Tuesday, July 24, 2018

Chapter 10: Nutrition, Fitness and Physical Activity

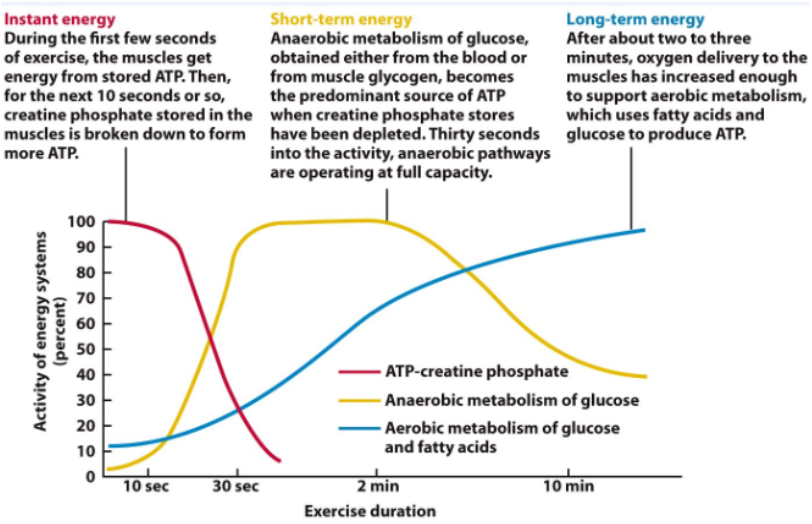
BPK 110

- 150 minutes of moderate to vigorous physical activity accumulated in 110 minute bouts
  - even more =even better (dont overtrain!)
- 2 days of strength training activity per week is also recommended

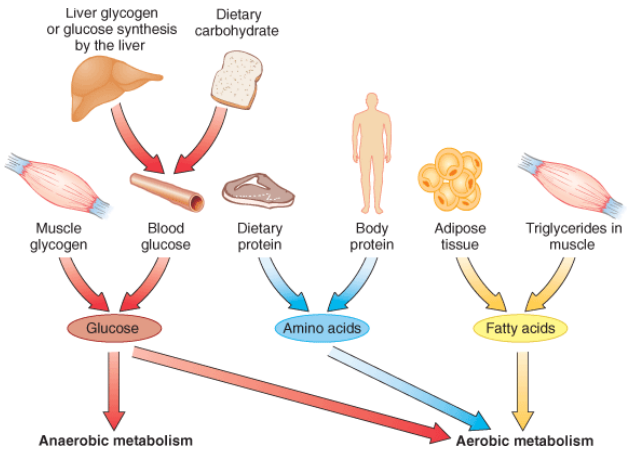
Exercise Duration and Fuel Use

4 main fuel sources for physical activity, the duration of the activity affects the preferred fuel used

- ATP & CP
- Glucose
- Fatty Acids
- Amino Acids(minor)



Aerobic vs Anaerobic



-aerobic activities: rhythmic, repetitive, sustained, activities where oxygen delivery matches oxygen need

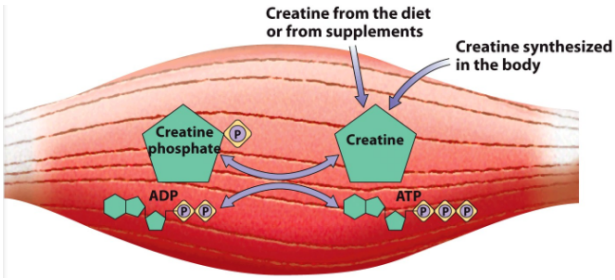
-can use glucose, fatty acids, amino acids to produce ATP

-anaerobic activities: short and intense bouts of activity where oxygen delivery cannot match high oxygen need

-can only use the nutrient glucose for fuel

Initial energy: ATP & Creatine Phosphate (CP)

- very small pool of ATP available in cells (gone in under a sec)
- CP can release phosphate which combines with ADP to form ATP



- supplies are limited, fuels activity for 8-15 s of maximal effort
- anaerobic

creatine phosphate + ADP ======= creatine +ATP

Short term and long term: **Glucose**

•Anaerobic metabolism

•Used during anaerobic activities

–Ex. Weight-lifting, sprinting

•Fuels activities from 20s to ≈ 2 min

•More likely to result in **fatigue**

Glucose —> Lactic Acid +CO2 +2 ATP

•Aerobic metabolism

•Used during aerobic activities

–Ex. Running, spinning

•Alone fuels activities 2 minutes to 20 minutes

•With fatty acids fuels activities >20min

•Less likely to result in fatigue

Glucose + Oxygen —> CO2 +H2O + 30 + ATP

Long term: Aerobic Metabolism of FA
- initially during exercise blood (FA) decreases
- after 20 minutes there is an increase in release of fatty acids from stores, becoming the **primary feel source for exercising muscles**

Protein as a Fuel for exercise
- **not a major energy source for the body**
  - amino acids must first be deaminated to be used as fuel = wasteful
  - protein promotes growth and repair of tissues, needs may therefore increase w activity levels
  - typical RDA is 0.8g/kg body weight

*the only type of energy you can use anaerobically is glucose
shorter duration = higher intensity -> use of carbohydrates as energy

Duration	Intensity	Preferred Fuel Source
8 – 15 seconds	EXTREME	ATP - CP
15 sec - ≈ 2 min	VERY HIGH	anaerobic glycolysis
2 – 20 minutes	HIGH	aerobic glycolysis
> 20 minutes	MODERATE	fatty acid oxidation

Physiological Changes Caused by Aerobic Training
- increase cell's capacity to burn fatty acids for ATP
- heat becomes larger/stronger (increase in cardiac output = more blood to flow is increased)
- total blood volume and red blood cell # increases
- muscle increases ability to store glycogen
- # and size of muscle mitochondria increase

Nutrient Considerations for Athletes
- need adequate vitamins and minerals to maximize performance
- oxidative damage increases with high levels of activity; need for antioxidants is increased
- iron needs may increase as more blood cells are formed
- water needs increase as sweat loss increases
- may need to also replenish electrolytes if sweating is excessive (to prevent hyponatremia)

To optimize performance : **Glycogen Supercompensation**
- glycogen stores and endurance are increased by *carbohydrate loading,* but will max out
  - rest for 1-3 days, consume high-carb diet before competition
- only recommended for endurance athletes (90+ min)

Pre-exercise Meal
- meals should maximize glycogen stores, adequately hydrate and minimize digestion, hunger, gastric distress
- for comp day: don't consume a new food the day of

What to eat during exercise
- endurance activities may require **carbs** to maintain glucose supplies for ATP
  - 30-60g of carb/hr is recommended

Four Core Food Handling Principle: CSCC
- **clean, seperate, cook, chill**

Organic Foods
- lower in nitrates, pesticide residues
- organic foods are not more nutrient dense than conventional foods

Genetically Modified Food
- a desirable piece of DNA is transferred into a plant cell
  - gene that promotes pesticide resistance
  - a gene that includes nutrient
- lowered amount of pesticide application

The impact of alcohol
- psychoactive drug (CNS depressant)
- should not be consumed during pregnancy (increases risk of fetal alcohol syndrome)
- associated with malnutrition (blocks B vitamins)
- can promote cirrhosis of the liver, CVD, cognitive impairments
- alcohol intake raises blood alcohol concentration in women than men
- in moderate consumers, most alcohol is broken down in the liver by **alcohol dehydrogenase**