

Summary Sheet:

Induction Agents

GABA_A

Propofol

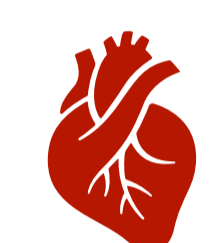
IV Induction: 1.5-2.5mg/kg
 IV Maintenance : 4-12mg/kg/hr
 IV Sedation : 0.3-4mg/kg/hr



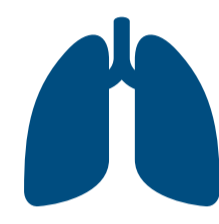
Weak acid
 pH 7
 pKa 11
 V_D 4L/kg
 Cl 30-60ml/kg/min



Excretion



↓SVR | ↓Contractility | ↓MAP | +/- ↑HR



Resp. depression | ↓Laryngeal reflexes



↓CBF | ↓CMRO | ↓ICP | Excitation



Antiemetic

GABA_A

Thiopentone

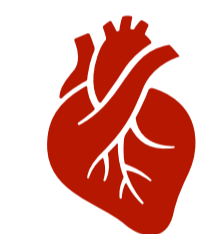
IV Induction: 4-6mg/kg



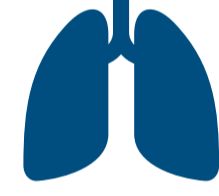
Weak acid
 pH 11
 pKa 7.6
 V_D 2.5L/kg
 Cl 3ml/kg/min



Excretion



↓SVR | ↓Contractility | ↓MAP | ↑HR



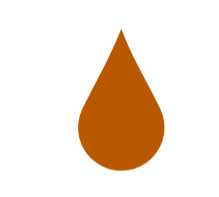
Resp. depression | Laryngo/bronchospam



↓CBF | ↓CMRO | ↓ICP | Anticonvulsant



Reduced Splanchnic/Renal bloodflow



Porphyria

GABA_A

Etomidate

IV Induction: 0.3mg/kg

Enantiopure R (+)



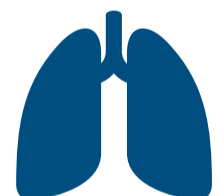
Weak base
 pH 8.1
 pKa 4.2
 V_D ~3L/kg
 Cl 10-20ml/kg/min



Excretion



Stable | +/- ↓MAP



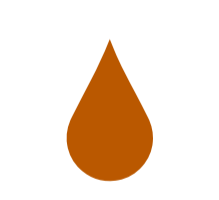
Transient Apnoea | ↓V_T with ↑RR



↓CBF | ↓CMRO | Epileptiform EEG



PONV | Adrenosuppression

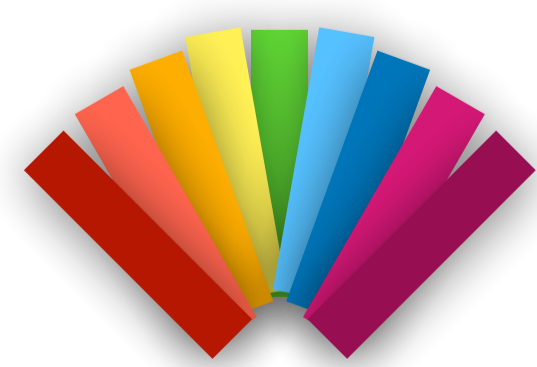


Antiplatelet

NMDA

Ketamine

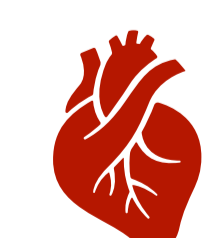
IV Induction: 1-2mg/kg
 IV Maintenance : 0.5mg/kg
 IM Induction : 10mg/kg



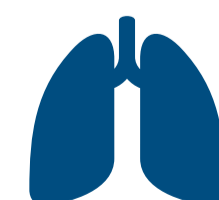
Weak base
 pH 3.5-4.5
 pKa 7.5
 V_D 3L/kg
 Cl 17ml/kg/min



Excretion



↑HR | ↑C.O. | ↑CVP | ↑MAP



↑RR | Bronchodilation

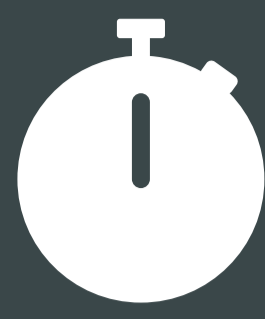


↑CBF | ↑CMRO | Emergence phenomena



PONV | Salivation | ↑Uterine tone

Onset/Offset Speed
inversely
proportional to
Blood:Gas Partition
Coefficient



Anaestheasier

Novice



Potency directly
proportional to
Oil:Gas Partition
Coefficient &
inversely
proportional to **MAC**

Summary Sheet:

Volatile Anaesthetics



MAC
1.1



↑ HR ↓ BP ↓ SVR ↓ Contractility



↑ RR ↓ V_T



↑ CBF ↓ CMRO



↓ Uterine tone

Blood:Gas
1.4

Oil:Gas
98

0.2%

Trifluoroacetic
Acid

- ✓ Potent
- ✓ Cheap
- ✓ No toxic metabolites



MAC
2.0



↓ BP ↓ SVR ↓ Contractility



↑ RR ↓ V_T Bronchodilation



↓ CMRO



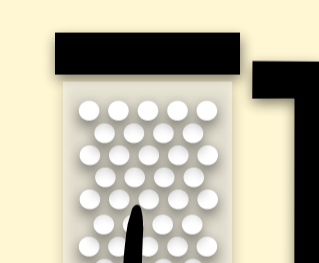
↓ Uterine tone

Blood:Gas
0.7

Oil:Gas
53

2%

Flourides



Compounds
A-E

- ✓ Potent
- ✓ Cheap
- ✓ Rapid onset/offset



MAC
6.6



↑ HR ↓ BP ↓ SVR ↓ Contractility



↑ RR ↓ V_T Irritant



↑ CBF ↓ CMRO



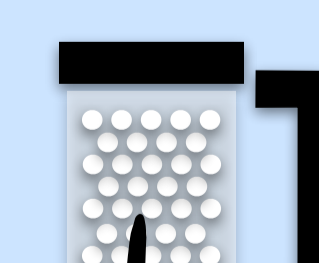
↓ Uterine tone

Blood:Gas
0.4

Oil:Gas
19

0.02%

Trifluoroacetic
Acid



Carbon
Monoxide

- ✓ Very rapid onset/offset
- ✓ Minimally metabolised

Minimum Alveolar Concentration: the concentration of inhalation anaesthetic at 1_{ATM} & FiO₂ 100% at which 50% of subjects will fail to respond to a standard surgical stimulus.

⌚ ↑ Unionised fraction
= Fast onset

Duration of action
determined by:

↻ Distribution
(e.g. Fentanyl short due to ↑ V_D)

✗ Elimination
(e.g. Remifentanyl short due to
rapid ester hydrolysis)

Anaestheasier

Novice

Summary Sheet: Opioids

μ_1 Receptors

🧠 Analgesia & Euphoria

👁️ Miosis

μ_2 Receptors

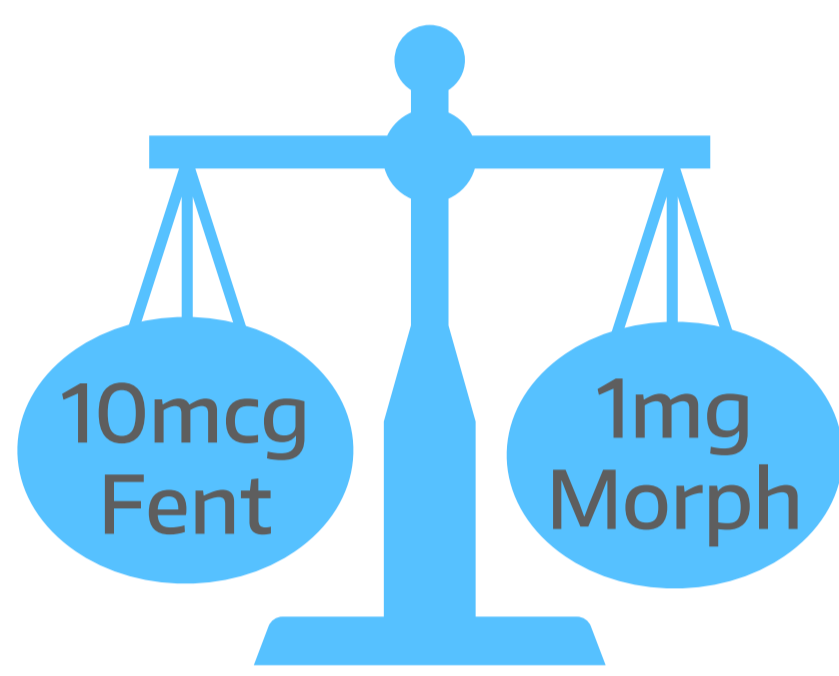
🫀 ↓ HR

🫁 Respiratory Depression

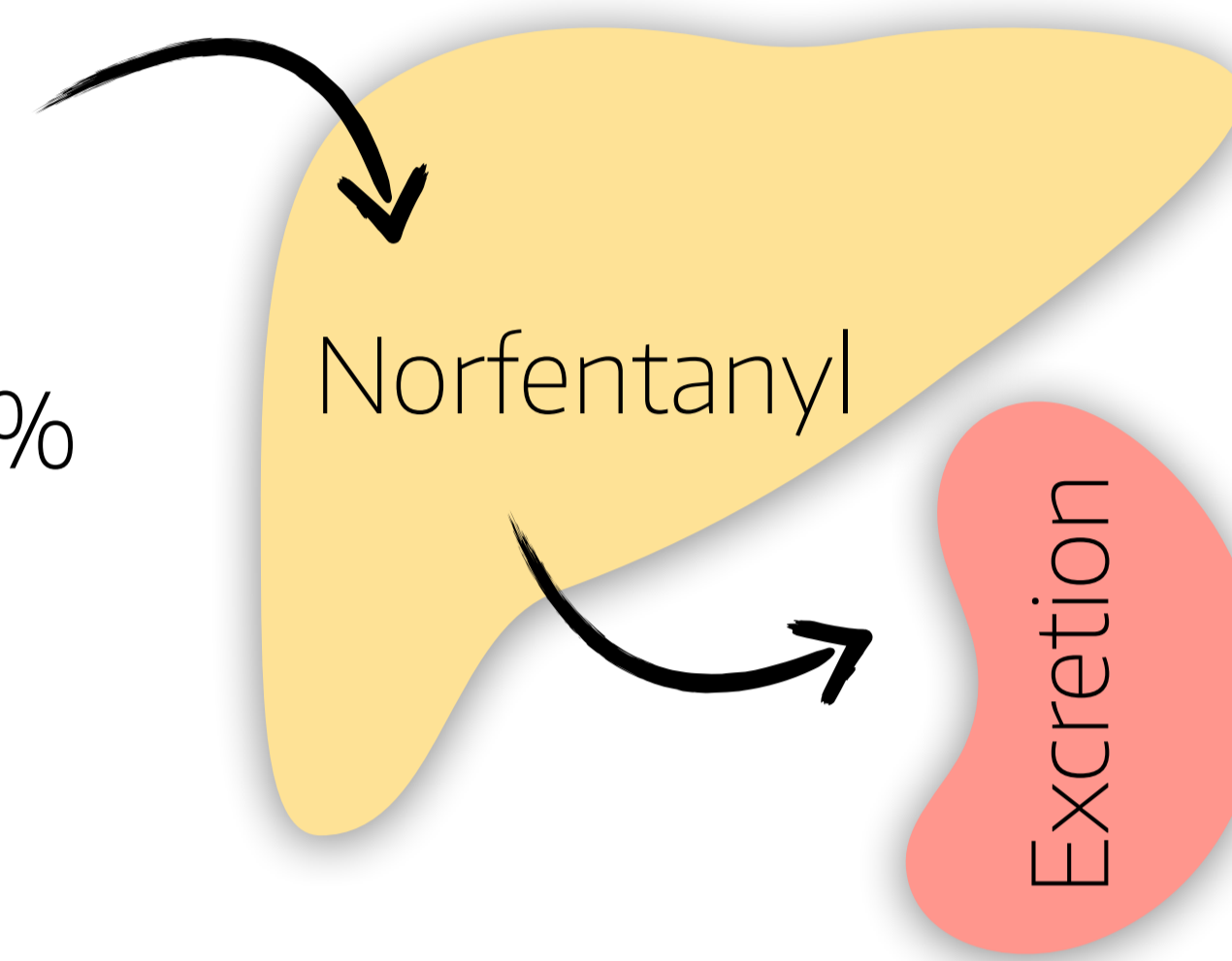
🌀 ↓ Gut Motility

μ

Fentanyl



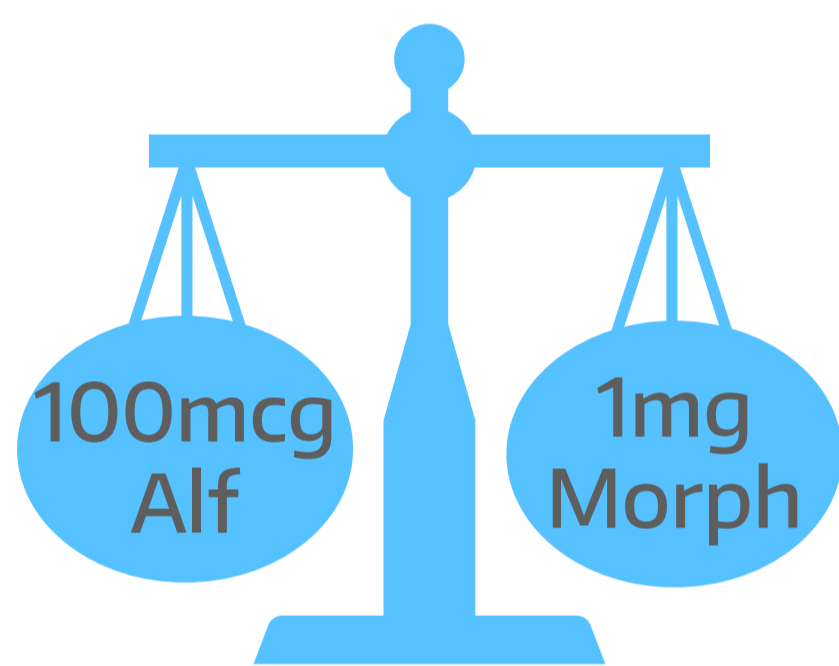
pKa 8.4
Unionised at pH 7.4: 9%
 V_D 4L/kg
Cl 13ml/kg/min
Terminal $t_{1/2}$: 190mins



