Heart Structure and Cardiac Muscle

- Provides an overview of the anatomy of the heart and the structure of cardiac muscle;
  - ~ *four chambered heart and double circulation*
  - ~ *heart valves and their functions*
  - ~ *cardiac muscle structure and conduction system*
  - ~ *stroke volume, cardiac output and mean arterial pressure*

Anatomy of the Heart

- The heart is located between the lungs in the chest cavity
- The heart has 4 chambers that pump blood through 2 vascular systems at about the same rate but at different pressures: *1) pulmonary (lungs)* *2) systemic (body)*
- Major structures of the heart:
  - ~ *right atria receives blood from the vena cava*
  - ~ *right ventricle receives blood from the right atria*
  - ~ *left atria receives blood from the pulmonary veins*
  - ~ *left ventricle receives blood from the left atria*
  - ~ *the heart valves ensure one directional flow*
- Blood leaves the right ventricle via the pulmonary artery and the left ventricle via the aorta

Heart Cycle (timings)

- Typical resting heart rate is 60 – 80 bpm
  - ~ *1 beat per 0.8 seconds*

1) All 4 chambers fill in about 0.4 seconds
2) Atria contract and fill the ventricles in only 0.1 seconds
3) Ventricles contract and empty whilst the atria refill in 0.3 seconds

- The cycle will only take 0.3 seconds if the heart rate is 200 bpm

Heart Valves

- The valves ensure that blood only flows in one direction:
  - ~ *valves close as the pressure increases in its chambers*
- Valves are attached to the heart wall by chordae tendinae
- Atrioventricular Valves:
  - ~ *right side : tricuspid valve*
  - ~ *left side : bicispid / mitral valve*
  - # *mitral regurgitation occurs when a valve doesn't close fully*
- Ventricular / Semilunar Valves:
  - ~ *right side : pulmonary valve* ~ *left side : aortic valve*
- Heart sounds : lub-dub sound when valves close

Structure of the Heart Wall

- The heart wall consists of:
  Epicardium ~ *a connective (areolar) tissue layer beneath an outer mesothelium lining*
  Myocardium ~ *thick layer of cardiac muscle, blood vessels and nerves*
  Endocardium ~ *inner lining of simple squamous epithelia and connective (areolar) tissue*