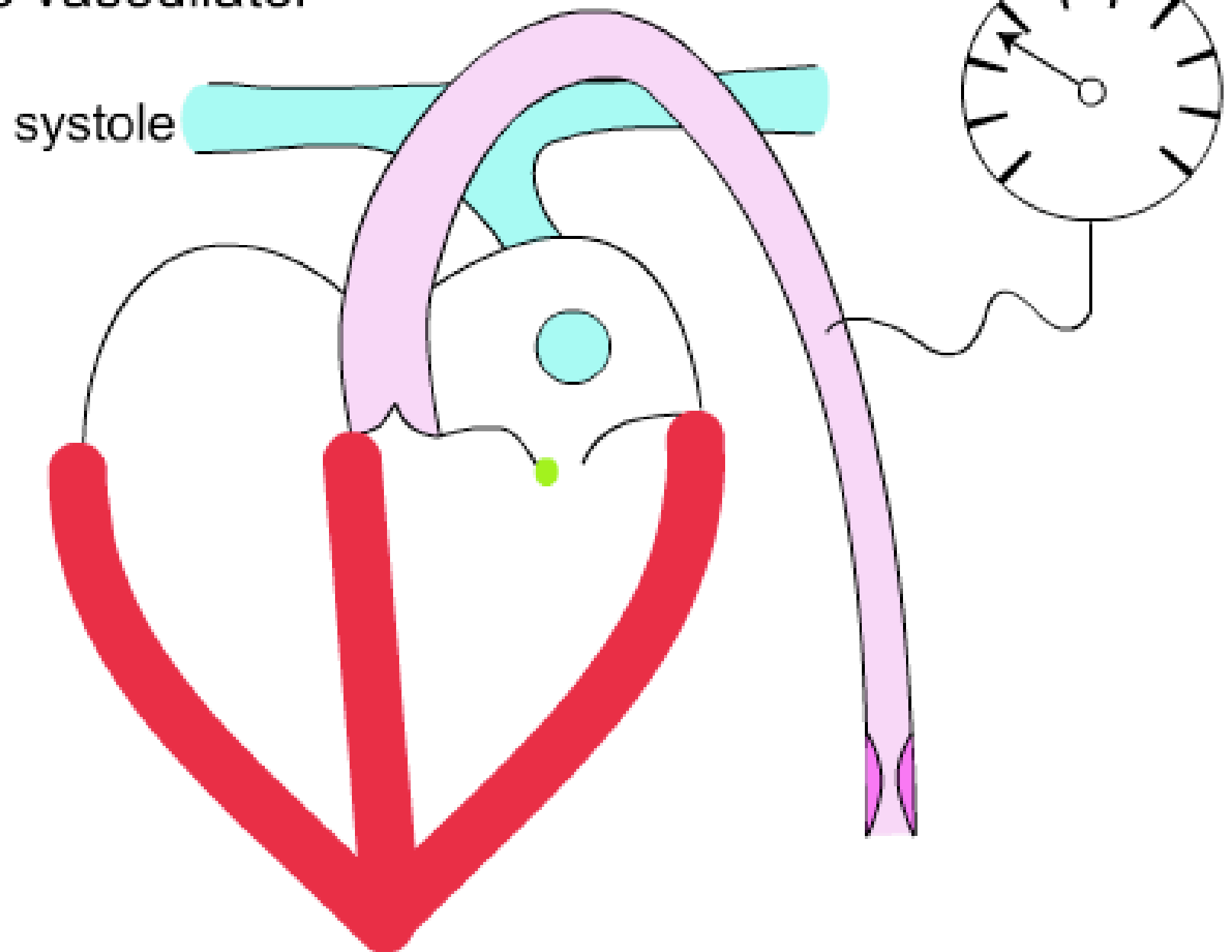


# drugs

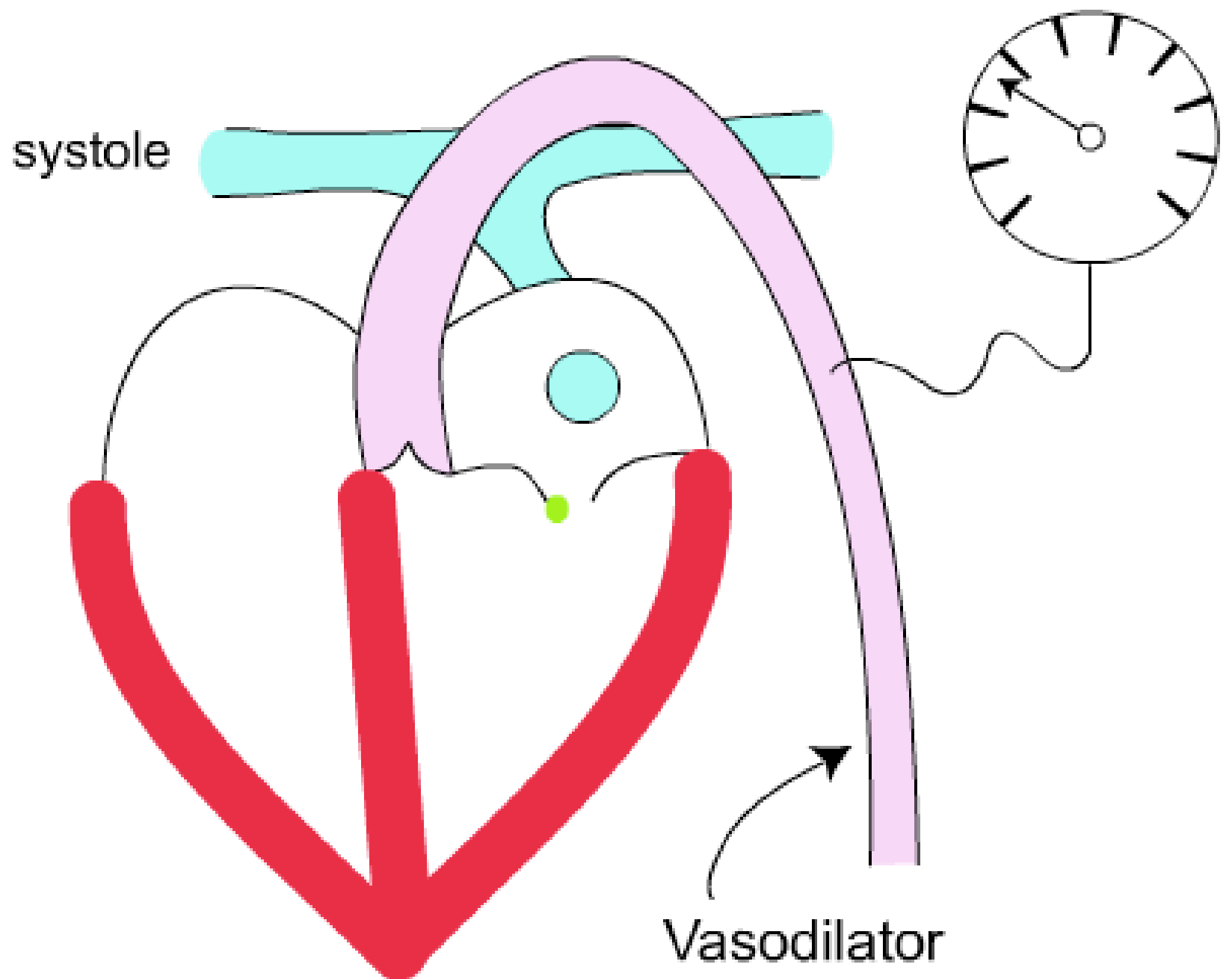
- **pulmonary oedema**
  - diuretics
- **ventricular ectopic beats**
  - antiarrhythmics
- **forward flow**
  - vasodilators
  - inotropes?