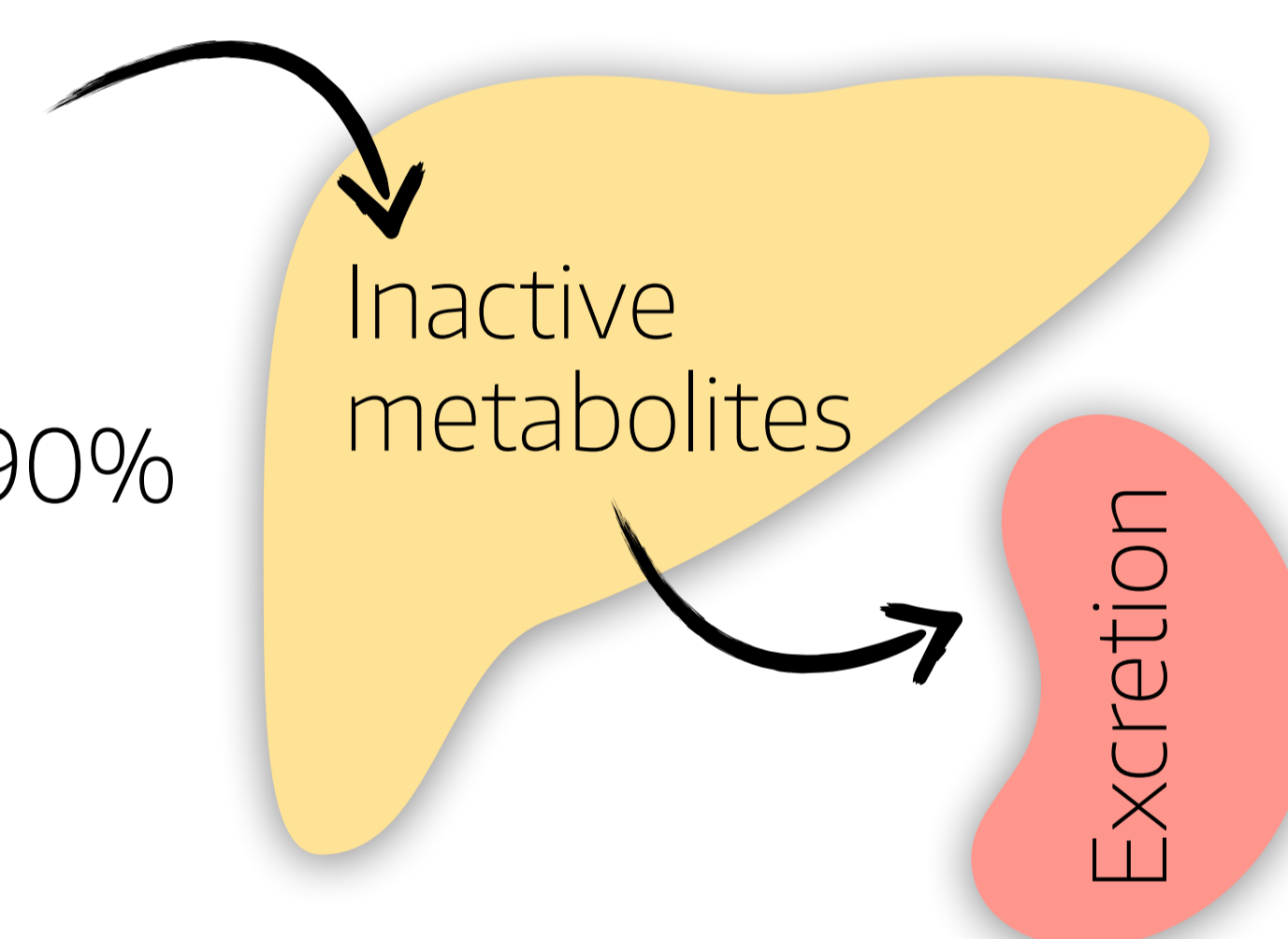
- ✓ Induction analgesia
- ✓ Fast-acting
- ✓ Short-acting
- ✓ Renal failure PCAs

μ

Alfentanil



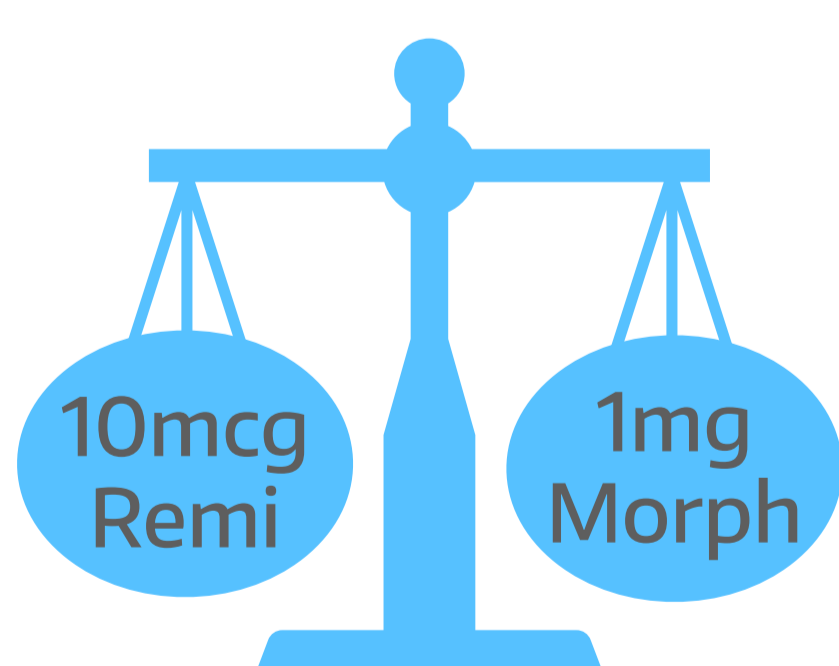
pKa 6.5
Unionised at pH 7.4: 90%
 V_D 0.4-1.0L/kg
Cl 6ml/kg/min
Terminal $t_{1/2}$: 100mins



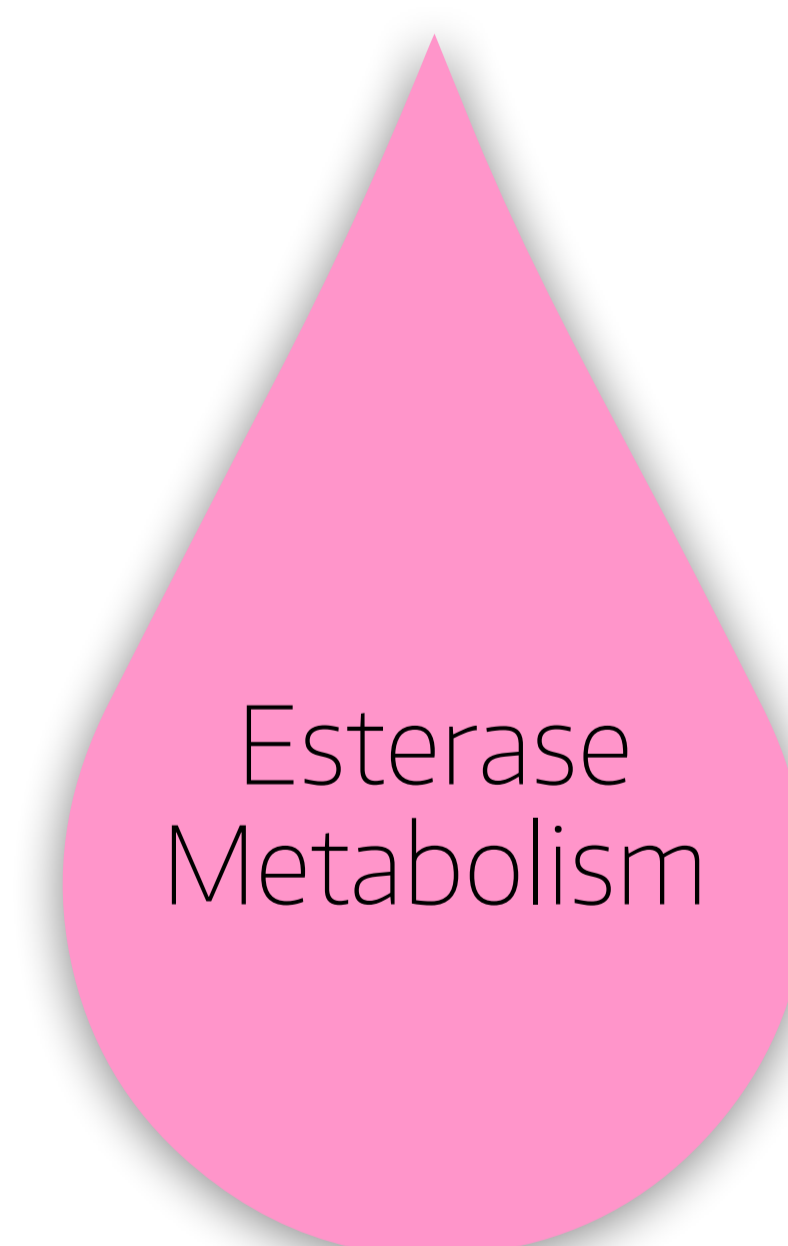
- ✓ Induction analgesia
- ✓ Ultrafast-acting
- ✓ Ultrashort-acting

μ

Remifentanyl



pKa 7.1
Unionised at pH 7.4: 70%
 V_D 0.2-0.3L/kg
Cl 30-40ml/kg/min
Terminal $t_{1/2}$: 3-10mins

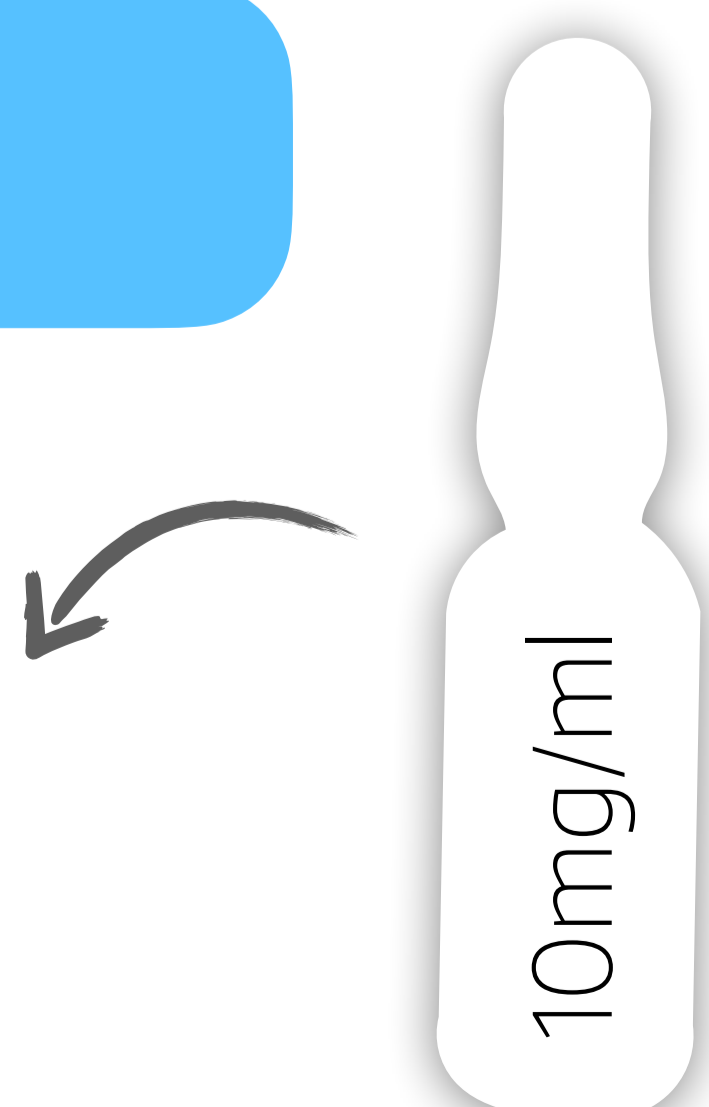


- ✓ IV Infusion analgesia
- ✓ AFOIs / extubation
- ✓ Ultrafast-acting
- ✓ Shortest-acting

