Amphetamines
Ephedrine (i.e., Ripped Fuel, Xenadrine RFA-1, Hydroxycut, Thermo Speed)

1. What type of athletic performance would this agent help (aerobic/anaerobic/strength)
   • Power and speed types of events

2. What is the purported mechanism of action for the agent?
   • Activates the SNS
   • Thought to increase concentration and alertness
   • Thought to improve performance by delaying fatigue, increasing speed and power

3. How does it actually improve performance?
   • Increases strength, acceleration, HR$_{\text{max}}$, time to fatigue

4. Is it safe, legal and effective?
   • Can elevate HR and BP
   • Can trigger cardiac arrhythmia
   • Addictive
   • Legality depends on the sport (Banned in NFL and Olympics)
   • Believed to have been the cause of death in a number of athletes
Caffeine

1. What type of athletic performance would this agent help (aerobic/anaerobic/strength)
   - Power and speed types of events
   - Aerobic Events

2. What is the purported mechanism of action for the agent?
   - Activates the CNS
   - Thought to increase concentration and alertness
   - Thought to improve performance by delaying fatigue, increasing speed and power

3. How does it actually improve performance?
   - Increases catecholamine release
   - Increases Fatty Acid mobilization which can spare muscle glycogen

4. Is it safe, legal and effective?
   - Addictive
   - Can cause nervousness/restlessness and insomnia
   - Can cause dehydration
   - Legality depends on the sport
Anabolic Steroids

1. What type of athletic performance would this agent help (aerobic/anaerobic/strength)
   • Power and speed types of events

2. What is the purported mechanism of action for the agent?
   • Accelerates growth
   • Increases FFM and muscle mass
   • Facilitates recovery

3. How does it actually improve performance?
   • Increases body mass, FFM, muscle size and strength

4. Is it safe, legal and effective?
   • Illegal in most sports
   • Many risks
     • Suppression of gonadotropic hormones
     • Early closure of epiphysis in children
     • Liver damage
     • Cardiomyopathy
     • Increased cholesterol levels
     • Changes in mood swings and violent behavior
Erythropoietin (EPO)

1. What type of athletic performance would this agent help (aerobic/anaerobic/strength)
   • Endurance events

2. What is the purported mechanism of action for the agent?
   • Increases RBC production

3. How does it actually improve performance?
   • Increased RBC concentration which increases \( O_2 \) carrying capacity of the blood
   • Increases Hct and Hb by ~10%
   • Increases \( VO_{2\text{max}} \) by ~6-8%
   • Increases time to fatigue by ~13-17%

4. Is it safe, legal and effective?
   • Illegal in a number of sports (Olympic Sports, Cycling)
   • New testing procedures can detect the use of EPO
   • While effective, can increase blood viscosity
     • Can lead to clotting and heart failure
Oxygen Supplementation

1. What type of athletic performance would this agent help (aerobic/anaerobic/strength)
   - Endurance events
   - Recovery (?)

2. What is the purported mechanism of action for the agent?
   - Increases O$_2$ content of blood

3. How does it actually improve performance?
   - Can enhance blood O$_2$ content, but only if the oxygen is breathed during exercise

4. Is it safe, legal and effective?
   - No effect if performed prior to exercise or to enhance recovery following exercise (possibly may be helpful at altitude)
   - Effectiveness is doubtful in a “real-world” setting as one would have to carry an oxygen tank with them during exercise
   - Legality ????
Bicarbonate Loading

1. What type of athletic performance would this agent help (aerobic/anaerobic/strength)
   - Anaerobic events lasting 1-7 minutes in duration

2. What is the purported mechanism of action for the agent?
   - Increases blood bicarbonate levels which increases blood buffering capacity

3. How does it actually improve performance?
   - Decreases blood lactate accumulation which results in less $[H^+]$ in the blood. This will increase time to fatigue during high intensity, short duration events
   - Time to fatigue can be increased by ~42% in these types of activities

4. Is it safe, legal and effective?
   - Relatively safe and legal
   - Can consume ~300mg of bicarbonate/kg body wt about 45 min to 1 hour prior to the event.
   - Risks: Diarrhea, cramps, bloating
Creatine Supplementation

1. What type of athletic performance would this agent help (aerobic/anaerobic/strength)
   - Power or sprint events that are repeated
   - Does not increase strength

2. What is the purported mechanism of action for the agent?
   - Increases skeletal muscle creatine (Cr) levels
   - Increased muscle mass (???) and decreased body fat

3. How does it actually improve performance?
   - CrP levels are increased which enhance the ATP-CrP energy system
   - Aids in recovery of the ATP and CrP stores between repeated bouts of high intensity types of activity
   - Allows for increased time to fatigue during subsequent bouts of exercise due to enhanced recovery
   - Does not increase strength or muscle mass

4. Is it safe, legal and effective?
   - Generally legal and believed to be safe
   - Should not be used chronically (i.e., every day)
   - Acute use: 20 g/d beginning 1 week prior to a competition