KINE 4400 10.26.2017

BCAAs: Branch Chain Amino Acids

* Claims: delay muscle fatigue and reduces breakdown during exercise. Boost the immune system. May inhibit muscle degradation
* Evidence: provide fuel for endurance activity but has not been shown to delay fatigue as a result, growing research suggest it may play a role in supporting immune function
* Leucine: a dietary signal to muscle
  + Leucine defines meal dose and distribution of protein
  + Efficiency of dietary protein use declines with age.
  + Exercise increases muscle response to protein.
  + mTOR 🡪 p70 S6K 🡪 protein synthesis
  + adequate leucine greatly impacts protein synthesis
  + 30 grams of protein supplies enough leucine (2.5 grams) to promote protein synthesis
  + In young adults: 15 grams supplies 1.2 grams of leucine and should be enough
* Initiation factors (eIF) for protein synthesis

HMB: beta hydroxyl beta methylbutylate

* Leucine metabolite
* Sources :
  + Catabolism of leucine transferase transanimates Leucine to alpha-ketoisocaproate (KIC).
  + 5-10% KIC converts to HMB (average 0.3 to 0.6 grams)
  + In many animal and plant based foods (catfish and alfalfa)
  + Doses of HMB would stimulate more protein synthesis (useless without more protein to supply amino acids)
* Anticatabolic agent
* Substrate for cholesterol synthesis in muscle.
  + Muscle is dependent on cholesterol synthesis to meet its needs. Increase cell membrane integrity
  + Increased cell membrane integrity with improved muscle cholesterol
* No adverse effects.
* Primary source is catabolism of leucine.
* Stimulates muscle protein synthesis and may also : increase cell membrane integrity via cholesterol synthesis, decrease indicators of muscle damage (creatine kinase levels), be an anticatabolic agent.
* Helps stimulate protein synthesis via the mTOR pathway
* Hmb improves aerobic performance, conditions associated with loss of muscle mass, wound healing capacity.
* Decrease indicators of muscle damage (CK levels)

Measuring protein breakdown: urinary 3-methylhistidine excretion (only comes during muscle breakdown). HMB decreases this excretion

Cortisol: blunt cortisol levels by consuming carbohydrates around exercise because that will reduce muscle breakdown.

**Fish Oil**

* Two fatty acids : DHA and EPA, small portions of ALA
  + Epa and dha are in cold water fish (salmon, cod)
  + Ala is in flaxseed oils, vegetable oils, and green leafy veggies
* Essential because they affect normal growth in young children
* EPA and DHA 🡪 eicosanoids and anti-inflammatory effect throughout the body.
* Fatty acids are used in the formation of cell membranes which maintain blood pressure, heart rate, nervous system function and hemostatic regulation (blood clotting)
* Low fatty acid intake : dry skin, coarse bumpy patches on skin, soft broken nails, dry hair, allergies. Poor brain function and development in children
* Effects of fish oil:
  + Reduced triglyceride levels in the blood
  + Reduce markers associated with heart health risk
  + Improve cardiovascular health, blood flow, circulation, longevity and quality of life
  + Support hearth rhythm and healthy blood vessels
* Intake: adults min 650 mg EPA and DHA per day
* ALA is not a reliable source of EPA and DHA. Only 1% gets converted

**Minerals and Vitamins**

* 20 minerals to maintain chemical reactions and body processes
* Major mineral : >100 mgs/day (Na, K, Cl, Ca, P, Mg, S) NacklCaPMgS
* Trace mineral: <100 mgs/day (Fe, Cu, Zn, Se, I, Cr, Fl, Mn, Molybdenum)
* Cofactor : binds to incomplete enzyme to activate enzyme so that enzyme can bind to molecule involved in chemical reaction and accelerate the transformation (enzyme and cofactor can be reused)
* Hormone that regulates calcium: calcitonin
* Parathyroid hormone initiates either the stimulation of calcium release form bone. Or kidneys either reduce calcium loss in urine or activate vitamin D which increases calcium absorption
* Zinc: scavenging free radicals, DNA and RNA synthesis, carb metabolism, acid-base balance, absorption of folate from food, storage and release of insulin, mobilization of vitamin A from liver, stabilization of cell membranes, influences hormonal regulation of cell division
* Iodine: ¾ in thyroid gland (metabolic rate, growth, dev and promote protein synthesis)
* Fat soluble vitamins: ADEK
* Water Soluble: C and B (thiamin, riboflavin, niacin, biotin, pantothenic acid, b6 and b12 colobamin)
* Coenzyme : an organic non-protein substance that binds to an enzyme to promote its activity
* Anti-oxidant: fight free radicals
* B: energy in carbs, fat and protein to ATP
* C: connective tissue and an antioxidant