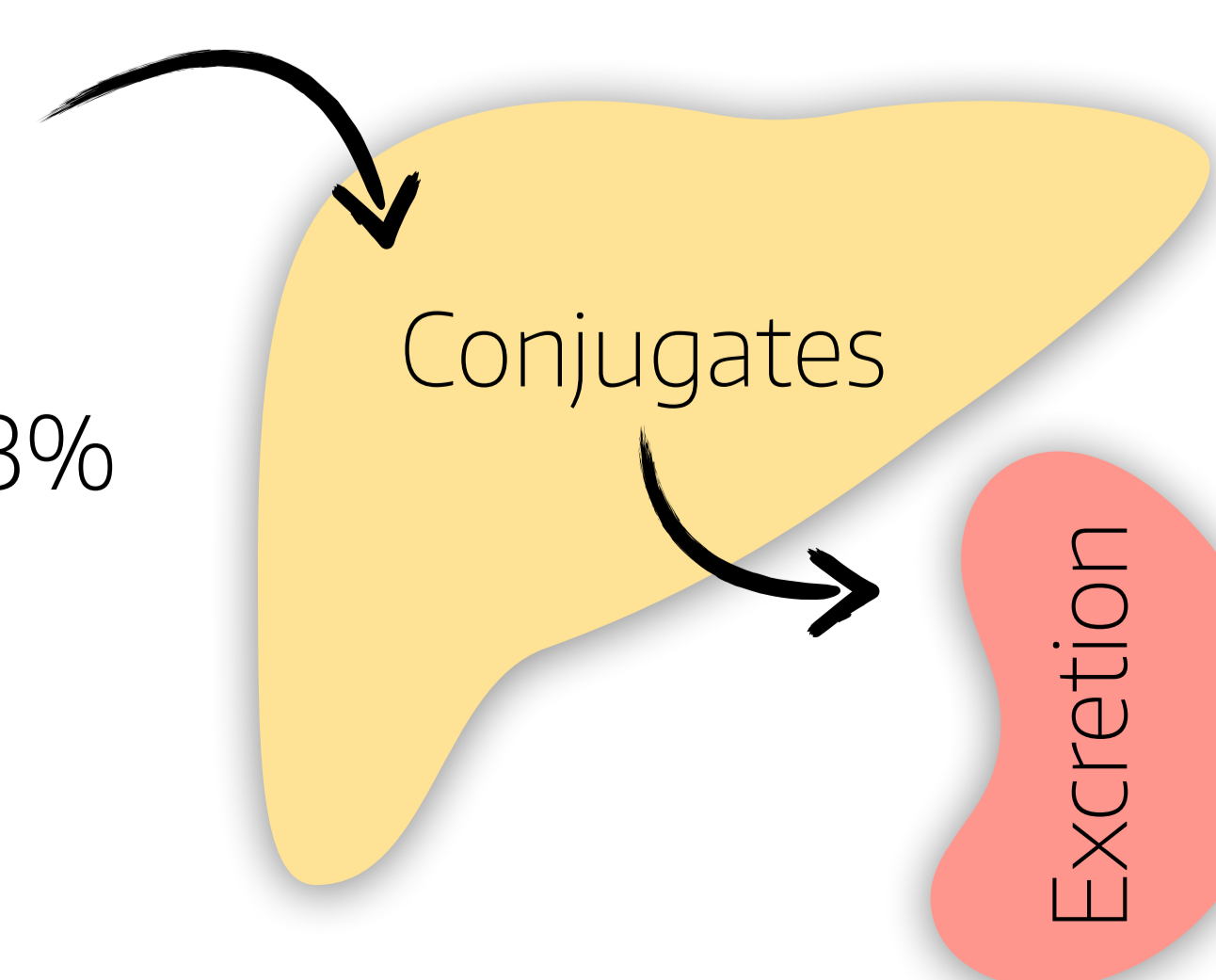
μ+k

Morphine

Generally diluted with saline in a 10ml syringe to 1mg/ml



pKa 8.0
Unionised at pH 7.4: 23%
 V_D 2-3L/kg
Cl 15-30ml/kg/min
Terminal $t_{1/2}$: 180mins



- ✓ Intra/Post-op analgesia
- ✓ Long acting
- ✓ PCAs

Synthetic Piperidine Derivatives

Phenanthrene

Depolarising Neuromuscular Blockade

Suxamethonium

Non-Depolarising Neuromuscular Blockade

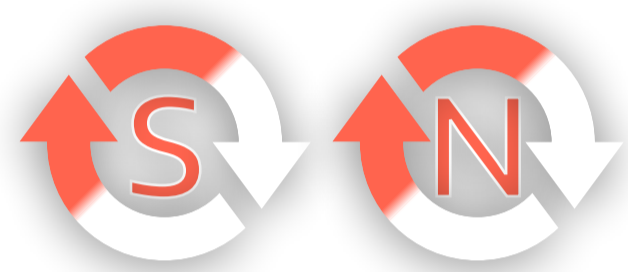
Aminosteroids
Benzylisoquinolinium

Summary Sheet:

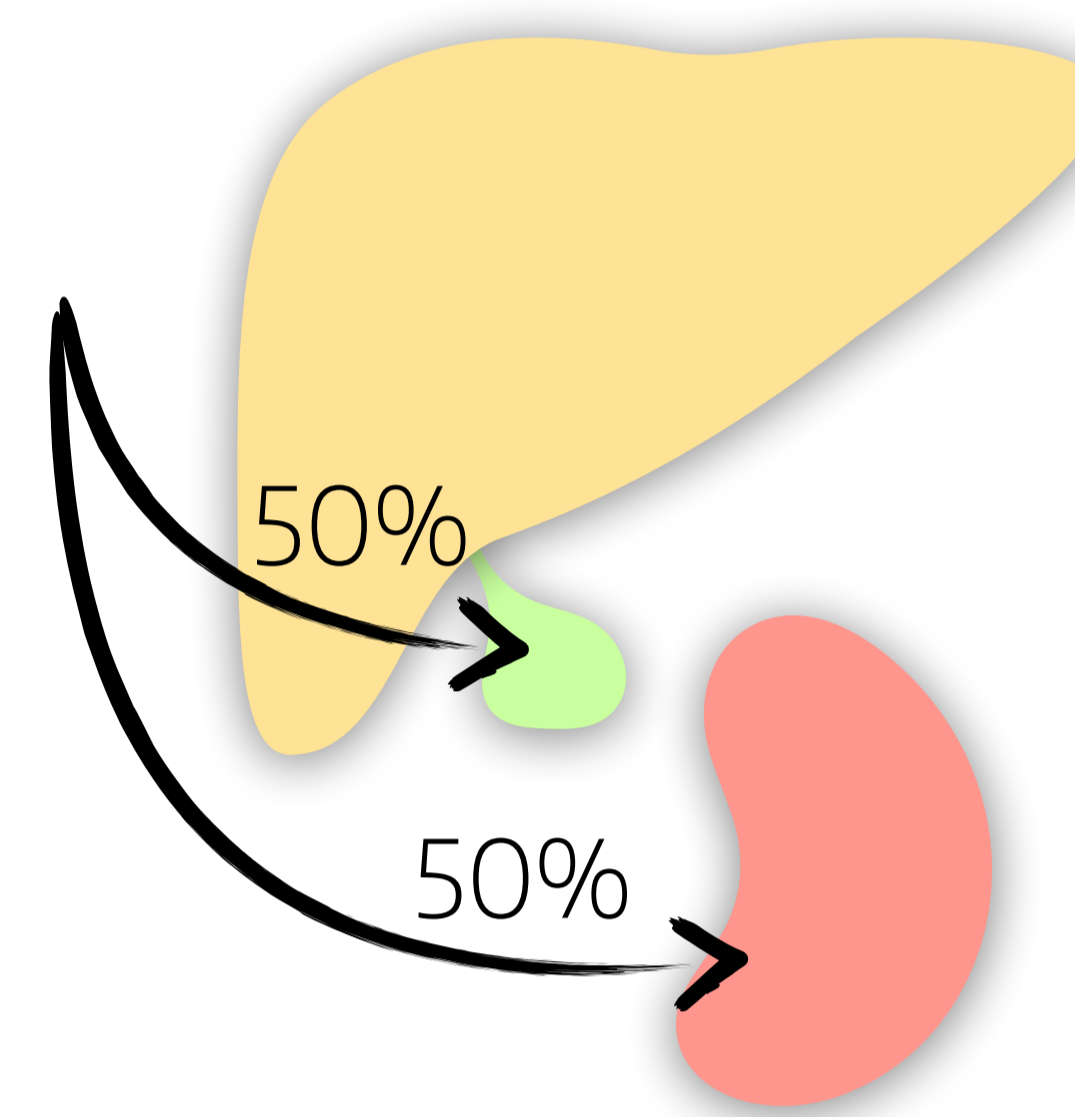
Neuromuscular Blockade

Rocuronium

Dose: 0.6mg/kg
RSI Dose : 1mg/kg



Onset: 1-2 mins
 V_D 0.2L/kg
Duration: 20-35 mins
Cl: 5ml/kg/min
Elimination: Urine & Bile

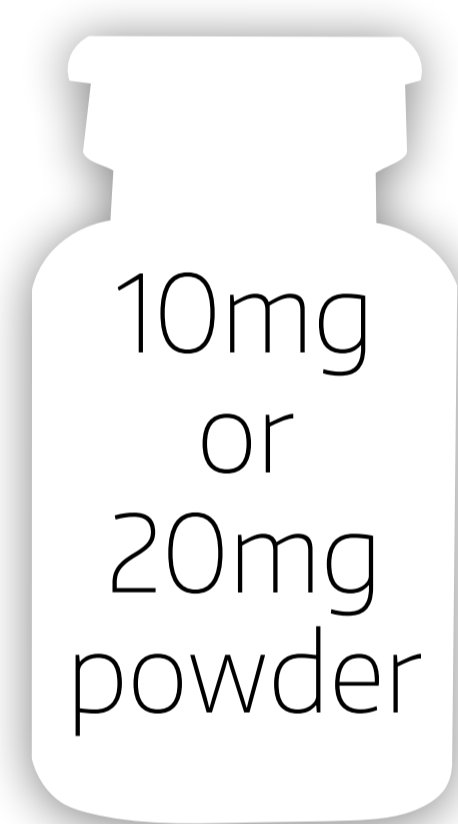
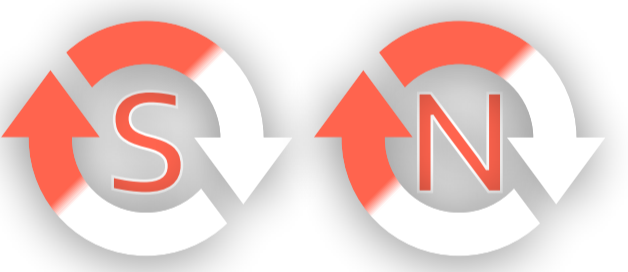


