Length-tension relationship

- Muscle can generate greatest tension at its resting length
- Same thing is true of each individual sarcomere (see Fig 10.10)
- Tension generated proportional to # of cross bridges that can form
- Number of cross bridges available depends on overlap of thick and thin filament

Muscle twitch (Fig 10.15)

- 1 nerve impulse -> 1 twitch
- Isotonic twitch
- Isometric twitch
- What determine latency?
- All or none phenomenon
- Twitch varies with muscle type

Load and velocity

- Increasing load decrease velocity of shortening
- What is happening at sarcomere level?
- Mechanical power = force x velocity = work per unit time
- At what speed of shortening, is work/ATP usage most efficient?

Strength of contraction

- Recruitment of motor units
  - Recruitment starts with small units, then larger units
  - Postural muscles have asynchronous firing pattern of motor units
- Frequency of contraction of individual motor units

Tetany and fused tetany (Fig 10.16)

- Why is tension in tetany > tension generated in a single twitch?
- Depends on stretching series elastic components
Energetics of muscle contraction

• ATP needed for
  – Power stroke
  – Break cross bridge
  – Resequester calcium into SR

• Source of energy (Fig 10.13)
  – Phosphogens (stored ATP and creatine phosphate)
  – Anaerobic metabolism
  – Aerobic metabolism.

Anaerobic vs. aerobic path

• Aerobic
  – Relies on oxygen delivery systems (lungs and cardiovascular)
  – High ATP yield/substrate
  – But slow max rate of ATP supply

• Anaerobic
  – No oxygen required
  – Lactic acid build up, use substrate fast
  – But high max rate of ATP supply

• Use aerobic pathways exclusively where need high endurance, sustainable, non-fatiguing, slow contraction (slow myosin-ATPase)
• Use anaerobic pathway for bursts of intense power output, easily fatigue, substrate used high and produce lactic acid.
• Recovery, oxygen debt
• What must be “recovered”?