No vasodilator







# vasodilators

- angiotensin converting enzyme inhibitors
- nitrates
- odds & sods

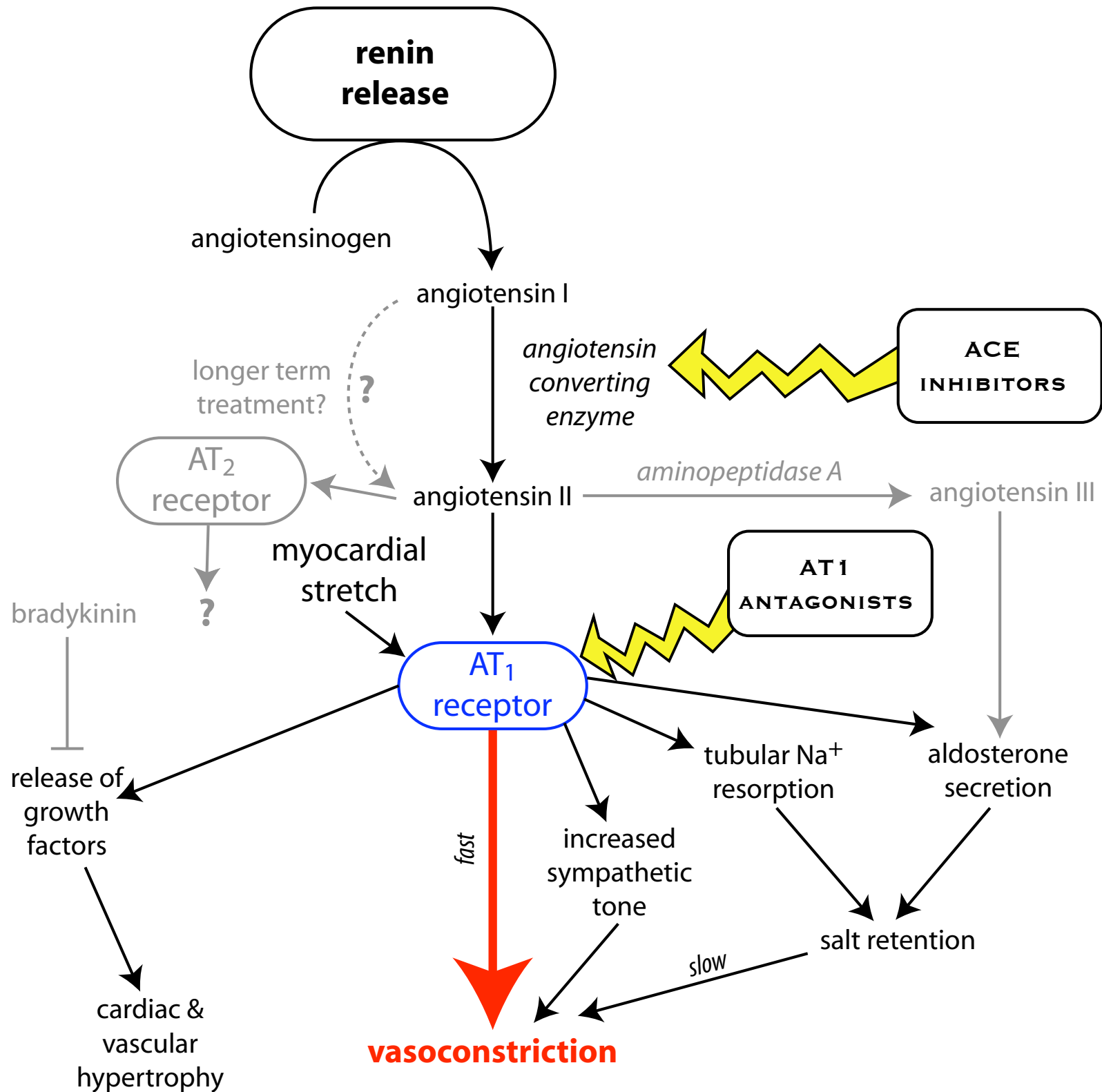


# ACE inhibitor effects

- normal animals
  - none
- CHF
  - arterial & venous dilatation
    - reduction in pre and afterload
    - reduction in myocardial work & O<sub>2</sub> consumption
    - reduction in pressure across valves
  - promotes myocardial remodelling







# ACEI indications

- congestive heart failure
- especially mitral regurgitation
- ± diuretics



# side effects

- hypotension ( $\pm$  tachycardia)
- anorexia
- vomiting
- diarrhoea
- (cough)





# care

- hyponatraemia
  - frusemide
- renal failure
- breeding bitches



# drugs

- enalapril
- benazepril
- quinapril
- captopril
- etc, etc



# congestive heart failure

- rest
- low salt diet
- vasodilators
- diuretics
- long acting inotropes
- (antiarrhythmics)