- ✓ RSI
- ✓ Fully Reversible
- ✓ Medium-acting

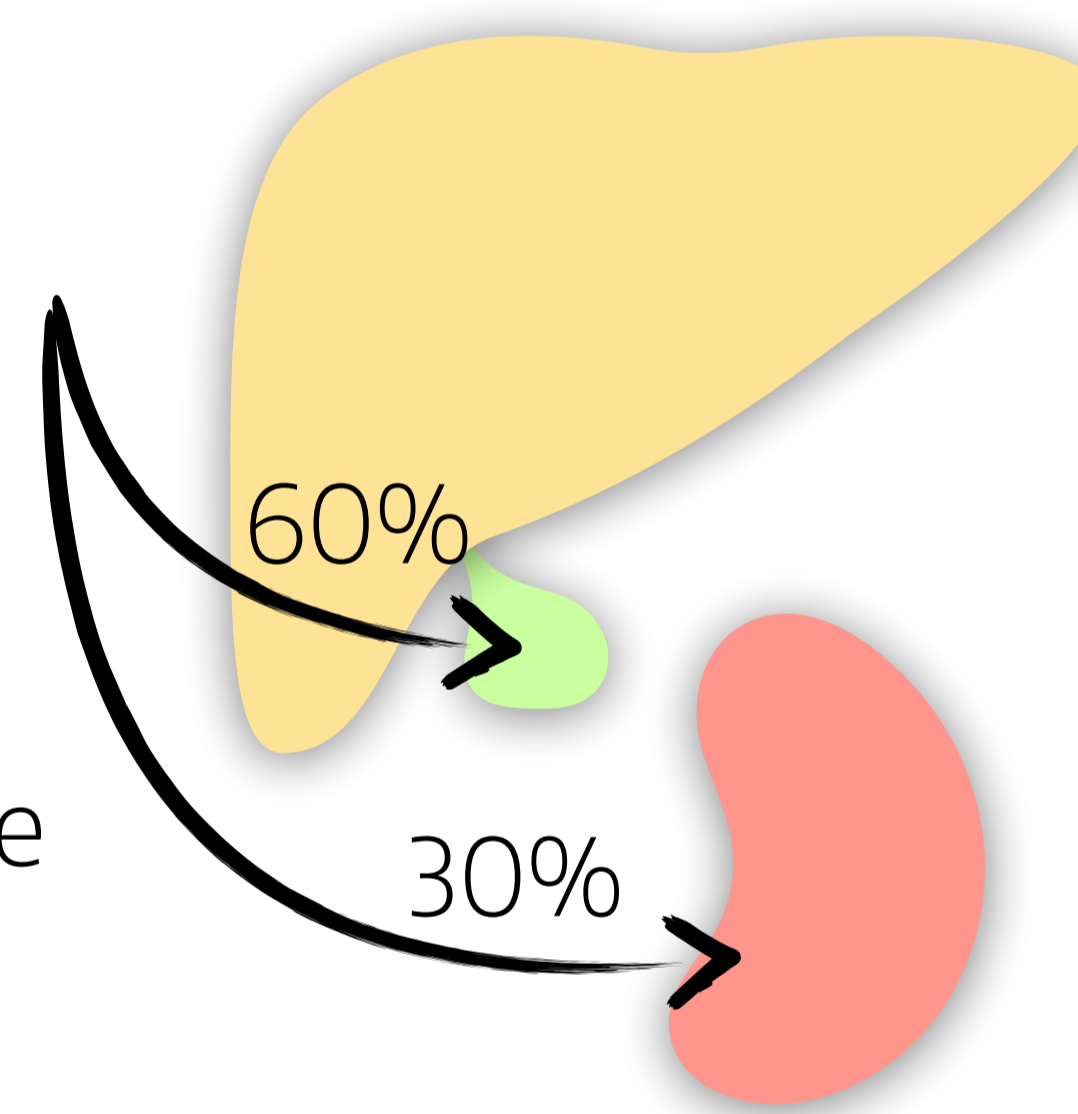
Monoquaternary Aminosteroids

Vecuronium

Dose: 0.08mg/kg



Onset: 3-5 mins
 V_D 0.2L/kg
Duration: 20-35 mins
Cl: 5ml/kg/min
Elimination: Urine & Bile



- ✓ No histamine release
- ✓ Fully Reversible
- ✓ Medium-acting

Atracurium

Dose: 0.5mg/kg



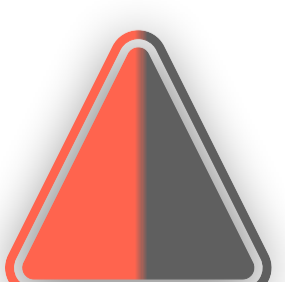
Onset: 2 mins
 V_D 0.16L/kg
Duration: 20-35 mins
Cl: 5ml/kg/min
Elimination: Esterases & Hoffman Degradation

- ✓ Safe in Renal & Liver Failure
- ✓ Medium-acting

Benzylisoquinolinium

Suxamethonium

IV Dose: 1-2mg/kg
IM Dose: 3-4mg/kg



Irreversible



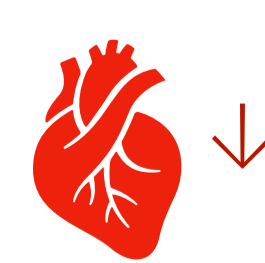
Onset: 30-60 secs
Duration: 2-6 minute
Elimination: Butyrylcholinesterase



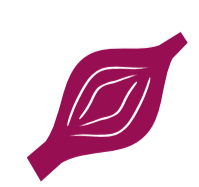
↑ Gastric pressure
↑ LOS tone



↑ IOP



↓ HR



Myalgia

- ✓ RSI
- ✓ IM/IV administration
- ✓ Short-acting

Summary Sheet: Reversal Agents

Anti-cholinesterase

Glycopyrrolate/Neostigmine

1ml contains:
2.5mg Neostigmine
0.5mg Glycopyrrolate
Dose: 1-2ml



Neostigmine increases concentration of ACh at the NMJ to competitively reverse residual non-depolarising block.

Glycopyrronium blocks the muscarinic side-effects of neostigmine to achieve CVS stability.

Can only be used if at least 2 twitches present on Train of Four (ToF).

Peak action: 10 mins

Duration: 20-30 mins

Elimination $t_{1/2}$: 15-30 mins (hepatic & renal elimination)

Blocks Monoquaternary Aminosteroids

Sugammadex

Reversal dosing:-
Immediate: 16mg/kg
PTC of 1-2: 4-8mg/kg
ToF 2 twitches: 2mg/kg



γ -Cyclodextrin ring chelates Rocuronium & Vecuronium to reverse even profound neuromuscular block.

Onset: <3 mins

Elimination $t_{1/2}$: 2 hours (renal elimination)



↓ HR



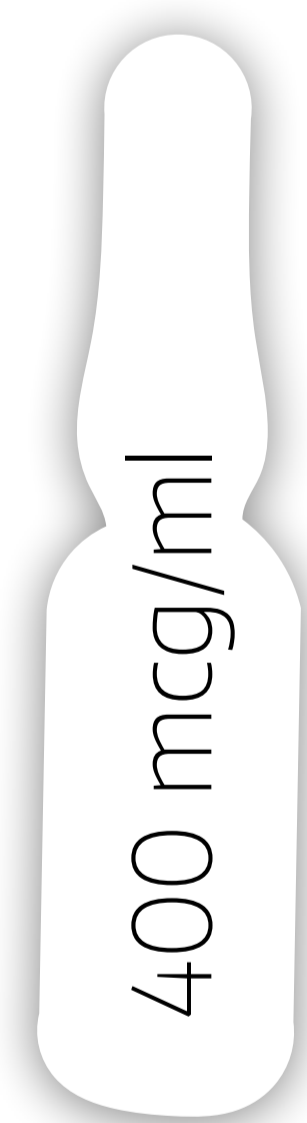
Prolonged PT & APTT



Reduces Progesterone exposure - missed pill rules

Naloxone

Bolus Dose: max. 800mcg
IVI Dose: initially 60% of initial resus bolus dose as infusion per hour



Antagonises opioid receptors

Onset: 1-2 mins

Duration: 45 mins - 4 hours

Elimination $t_{1/2}$: 1-1.5 hours (hepatic metabolism & renal excretion)



↓/↑ HR & Arrhythmias |
↓/↑ BP



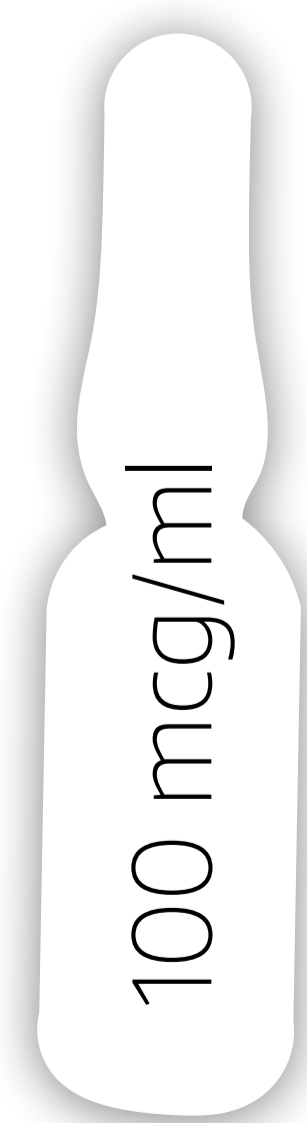
Nausea/Vomiting



Dizziness / Headache

Flumazenil

Bolus Dose: 200mcg



Competitive inhibitor of benzodiazepines (& Zopiclone) at the GABA_A binding sites.

Onset: 1-2 mins

Duration: 20-50 mins

Elimination $t_{1/2}$: 40-80 mins (renal elimination)



