MECHANICAL CHARACTERISTICS
- Like in skeletal muscle, there is a resting length at which the contraction of the cardiac muscle is maximal.
- The initial length of the fibers is determined by the degree of diastolic filling (that’s what stretches the sarcomeres).
- The pressure these fibers develop when they contract increases along with the filling pressure – up to a point. Then it decreases again.
- The stretching of fibers causes Troponin C to increase its affinity for calcium, which in turn increases contractility.
- HOWEVER the decrease in contraction strength is NOT due to a decrease in the number of cross-bridges like it is in skeletal muscle. A stupidly dilated heart still hasn’t got to that point.
- Instead the decrease is due to disruption of the myocardial fibers- they come apart at the intercalated discs.

AUTONOMIC FACTORS INFLUENCING CONTRACTILITY
- Beta-1 receptors affect the contractility of the heart by influencing Ca++ homeostasis:
  - They produce cAMP, which in turn activates Protein Kinase A, which in turn phosphorylates voltage-gated calcium channels, forcing them to spend more time in the open state.
  - Protein Kinase A also phosphorylate phospholamban, which causes the SERCA pump to concentrate more potassium in the sarcoplasmic reticulum, and the result is more calcium release during the contraction.
  - Increased SERCA activity also means shortened relaxation time, which is important if the heart rate is increased (a nicely relaxed ventricle permits better diastolic filling)
- The heart also has Beta-2 receptors, but they are not innervated, and are concentrated in the atria.

CARDIAC METABOLISM
- Our hearts have an insanely generous blood supply, numerous mitochondria, and they have a higher concentration of myoglobin.
- Normally, less than 1% is produced by anaerobic metabolism; in states of great strive this can go up to 10%, but that’s about it. Under anaerobic conditions no contraction is possible.

  Normally, the heart is a fat-burning organ
  - 35% of the caloric needs are satisfied by CARBOHYDRATES
  - 5% by KETONES
  - 60% by FAT
  - Of tis fat, 50% is in the form of circulating free fatty acids

References: Ganong Review of Medical physiology, 23rd ed, chapter 5