

This station will explore your knowledge of the following areas:
Neurophysiology and Opioid pharmacology

Candidates were asked about cerebral blood flow, its measurement, regulation and opioids and their CNS effects

“Describe cerebral blood flow”

is 750ml minute (15% CO)

O₂ consumption is 3ml/100g which given a weight of 1400g is about 50ml (20%)

it is determined by the Cerebral Perfusion Pressure / Cerebrovascular Resistance

CPP is calculated by MAP - CVP, or in pathological states MAP - ICP (starling resistor model)

“How is cerebral blood flow measured?”

measurement is via the Fick principle using the Kety-Schmidt method

fick principle states that the amount taken up by the organ/[arterial]-[venous] = flow

K-S used NO (highly inert and diffusible) and measured uptake/arterial-venous conc diff

“What factors alter cerebral blood flow?”

intrinsically it demonstrates autoregulation

primarily myogenic stretch factors

local metabolic control is more specific to regional distribution rather than total flow
extrinsically

hypoxia results in increased flows when it drops below 50mmHg

raised CO₂ shows a near linear increase in blood flow 20mmHg to 80mmHg

“What would happen to cerebral blood flow at altitude?”

as the pCO₂ drops there is decreased blood flow, however when the O₂ drops below 50mmHg then flow will increase

“Describe the pharmacology of Morphine”

naturally occurring phenanthrene derivative from the papaver somniferum plant

available as liquid for injection or oral formulations

action is via GPCR mu opioid receptors modulating pain responses, in particular slow pain

side effects include dysphoria or euphoria, confusion, depressed resp drive, decreased gut motility

A bioavailability is 30% orally due to high first pass metab

D Vd 3-4L/kg, protein binding 30%, low lipid solubility rel to other opiates, pKa 8 (25% ionised)

M metabolised hepatically via glucuronidation, active metabolite M6G, may accumulate in CRF

E half life 2-4 hours, excretion in urine and faeces

“How does morphine affect cerebral blood flow”

evidence is mixed

ultimately it is dependent on how the morphine affects the CPP (MAP-CVP or ICP) and CVR
it is possible that there is a blunting of autoregulation, which if associated with a drop in CPP
may lead to ischaemia

this may be important in patients with intracranial pathology