Arrhythmias



Dyspnoea | Chest pain

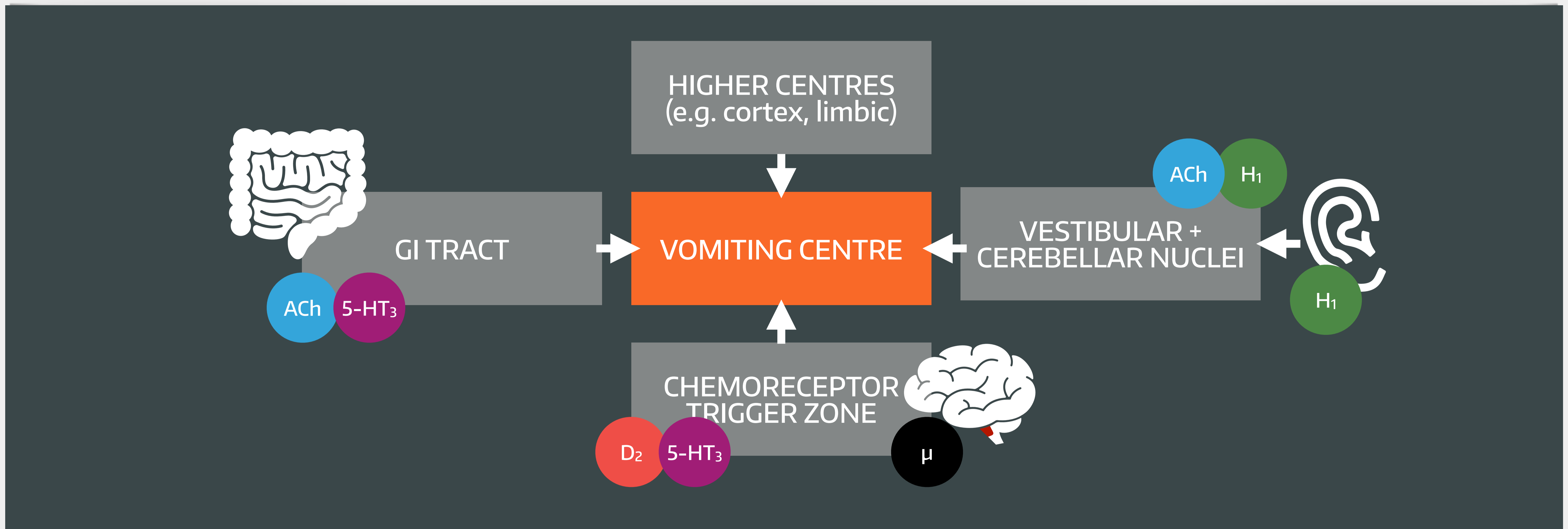


Nausea/Vomiting



Altered mental states |
Vertigo | Headache | Seizures

Summary Sheet: Antiemetics



5-HT₃

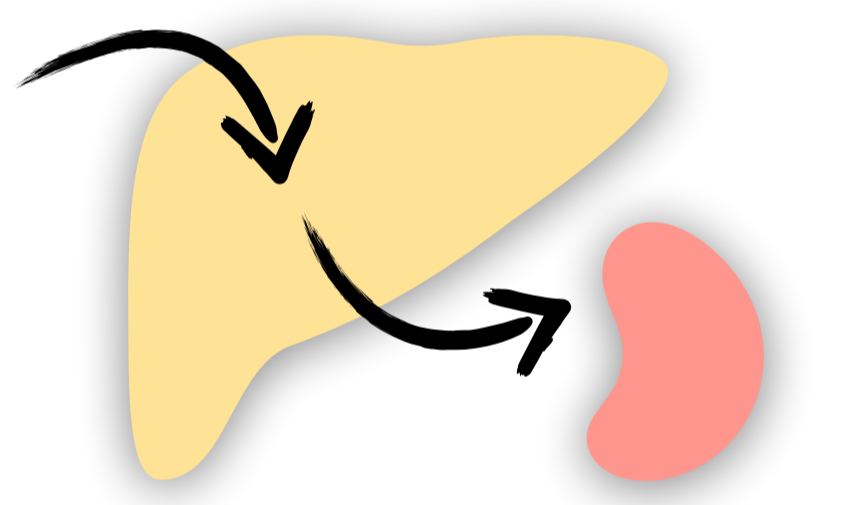
Ondansetron

Dose: 0.1mg/kg (4-8mg), 8^o



Synthetic Carbazole
Blocks vagal afferents from GI tract
Central action at CTZ

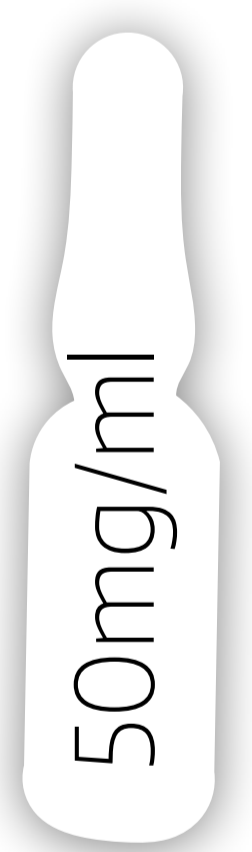
Constipation ↓ HR Headache & Flushing



H₁

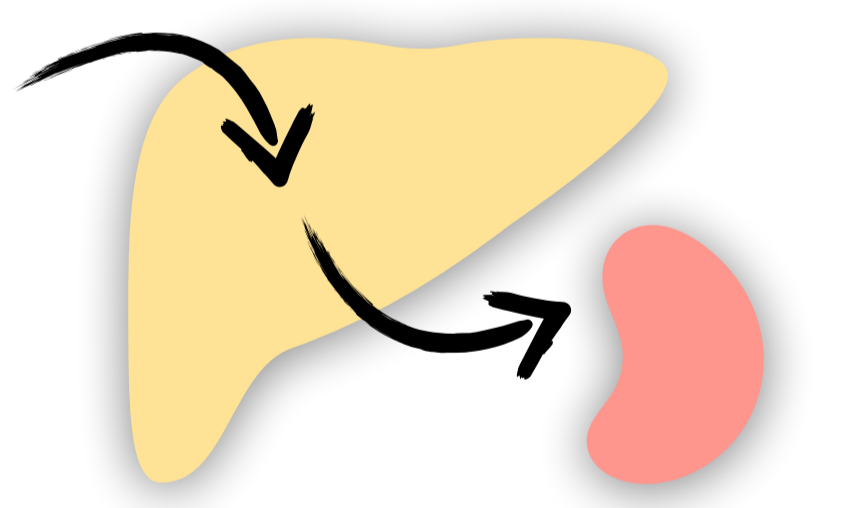
Cyclizine

Dose: 1mg/kg (25-50mg), 8^o



Piperazine derivative
Reduces sensitivity of vestibular apparatus
Also has anticholinergic properties

↑LOS tone | Dry mouth ↑ HR Drowsiness Blurred vision



D₂

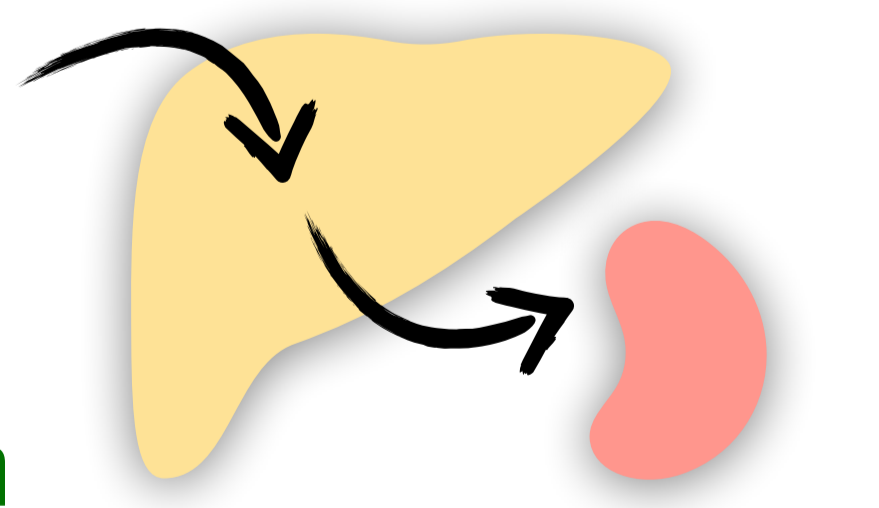
Prochlorperazine

Dose: **IM** 12.5mg, 12^o



Phenothiazine neuroleptic
Central action at CTZ

VTE, | ↑ QT_c Oculogyric Crisis Dry mouth NMS | Parkinsonism | Lower seizure threshold

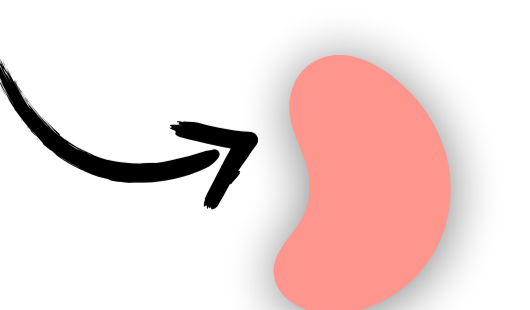


Dexamethasone

Dose: 0.1mg/kg (4-8mg)



Glucocorticoid
Unclear mechanism for antiemetic effects



Summary Sheet: Vasopressors

Ohm's Law as Applied to CVS

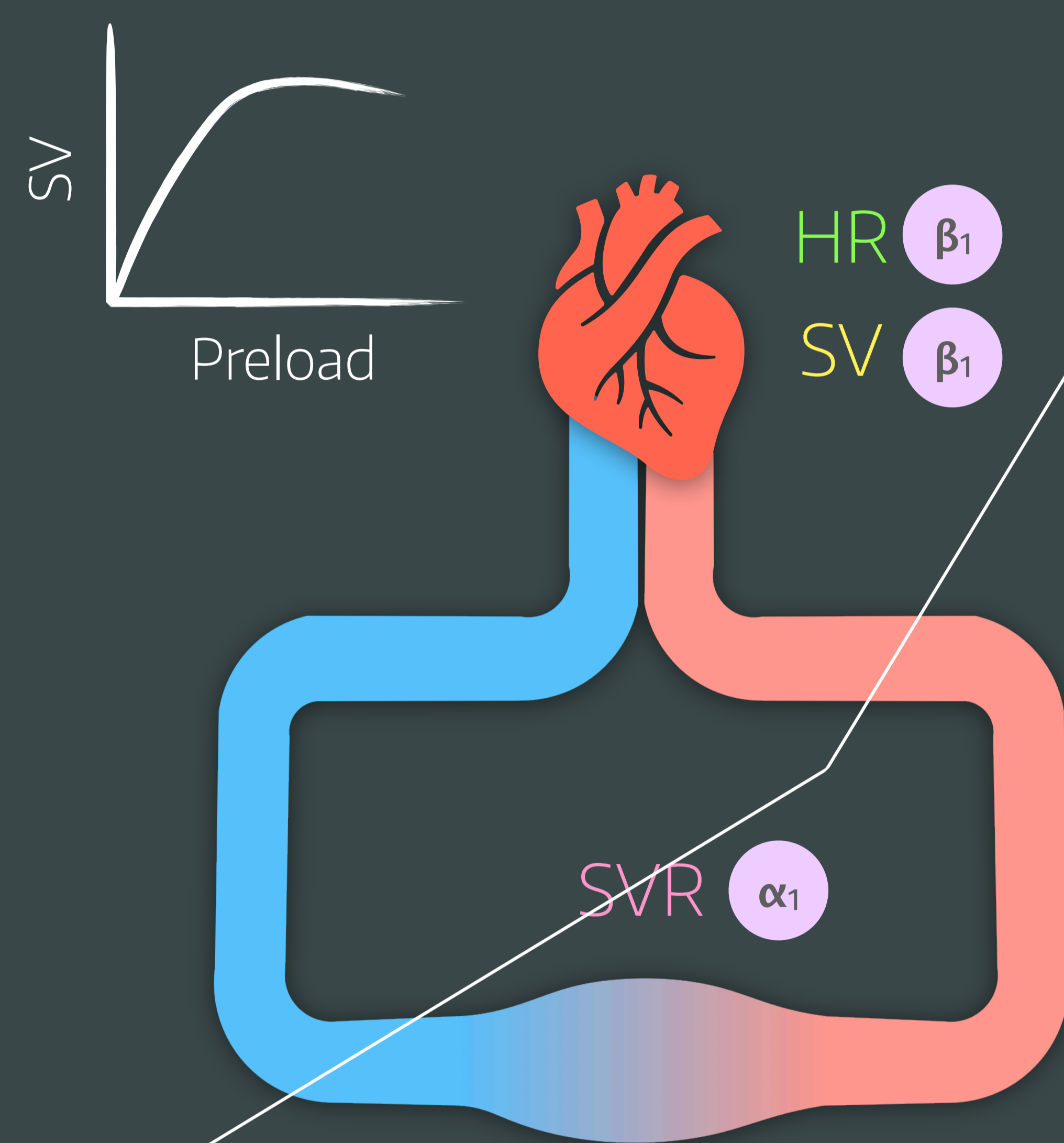
$$MAP - CVP = \underbrace{HR \times SV}_{C.O.} \times SVR$$

α_1
 Preload \rightarrow \uparrow \leftarrow Afterload
 β_1 Contractility

Adrenoceptors

- α_1 Vasoconstriction
- α_2 Vasodilatation
- β_1 Inotropy & Chronotropy
- β_2 Bronchodilatation & Vasodilatation
- β_2 Lipolysis & Thermogenesis

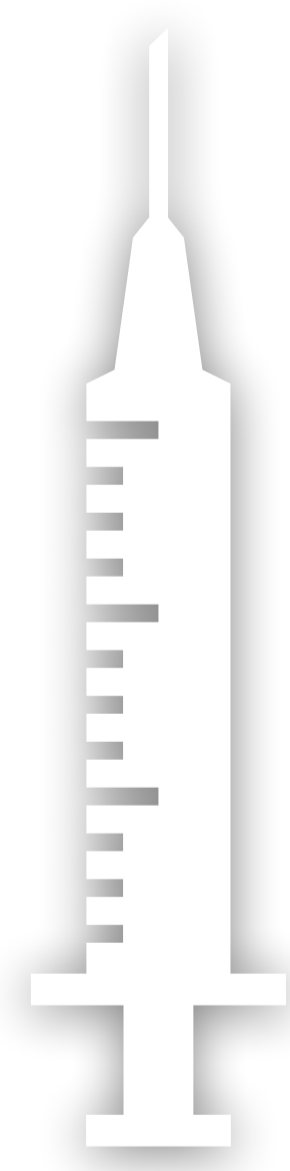
Optimising Perfusion & C.O.



α_1

Metaraminol

Bolus Dose: 500-2000mcg
 IVI Dose: 15-100mg/hr
 Conc.: 500mcg/ml



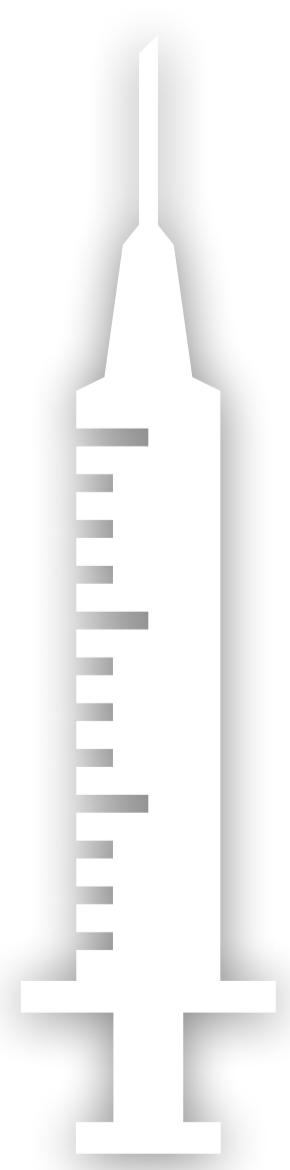
Various presentations - check concentration!
 Onset: 1-2 minutes
 Duration: 20+mins (tapers)
 Direct & Indirect (\uparrow NA release) sympathomimetic effects
 Predominant α_1 activity, some β_1 activity

\uparrow SVR therefore \uparrow BP (\pm \downarrow HR)

