

## **Q9 Describe the changes to cardiovascular physiology in a healthy elderly person (March 2012)**

### **MYOCARDIAL CHANGES**

- Decrease in sensitivity to catecholamines due to reduction in receptor density and number
- Decrease in maximum heart rate (due to the above and also possibly reduced intrinsic SA activity due to a reduction in the number of pacemaker cells with age)
- Decrease in maximum ejection fraction during exercise (due to increased afterload and reduced compliance)
- Decrease in resting and maximum cardiac output (due to reduction in heart rate and stroke volume)
- Decrease in diastolic compliance and hence ventricular filling (particularly the early phase of diastole which is reduced by 50% of its capacity at younger ages)
- Accumulation of pigment in the myocytes
- Decrease in the number of functioning myocytes (possibly due to age related reduction in capillary density and ischaemic injury) and concentric hypertrophy of existing myocytes (due to increased workload of remaining cells)
- Increase in relaxation time due to reduced reuptake of Ca by the sarcoplasmic reticulum (ie, prolongation of the cardiac cycle)

### **PERIPHERAL VASCULAR CHANGES**

- Increase in TPR due to age related increases in intimal thickness and vessel stiffness, and a decrease in arterial and venous compliance (less Windkessel effect or elastic reservoir)
- Reduction in endothelial cell function including less nitrous oxide release and reduced bioavailability of NO, resulting in vasoconstriction
- Blunted baroreceptor response due to decreased stretch in the carotid and aortic bodies (less sensitivity) and impaired sympathetic response (less catecholamine sensitivity)
- Reduction in catecholamine receptors and density

### **HAEMODYNAMIC CONSEQUENCES**

- Increased pulse pressure and MAP
- Increased afterload due to raised MAP and aortic impedance (which may contribute to LV hypertrophy)