# AT<sub>1</sub> antagonists

- losartan
- candesartan
- no experience in dogs





# other vasodilators

- nitrates
- calcium channel blockers
- hydralazine



# nitrates

- converted to NO
- venous & arterial relaxation



# nitrates

- **nitroprusside**
  - very short half life
  - anaesthesia / intensive care only
- **nitroglycerine (glyceryl trinitrate)**
  - longer half life
  - iv / transcutaneous ointment
- **isosorbide dinitrate**
  - similar but tablets



# Ca channel blockers

- **vasodilators**
  - nicardipine
  - nifedipine, etc etc.
- **antiarrhythmics**
  - verapamil
  - diltiazem





# hydralazine

- old drug
- mechanism unknown
- used when all else fails

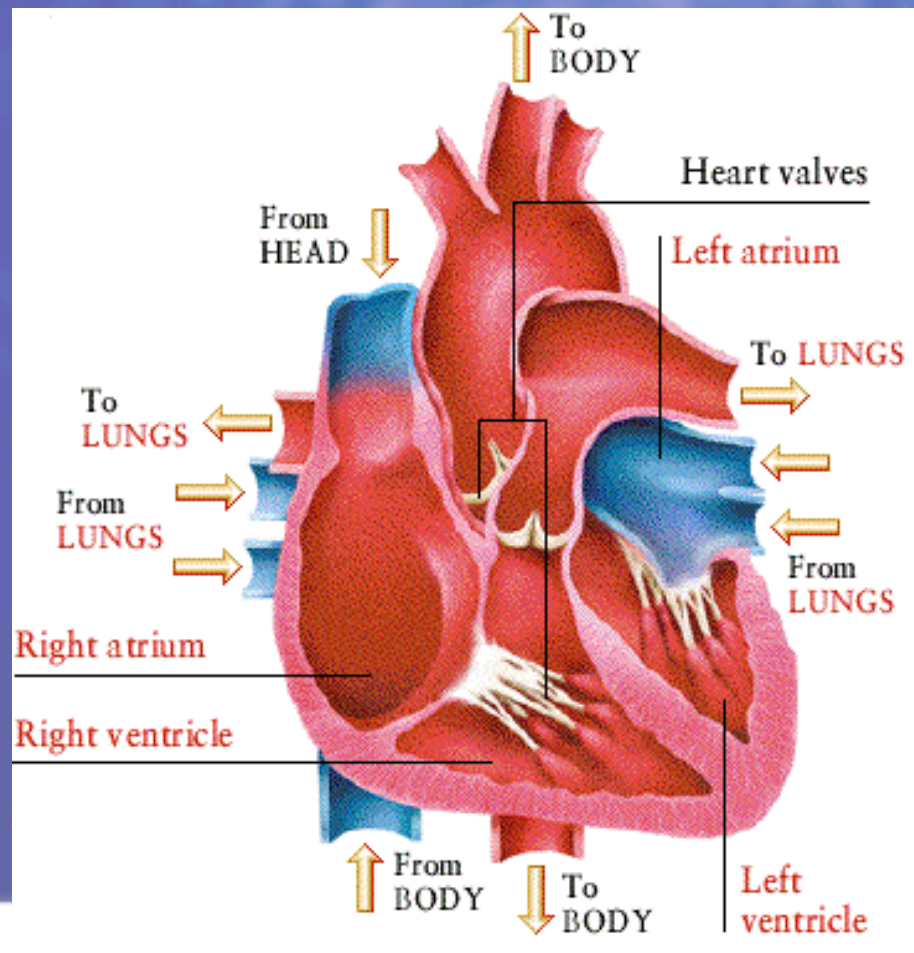


# 5 month old Labrador



# diagnosis

- patent ductus arteriosus





# problems

- sudden increase in afterload on ligation
- handling heart
- pulmonary hypertension





# treatment

- intra op
  - vasodilators
  - antiarrhythmics



# treatment

- **post op**
  - vasodilators
  - inotropes
  - antiarrhythmics
  - diuretics
  - oxygen
  - fluids
  - analgesics



# vasodilators

- reduce afterload and can prolong life in congestive heart failure
- angiotensin converting enzyme inhibitors block production of ATII, probably most useful in dogs
- nitrates - converted to nitric oxide (EDRF)
- hydralazine sometimes used if others don't work