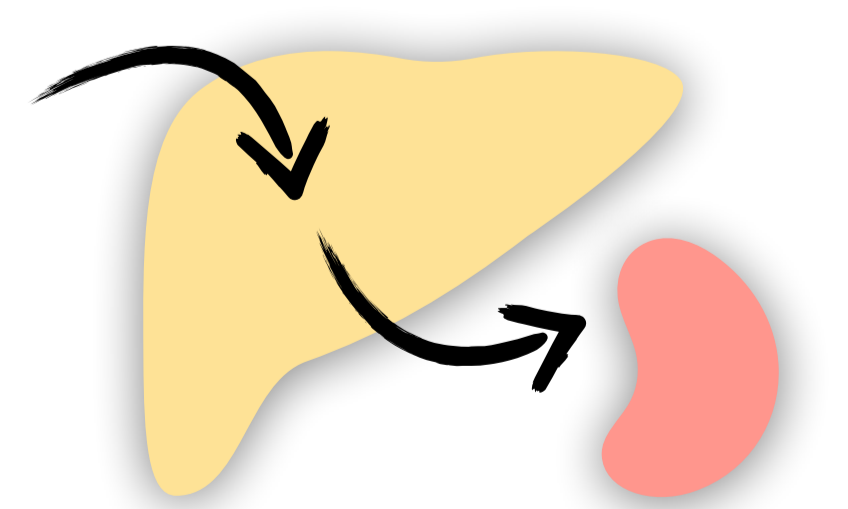
$\alpha_1 + \beta$

Ephedrine

Dose: 3-6mg bolus
 Conc.: 3mg/ml



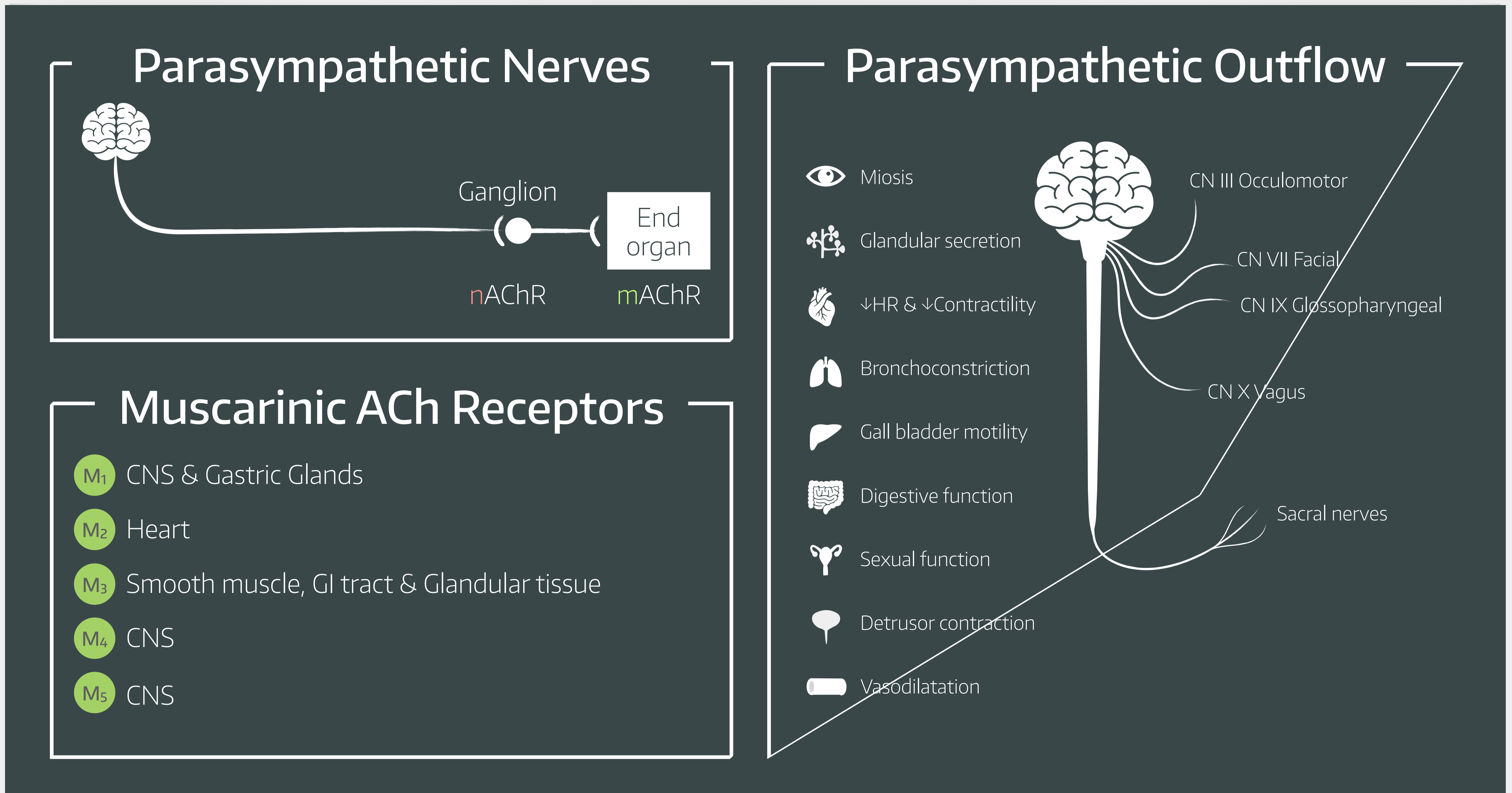
Onset: 1-2 minutes
 Duration: 10+mins (tapers)
 Direct & Indirect (\uparrow NA release) sympathomimetic effects
 Monoamine Oxidase Inhibitor
 Both α & β activity



Bronchodilatation

\uparrow HR, \uparrow Contractility & \uparrow SVR therefore \uparrow BP

Summary Sheet: Antimuscarinics



mAChR

Atropine

Bolus Dose: 600mcg

Inhibits post-ganglionic mAChR
Peak action: 2-3 minutes
Duration: 30 mins
Crosses blood-brain barrier & high V_d
Metabolised in liver

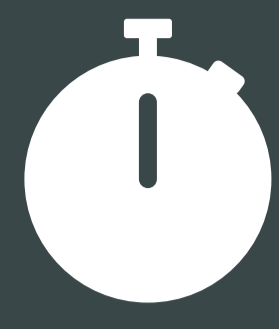
mAChR

Glycopyrrolate

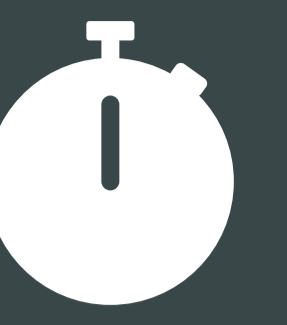
Bolus Dose: 200mcg

Inhibits post-ganglionic mAChR
Peak action: 3-4 minutes
Duration: 2-3 hours
Does not cross blood-brain barrier
Metabolised unknown

Onset Speed
inversely
proportional to **pKa**
(i.e. directly
proportional to
unionised fraction)



Duration of action
directly proportional
to **protein-binding**



Summary Sheet:

Local Anaesthetics

Chemistry

Local anaesthetics are all **weak bases**.

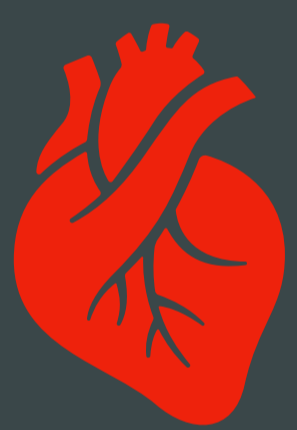
Amide Local Anaesthetics have a longer half-life and are metabolised in the liver.

Ester Local Anaesthetics are rapidly inactivated by plasma/liver esterases.

Toxicity

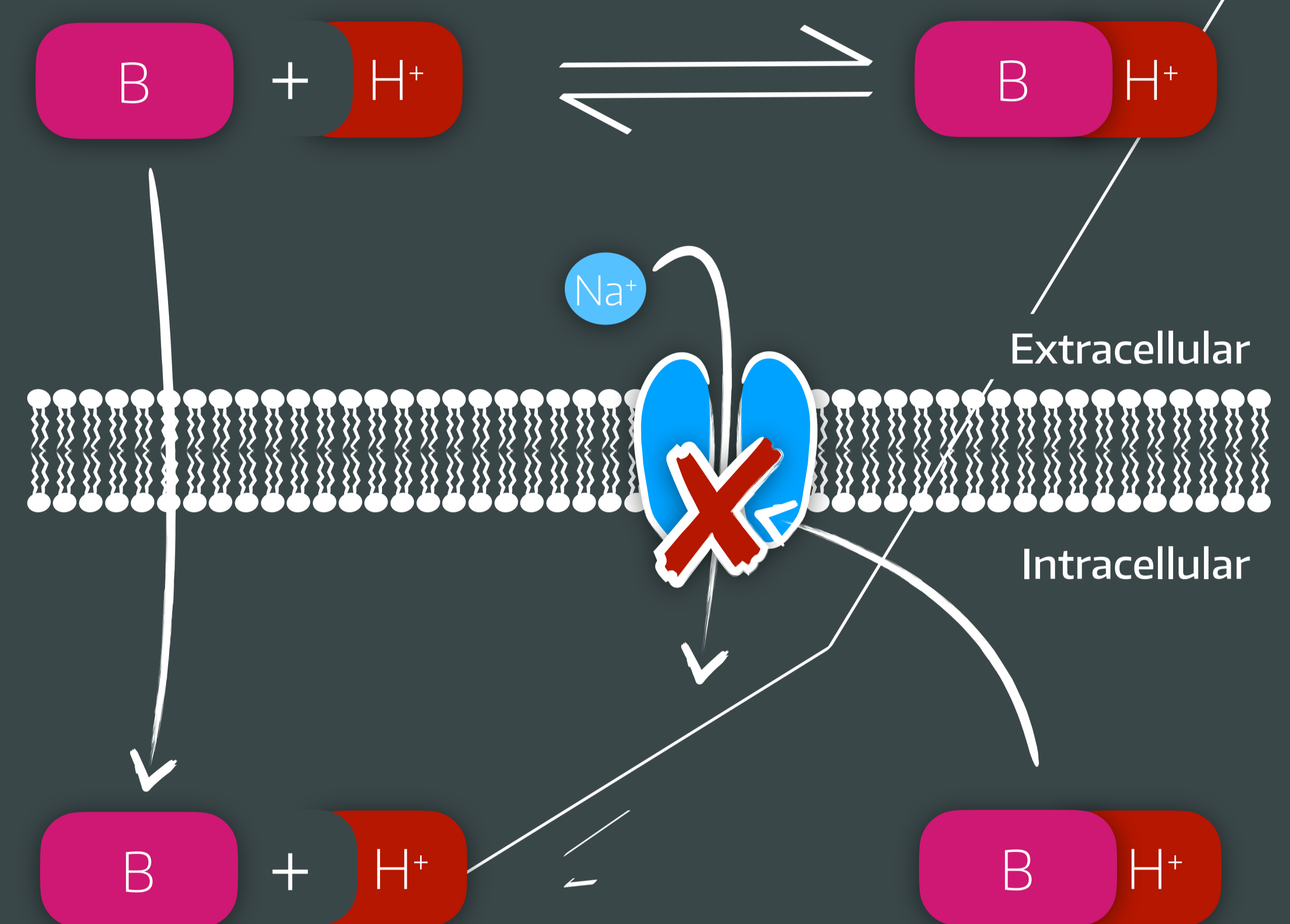


Paraesthesia | Light-headedness & Dizziness | Visual/auditory disturbances | Confusion | Shivering | Twitching | Seizures



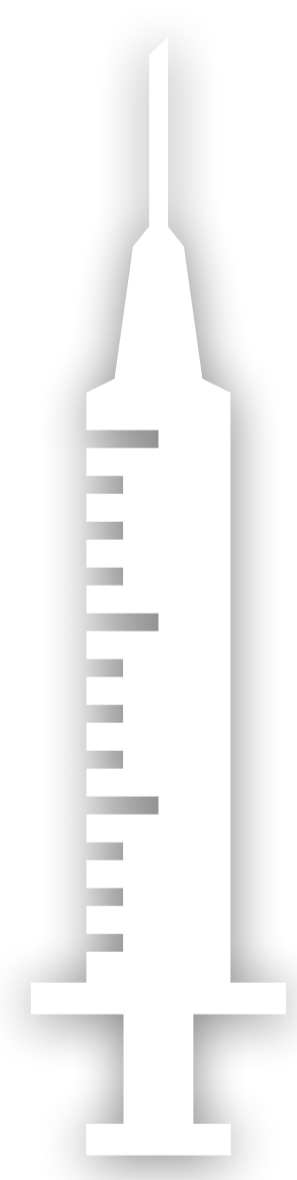
Myocardial depression | Prolonged phase 0 | Dysrhythmias | VF

Mode of Action



Lidocaine

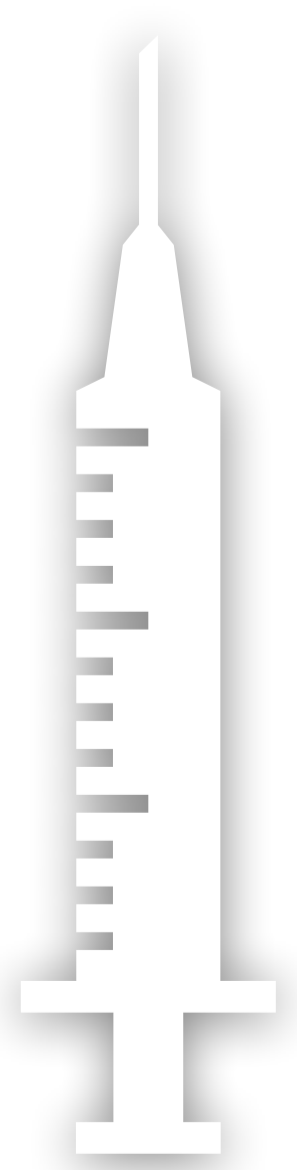
Max Dose: 3mg/kg
⌊ Adrenaline: 7mg/kg



pKa: 7.9
Unionised fraction at pH 7.4: 25%
Protein-binding: 70%
Elimination $t_{1/2}$: 100 mins
Less lipid-soluble than Bupivacaine (so 8 × less potent)

