I. Muscle energy
   A. Sources
      1. fatty acids
      2. muscle glycogen
      3. blood glucose
   
   B. Generates ATP
      1. energizing myosin head
      2. pumping of Ca^{++}

II. Skeletal Muscle Metabolism
   A. Anaerobic initially during exercise
      1. glucose $\rightarrow$ ATP + lactic acid

      2. cytoplasmic
      3. rapid ATP synthesis/ short periods only

      4. lactic acid diffuses into blood
         some remains in muscle fibers

   B. Aerobic (after about 2 minutes of exercise)
      1. glucose $\rightarrow$ ATP + CO_{2} + H_{2}O

      2. mitochondrial
      3. very efficient (36-38 ATP per glucose)

      4. glucose, fatty acids, and proteins as source materials

   C. ATP stored as creatine phosphate
      1. ATP energy used to make creatine phosphate
2. makes ATP early on during active periods

III. Classification of Skeletal Muscle Fibers
   A. Type I / Slow twitch
      1. sustained contractions
      2. resistance to fatigue
      3. increased oxidative capacity for aerobic respiration

   B. Type II / Fast twitch (white)
      1. thicker than Type I
      2. adapted for anaerobic respiration
         a. increased glycogen storage
         b. glycolytic and phosphagenic enzymes
      3. Subtypes
         a. IIB : regular fast-twitch, fast glycolytic
         b. IIA : intermediate, fast oxidative

   C. Type I and II classification dependent on innervation
      1. fast-twitch
      2. slow-twitch

IV. Exercise and Fatigue
   A. Muscle fatigue
      1. inability to maintain or reproduce a specific level of tension
      2. may be due to increased extracellular K+
      3. slow-twitch fibers --> use up glycogen
      4. fast-twitch fibers --> anaerobic
      5. junctional fatigue

   B. Response to aerobic exercise
      1. maximal oxygen uptake
      2. increase endurance --> increase mitochondria
      3. some fast glycolytic into fast oxidative
4. increased triglyceride accumulation

C. Response to resistance training
   1. hypertrophy
      a. thickening of mainly fast glycolytic fibers
      b. synthesize myofilaments

      c. myofibrils (and myofibers) may split