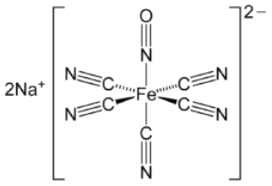
First 2011
VIVA 8

This Viva will discuss the pharmacology and the physiology of the peripheral circulation During the reading time, candidates were also shown a figure of SNP, and were asked if they recognised it. The viva then went on to discuss the pharmacology of SNP. This was generally well done. For the latter half of the viva, candidates were tested on their knowledge of the physiology of the peripheral circulation. Areas of weakness were, the understanding of the physiology of the endothelium, substances it secretes (eg prostacyclin, EDRF and endothelin), as well knowledge of the vasomotor centre.

"What is this molecule?"

sodium nitroprusside



"Could you please describe the pharmacology of sodium nitroprusside?"

Is an inorganic complex that acts as a prodrug
it is injectable only and is unstable and must be stored out of light
it mechanism of action is via NO donation which reacts with SH groups in vascular smooth muscle stimulating cGMP and causing generalised vasodilation.
effects: It acts on both arterial and venous equally, attentuates HPV in lungs, increases ICP due to increase in CBF although renal blood flow is unchanged
side effects include excessive hypotension, n+v and abdo pain, rebound hypertension on cessation
long term risks with cyanide accumulationand subsequent impaired oxidative phosphorylation
It is given IV only, its distribution is not known,
rapid metabolised in the blood stream to prussic acid then thiocyanate
half life of 2-4 minutes and excreted in the urine (inactive)

"Please describe the physiology of the vascular endothelium"

The whole CVS is lined with a single layer of endothelial cells forming the surface contact with blood.
The functions of endothelial cells are;

- nutrient and waste fitration
- fluid filtration
- production of vasoactive substances
  - prostacyclin (from arachidonic acid) inhibits platelet aggregation and vessel constriction
  - nitric oxide
    - (L-arginine) increases smooth muscle cGMP
    - decreases intracellular Ca^{2+} producing muscle relaxation and vasodilation
    - NO is stimulated by ACh, ATP, bradykinin, serotonin, substance P and histamine
  - endothelin which increases the PVR and therefore the blood pressure
- formation of new capillaries under the influence of angiogenic factors

"What is the vasomotor centre and where is it located?"

located in NTS of the medulla it has a set point of around 100mmHg MAP
modifies parasympathetic (via the CVLM) and sympathetic responses (via RVLM) to achieve this set point

"What is the input for the vasomotor centre?"

baroreceptors in the walls of the aorta (via CNX) and at the bifurcation of the aortic arch (via CNIX)

"What are the effectors?"

the autonomic nervous system modfies preload, afterload, contractility and chronotropy

"What role does this system play in long term regulation?"

Baroreptors do not have a role in the long term regulation of blood pressure and will reset the target blood pressure when pressures are elevated for extended periods of time (eg essential hypertension).