

Fluids



water in the body

- **total body water**
 - 65% body weight (adults)
 - 80% body weight (neonates)
- **intracellular fluid 45% bw**
- **extracellular fluid 20% bw**
 - blood volume 9% bw
 - plasma volume 5% bw
- **In very fat animals these figures will be lower**



fluid loss

- urine 20 ml/kg/day
- expired air 20 ml/kg/day
- haemorrhage (not necessarily external)
- vomiting 4 ml/kg/vomit?
- diarrhoea 0 - huge amounts
- not drinking
- anaesthesia (breathing dry gas)
- laparotomy / thoracotomy (evaporation)



fluid compartments are adjusted to keep blood volume high enough to provide flow to tissues - otherwise **shock** occurs

main indication for fluids is **low blood volume**



shock

- a generalised failure of perfusion of tissues



shock treatment

- 1 place large bore catheter
 - sedate if necessary
 - benzodiazepine \pm opioid
 - cut down if necessary
 - local anaesthetic

lat saphenous cut down

shock treatment

- 1 place large bore catheter
sedate if necessary
benzodiazepine \pm opioid
cut down if necessary
local anaesthetic

- 2 check heart

peripheral shock

cardiogenic shock

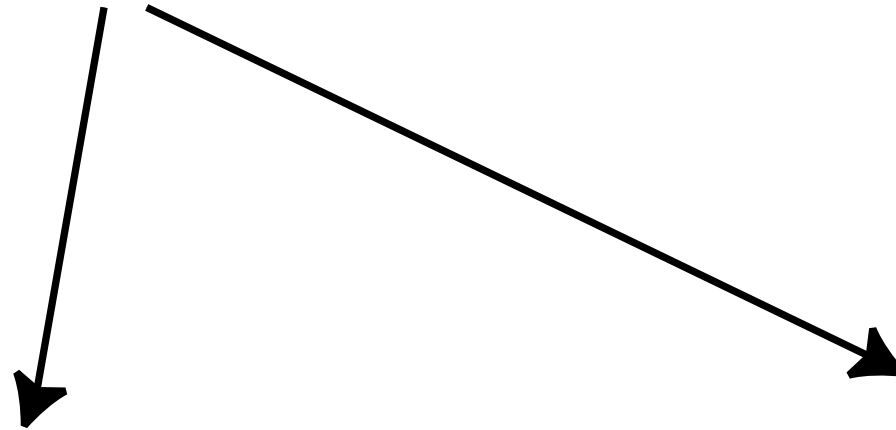
- 3 give lots of fluids iv
any type of iv fluid (not dextrose)

- give oxygen
sedate if necessary
benzodiazepine
check for cardiac tamponade
drain
treat for acute heart failure

- 4 consider oxygen

- 5 diagnose cause

5 diagnose cause



hypovolaemic shock

septic shock

6 give more iv fluids
colloids

7 stop any bleeding
pressure

8 consider vasoconstrictors
surgery

9 keep warm

take blood for culture

consider
high dose steroids

iv antibiotics

give more iv fluids
colloids

keep warm

fluids available

- oral fluids
 - water
 - electrolyte solutions
- blood
- colloids
- crystalloids



administration

- **dose**

- as much as required

- deficits
 - maintenance

- **rate**

- as fast as needed

- 90 - 10 ml/kg/h

$$Q = \frac{\pi r^4}{8\mu l}$$

- **route**

- iv, po

- ip, sc

- intraosseus



monitoring effects

- central venous pressure
- pulmonary oedema
- ions



longer term priorities

- correct acidosis
- electrolytes
- calculate and give maintenance requirements
- treat the original problem!!



iv fluids

- blood
- colloids
- crystalloids
- electrolyte additives
- parenteral nutrition solutions



for oxygen carriage

- whole blood
 - fresh
 - ACD / CPD
- packed cells
- (perfluorocarbons)
- (haemoglobin solutions)



for clotting factors

- fresh whole blood
- fresh frozen plasma
- (freeze dried clotting factors)



for volume expansion

- colloids
- crystalloids
- hypertonic saline
- (blood)



colloids

- **plasma**
 - diy
- **gelatins**
 - Haemaccel
 - Gelofusin
- **starches**
 - hetastarch
 - pentastarch
 - dextrans



hypertonic saline

- NaCl 7% solution



for water & ions

- crystalloids
- strong electrolyte solutions



crystalloids

- normal saline - NaCl 0.9%
- Hartmann's solution
 - compound Na lactate, lactated Ringer's
- NaCl 0.18% & dextrose 4%
- dextrose 5%
- Ringer's solution



Hartmann's

- Na^+ 129mM
- Cl^- 109mM
- K^+ 5mM
- Ca^{++} 2mM
- lactate 29mM
- water qs



concentrated ions

- potassium chloride
- bicarbonate
- calcium (boro) gluconate
- magnesium hypophosphite
- magnesium sulphate



for parenteral nutrition

- lipid emulsions
- amino acid solutions
- propylene glycol
- propionate
- glycerol



What would you do?

- dog left in car on a hot day
- now collapsed
- temperature 42°C
- heart rate 148
- panting



problems

- hyperthermia
- dehydration



treatment

- hose down with cold water
- 5% dextrose iv
- 0.18% saline & 4% dextrose iv



What would you do?

- bitch spayed that morning
- now collapsed
- pale mucous membranes
- heart rate 160, v weak pulse
- panting



haematology

- PCV 17%



problems

- blood loss
- hypovolaemia



dog needs...

- plasma expander
- red cells
- clotting factors



fluids

- in emergency any iv fluid is useful for plasma expansion
- hypertonic saline is a first aid measure only
- colloids stay in blood vessels, crystalloids redistribute to other compartments
- beware overdose of K^+ , Mg^{++} and bicarb