Bupivacaine

Max Dose: 2mg/kg
⌊ Adrenaline: 2mg/kg



pKa: 8.1
Unionised fraction at pH 7.4: 15%
Protein-binding: 95%
Elimination $t_{1/2}$: 160 mins
More lipid-soluble than Lidocaine (so 8 × more potent)

Levobupivacaine

Less motor block & vasodilatation
97% Protein-bound
Lower risk of cardio toxicity

Plasma Composition

Osmolarity: 275-295mOsm/L
 Na⁺: 135-145 mmol/L
 K⁺: 3.5-5.3 mmol/L
 Cl⁻: 95-105 mmol/L
 Mg²⁺: 1.5 mmol/L
 Ca²⁺: 2.2-2.6 mmol/L
 Glucose: 3.5-5.5 mmol/L
 Bicarbonate: 24-32 mmol/L

Anaestheasier

Novice

Summary Sheet: IV Fluids

Maintenance Fluids



First
10kg

4ml/kg =



Next
10-20kg

2ml/kg =



>20kg

1ml/kg =

Hourly requirements =

Total Body Water

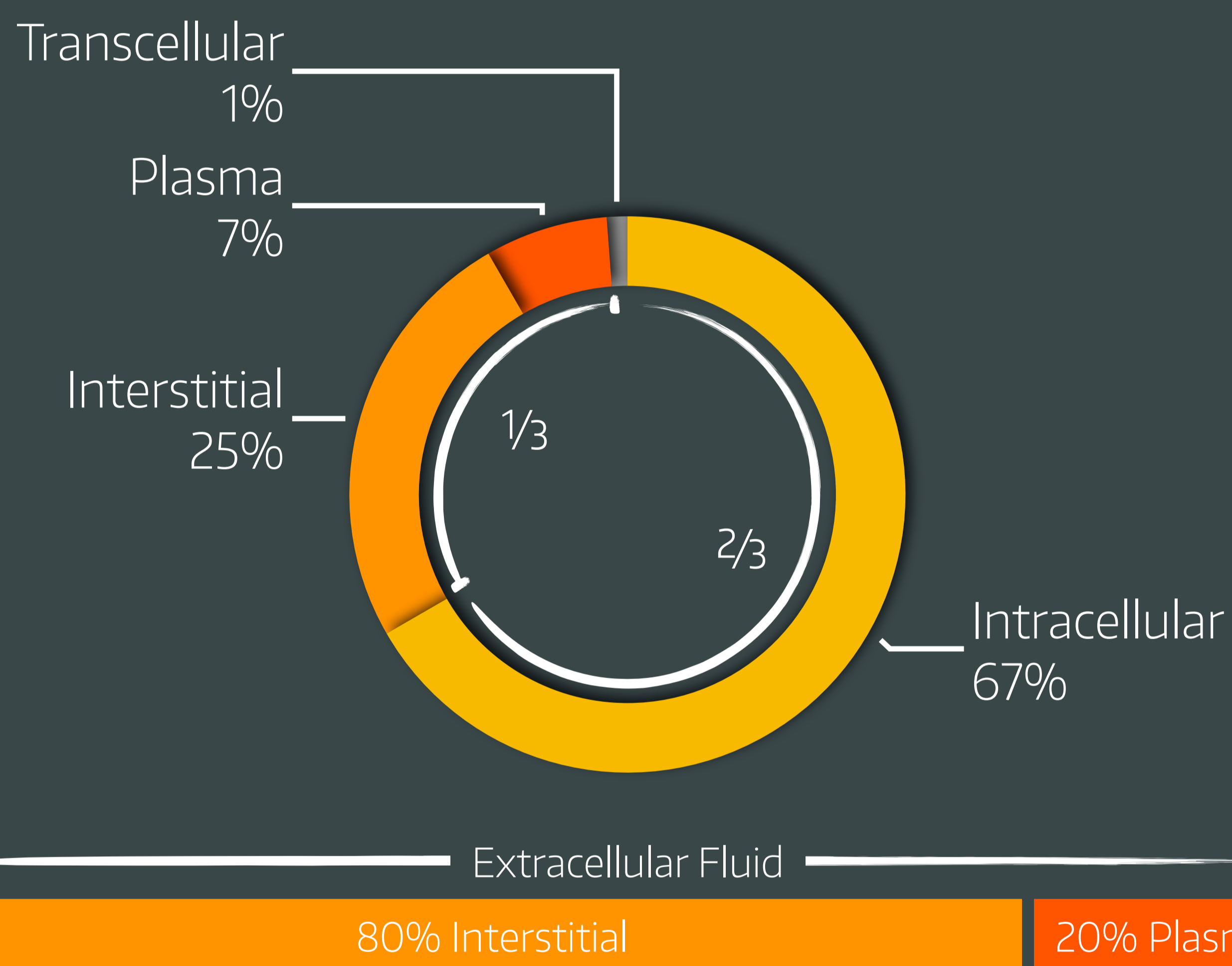


~60% body weight

