**Nutrition & Sports PET3361 Study Guide Exam II**

## Know the legal limit for urinary caffeine concentration and how intake affects the measurement.

Caffeine is on the banned substance listed only if one has more than 15ug/ml in their urine.
Optimal Intake would be 5 mg/kg/BW given approximately 30 min before exercise to help reduce fatigue.
So, 12 – 16 cups would be banned.

Though, when exercising, the half-life of caffeine can decrease drastically. Effect of 6 hours at rest = 3 hours exercising.

## What are the performance benefits of caffeine consumption and the required dosage?

Enhances performance via the effect on the central nervous system, fat mobility (possible use of fat; lipolysis), and saves our stored CHO for later. Not much benefit with strength-power performance but benefit seen in endurance.

Recommended dosage: 2 -4 cups of coffee (200-400mg) at one dose to have an effect.

## Explain caffeine's mode of action.

- Active compound is **methylxanthine**
- **Adenosine inhibition:** Adenosine inhibits NE release (Catecholamine). When caffeine is around we have more Epinephrine secretion.
- **CNS stimulation**: Excitement in CNS, jitters, decreases pain with muscle contractions
- **PDE:** Inhibit intracellular signaling of cAMP and thus caffeine can prolong the action of cAMP by stopping PDE and the production of exercise hindering byproducts (i.e feelings of pain are reduced). Caffeine stops PDE and allows cAMP to continue on.
- Good for LIPOLYSIS but doesn't "burn more fat". This allows us to save our CHO stores for later!

## Explain green tea's mode of action.

No credible evidence exists to support claims that there are health benefits of green tea. It is rich in plant compounds that may protect lab animals from diverse diseases, but there is no final decision as to whether it protects humans against heart disease, strokes, cancer, or cognitive decline.

## Explain beta-alanine's mode of action

Beta-alanine is an Amino Acid derivative and is naturally made in our liver.
Beta-alanine increase LBM and carnosine concentrations within our skeletal muscle.
B-alanine is the Rate Limiting Enzyme for Carnosine. Carnosine is a buffer during high intensity exercise.

Mode of Action:

- Acts as a buffer during high-intensity exercise with intramuscular H+ ion buffering. This would delay our sense of fatigue
- Optimally we should take 3 – 6 g of B-alanine/day x 4 weeks. Its best to split this up by taking a a 2x800 mg dose, every 2-3 hours, 3x/day!

What does HMB stand for?

β-Hydroxy β-methylbutyric acid, or β-hydroxy β-methylbutyrate

Explain when buffering solutions may be appropriate and why. What is the typically recommended dosing guideline? Do they work?

Our bicarbonate buffering system provides a major line of defense against increased intracellular H concentration. Maintaining high bicarbonate extracellularly rapidly releases Hydrogen from cells and delays the onset of intracellular acidosis. This may result in enhanced anaerobic performance, VO2 max, training volume and LBM. Ergogenic befits of pre-exercise alkalosis occur significantly in both men and women.

Ideal is .3-.5 g/kg/BW in a .5 L solution an hour or two prior to competition.

Why is EPO use both beneficial and potentially dangerous?

EPO is a chemical that stimulates RBC production. Too many RBCs can lead to a thick and very viscous blood. This is dangerous as clotting, and potentially death can result. EPO can increase our oxygen carrying capacity and $VO_2$ max.

Explain the normal physiological status of creatine, sources and function during exercise and recovery.

95% of our creatine is stored in the muscles and the liver and kidney naturally produce it. It can also be consumed from fish and beef.
There are 3 amino acids required to produce Creatine naturally: Gly-Ala-Met.

Function during exercise: To put off going into glycolysis and lower our lactate production. This will improve exercise capacity and increases our muscle CXAs (FFM). This is great for sub 30 second exercise and doesn't have as many aerobic benefits.

Know the typical creatine supplementation dosing strategy, its effect on total Cr and the resynthesis of PCr. How does CHO influence supplementation?

If we take Creatine with CHO, we have a better surge of insulin to help drive the product into the muscle itself.

Loading phase: 20g for 5 days. Split dosing is now recommended.

What are the effects of creatine supplementation on performance in activities at different durations (intensity-dependent variable)? Has creatine been effective in longer duration activity?

Able to last a longer amount of time and increase training volume as lactate threshold was improved. This provided significance in terms of strength gains.

Can also work in endurance athletes where LBM, strength, and sprint performance were improved.

How has Cr been shown to affect body composition?

There has been no change in Fat mass or Body Fat %. There has been change in improvements with FFM and Total body mass (i.e. we are making muscle gains)

Does creatine shut down your kidney's?

Not necessarily, this is mainly anecdotal and not proven evidence. Though, Creatine can cause GI distress and weight gain.

What affects do Andro-(stenedione and stenediol) have on the body?

Androstenedione is a testosterone precursor. When taken there was no effect on testosterone levels overall. The levels can increase but once androstenedione is not taken, testosterone levels will return to normal. There is no real strength gain with this and HDL levels were lowered. Too much can lead to conversion to Estradiol to Estrogen!

Know the possible mechanisms of HMB action.

As stated in lecture, HMB is a byproduct of Leucine metabolism and thus is normally already in our bodies! We typically produce .2 - .4 g HMB/Day depending on Leucine intake.

HMB can stimulate HMG Co-A reductase, to increase substrate for muscle and cellular repair. This could also decrease the ubiquitin pathway (a pathway normally causing protein degradation) so loss of protein is prevented! HMB acts on the mTOR pathway to increase protein synthesis. HMB enhances the repair of