Adiponectin- increases insulin sensitivity and FA oxidation

Plasma glucose is maintained during exercise by:
- increasing liver glycogen mobilization
- using more plasma FFA
- increasing gluconeogenesis (lactate acid to glucose)
- decreasing glucose uptake by tissues.

The decrease in plasma insulin and the increase in plasma E, NE, GH, glucagon, and cortisol (they preserve glucose) during exercise control these mechanisms to maintain the glucose concentration.

**Muscle Glycogen Utilization:**
Glycogenolysis (breakdown of muscle glycogen) in muscle is under the dual control of epinephrine-cyclic AMP and Ca++-calmodulin. The latter’s role is enhanced during exercise due to the increase in Ca++ from the sarcoplasmic reticulum (more calcium = more muscle action because calcium binds to troponin). In this way, the delivery of fuel (glucose) parallels the activation of contraction.

The plasma FFA concentration decreases during heavy exercise even though the adipose cell is stimulated by a variety of hormones to increase triglyceride breakdown to FFA and glycerol. This may be due to:
- (a) the higher H+ concentration, which may inhibit hormone sensitive lipase,
- (b) the high levels of lactate during heavy exercise promoting the resynthesis of triglycerides,
- (c) an inadequate blood flow to adipose tissue, or
- (d) insufficient albumin needed to transport the FFA in the plasma.

**Anabolic Steroids:**
- studies show no benefit in muscle mass, but subjects are taking megadoses
- negative side effects - masculine characteristics reverting back to normal after discontinuation

**Growth Hormone:**
- more adverse effects than benefits, no promotion of strength gains