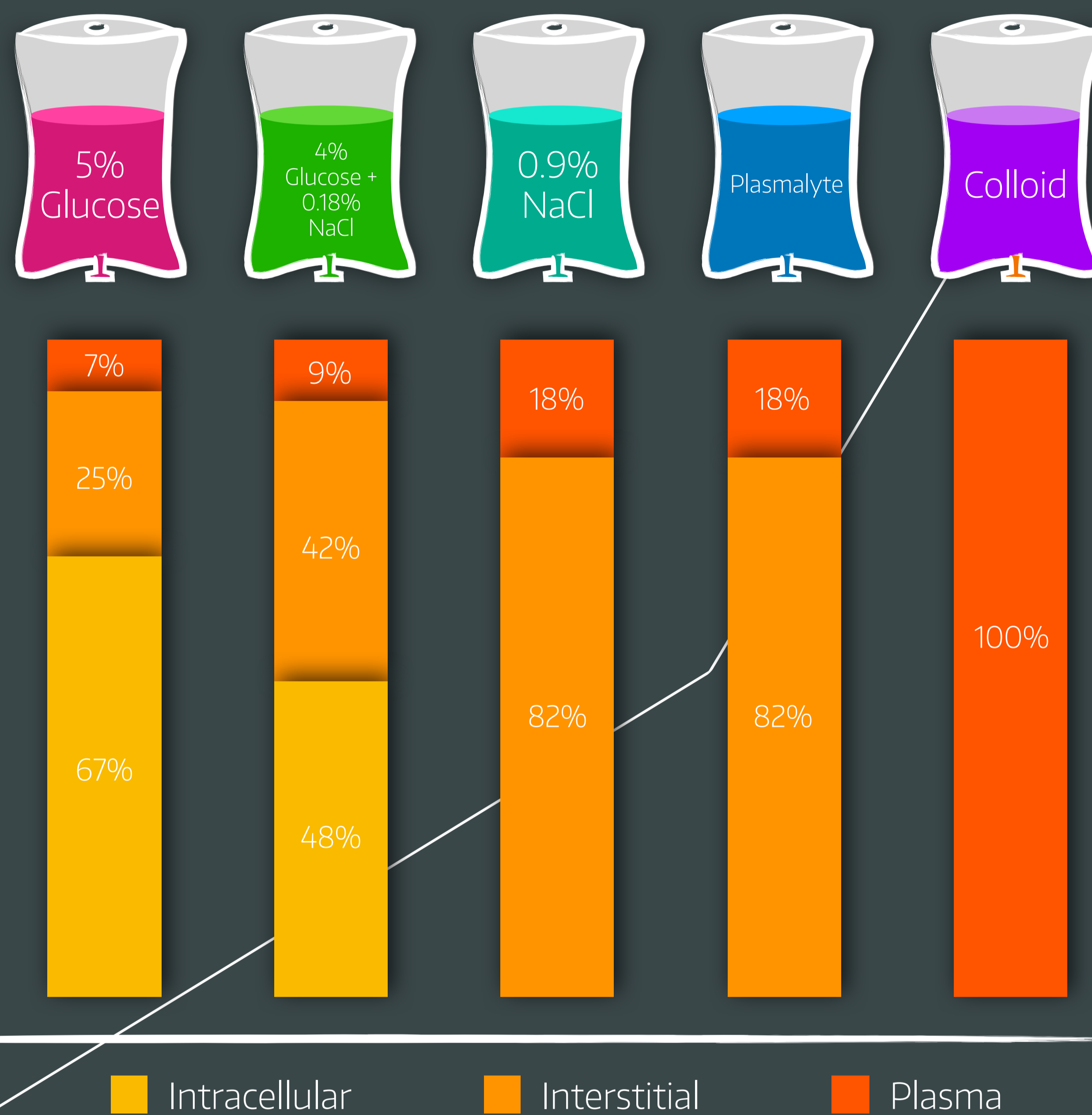


~50-55% body weight

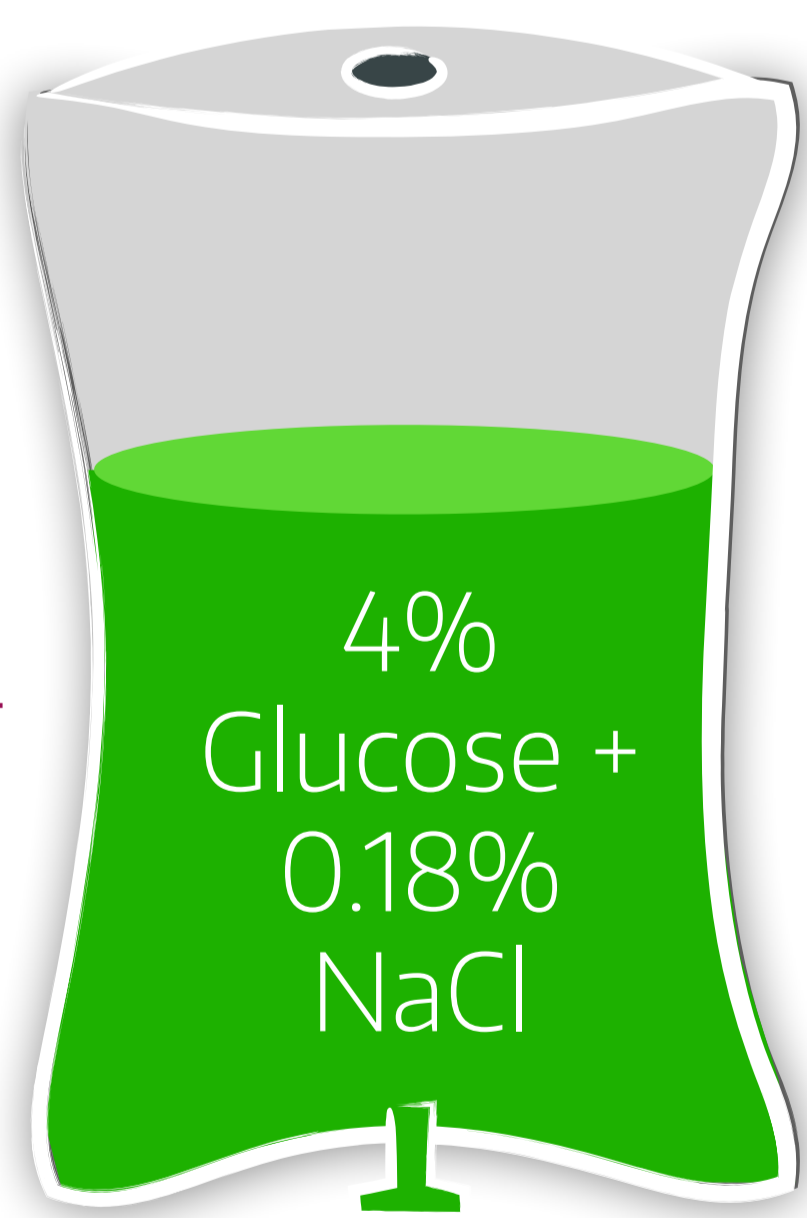
Body Fluid Compartments



IV Fluid Distribution



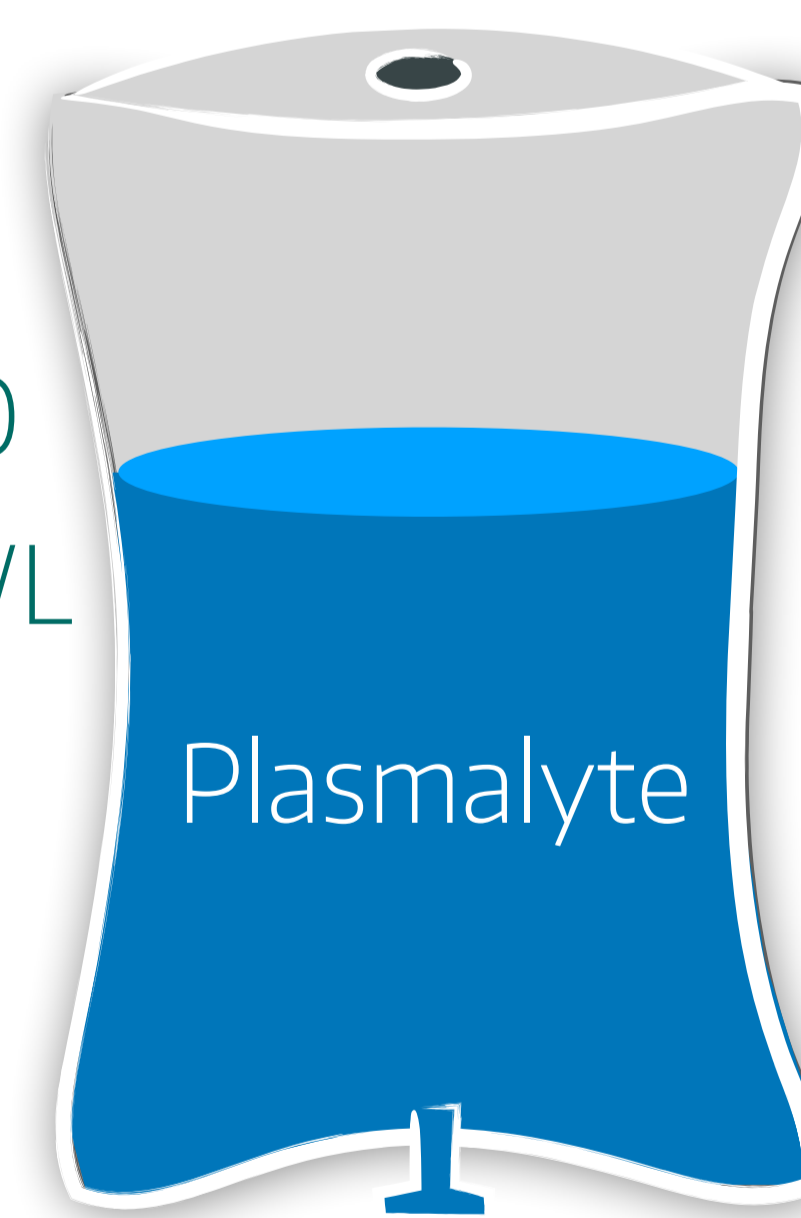
pH 3.5-5.5
 278mOsm/L
 Gluc 278



pH 4.5
 308mOsm/L
 Na⁺ 31
 Cl⁻ 31
 Gluc 222



pH 4.5 - 7.0
 308mOsm/L
 Na⁺ 154
 Cl⁻ 154

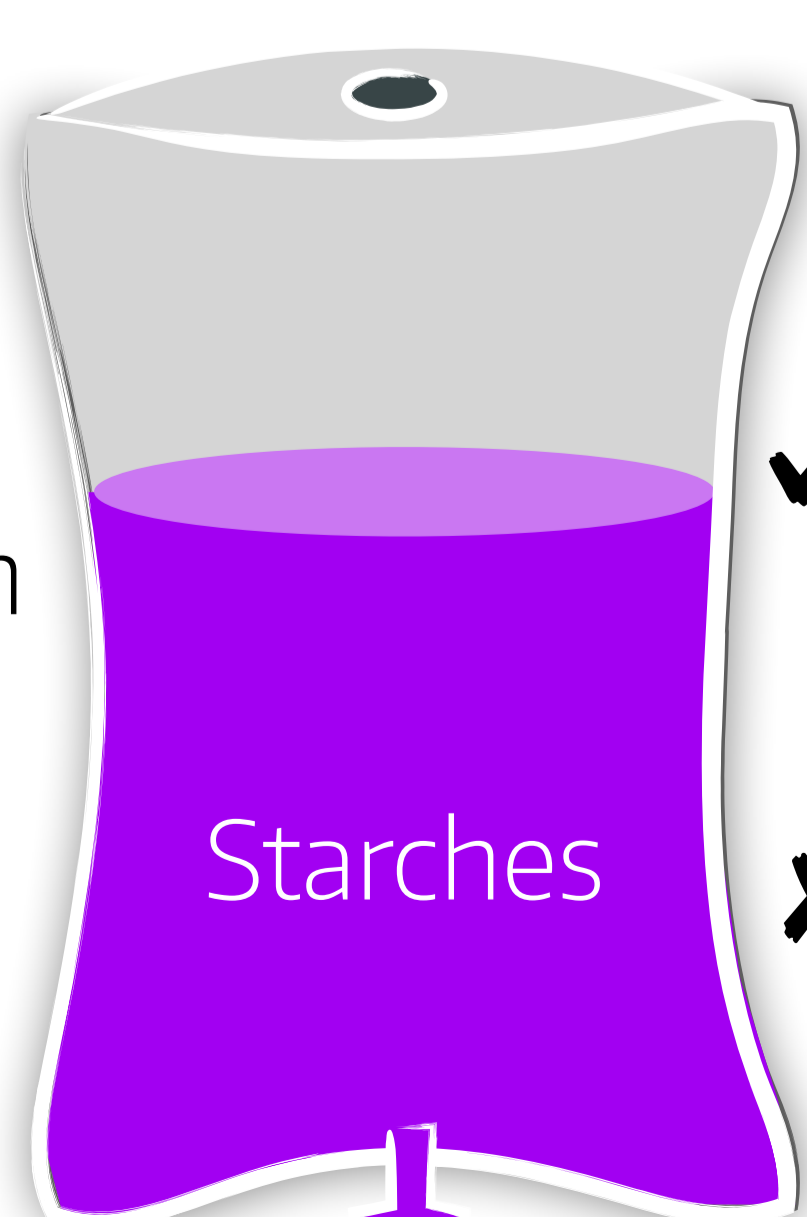


pH 7.4
 308mOsm/L
 Na⁺ 140
 K⁺ 5.0
 Cl⁻ 98
 Acetate 27
 Gluconate 23
 Mg²⁺ 1.5

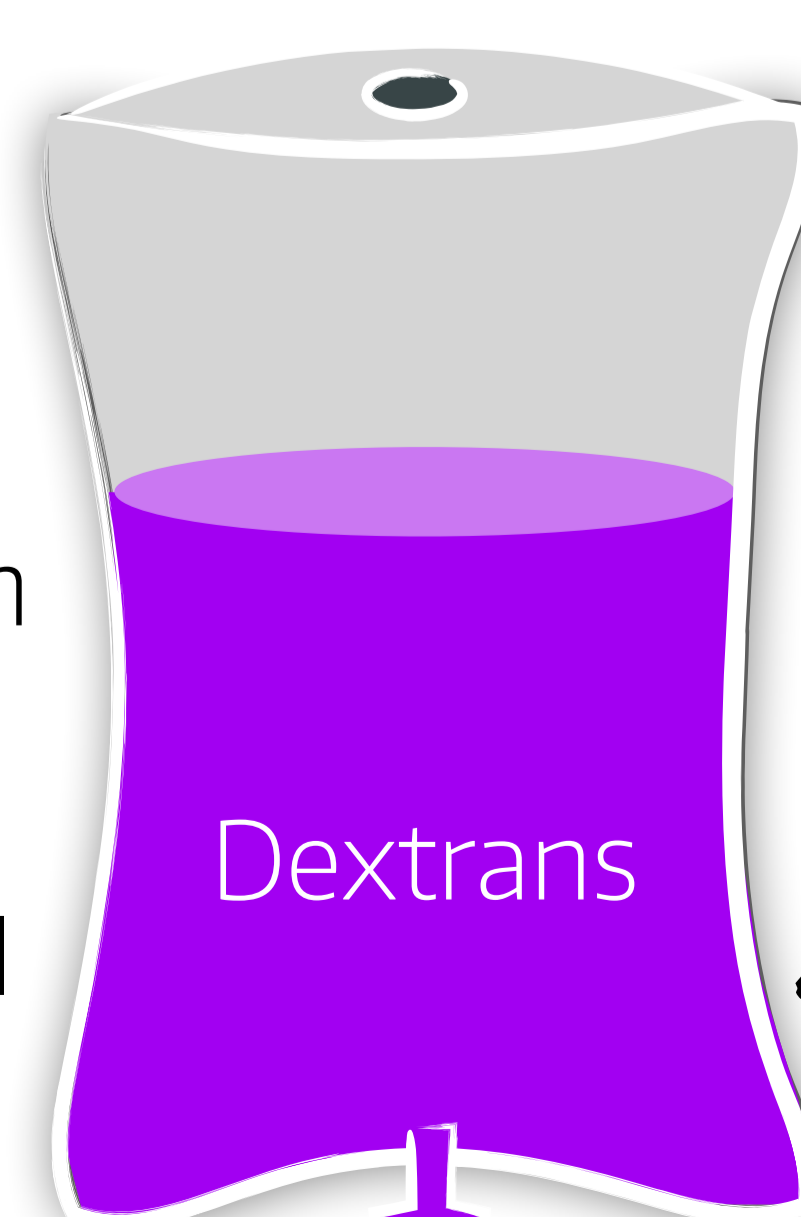
Crystalloids



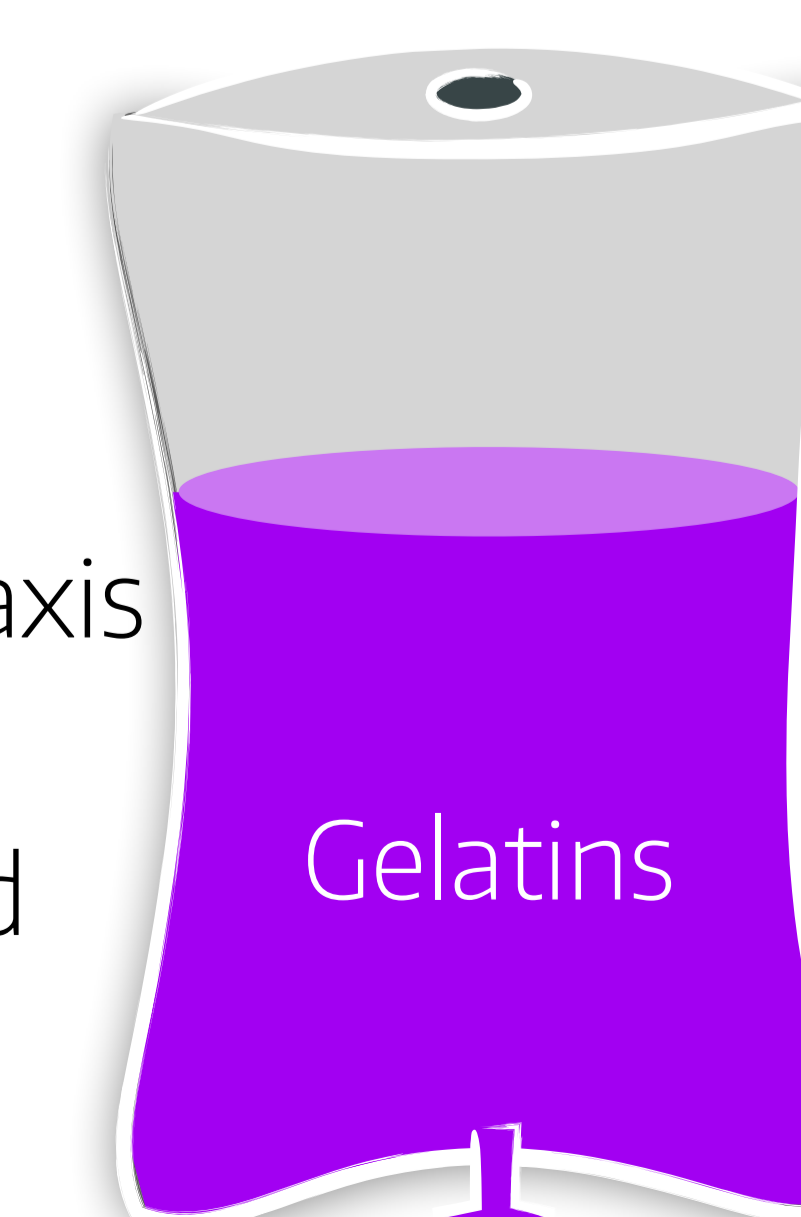
✓ Good plasma expansion
 ✓ Minimal side-effects



✓ Good plasma expansion
 ✗ ↓vWF & Factor VIII



✗ Renal failure
 ✗ Anaphylaxis risk
 ✗ Deranged clotting



✓ 2 hours plasma expansion
 ✗ Anaphylaxis risk

Colloids