

Strength and Conditioning

Nutrient intake and timing



Objectives

- Provide leaders with nutrition education for assisting their Soldiers achieve appropriate strength, endurance and conditioning goals.
- Develop Soldier Athletes
- Increase Soldier readiness.



Nutrient Basics: Soldier Fueling

- Soldiers train with higher intensity and more frequency
 - More activity leads to more energy used and potential nutrient depletion
- The body relies on different energy systems at different exercise intensities
 - Active person relies on quick-energy systems
- Duration of exercise depends on availability of fuel used for that intensity



Energy Pathways: *transfer*

- Three systems are used to transfer stored energy to form ATP:
 - Phosphagen System: Used for short bursts of 5 seconds.
 - Glycolytic System:
Uses glucose with out oxygen for high intensity activities of approximately 1 to 3 minutes
 - Aerobic System:
Uses Carbohydrates (CHO), Fat, and some protein (PRO) for sustained activity.
- All 3 systems work simultaneously but one system may predominate based on activity.

Energy intake: *how does this affect energy pathways?*

- Food intake influences availability of fuel for exercise
- You have specific nutrient requirements
 - Energy/Calories
 - Carbohydrates
 - Protein
 - Fluid
- Strength, Endurance, and Conditioning
 - Pick foods and beverages that provide the nutrients you need and properly timing their intake.

Calories

- Calories come from four sources:
 - Carbohydrates: 4 kcals/gram
 - Protein: 4 kcals/gram
 - Fat: 9 kcals/gram
 - Alcohol : 7 kcals/gram

Nutrition Facts	
Serving Size 1 teaspoon (1.5g)	
Amount Per Serving	
Calories 5	Calories from Fat 0
% Daily Value*	
Total Fat 0 g	0%
Trans Fat 0 g	0%
Cholesterol 0 mg	0%
Sodium 0 mg	0%
Total Carbohydrate 1 g	0%
Protein 0 g	0%

Not a significant source of Saturated Fat, Dietary Fiber, Sugars, Vitamin A, Vitamin C, Calcium and Iron.

Carbohydrates

- Carbohydrates are the best source of energy.
 - More available during higher-intensity exercise
 - Needed to completely burn fat
 - Limited storage space
 - Therefore running out of CHO can be a problem.
 - Difficult to sustain high intensity training.
 - Availability greatly affected by amount in diet
 - Availability also affected by muscle mass.

Limited Stores: Carbohydrate Stores

180 lb. active Soldier Athlete

2,160 calories total CHO stores

72,000+ calories total FAT stores

Calories	Storage Place	Purpose
96	Blood	Feed brain
384	Liver	Blood sugar
<u>1680</u>	<u>Muscle</u>	<u>Fuel Muscles</u>

Carbohydrates

- Carbohydrates stores are depleted and then replenished more rapidly than fat stores
 - 3 hours of intense training may deplete CHO stores.
 - *Impact of repeated training sessions?*
- Amount of carbohydrates in diet greatly influences how much carbohydrate we store
 - Low carbohydrate diets deplete CHO stores
 - Paleo dieting will deplete CHO stores
 - Can take multiple days to replenish CHO stores

Protein

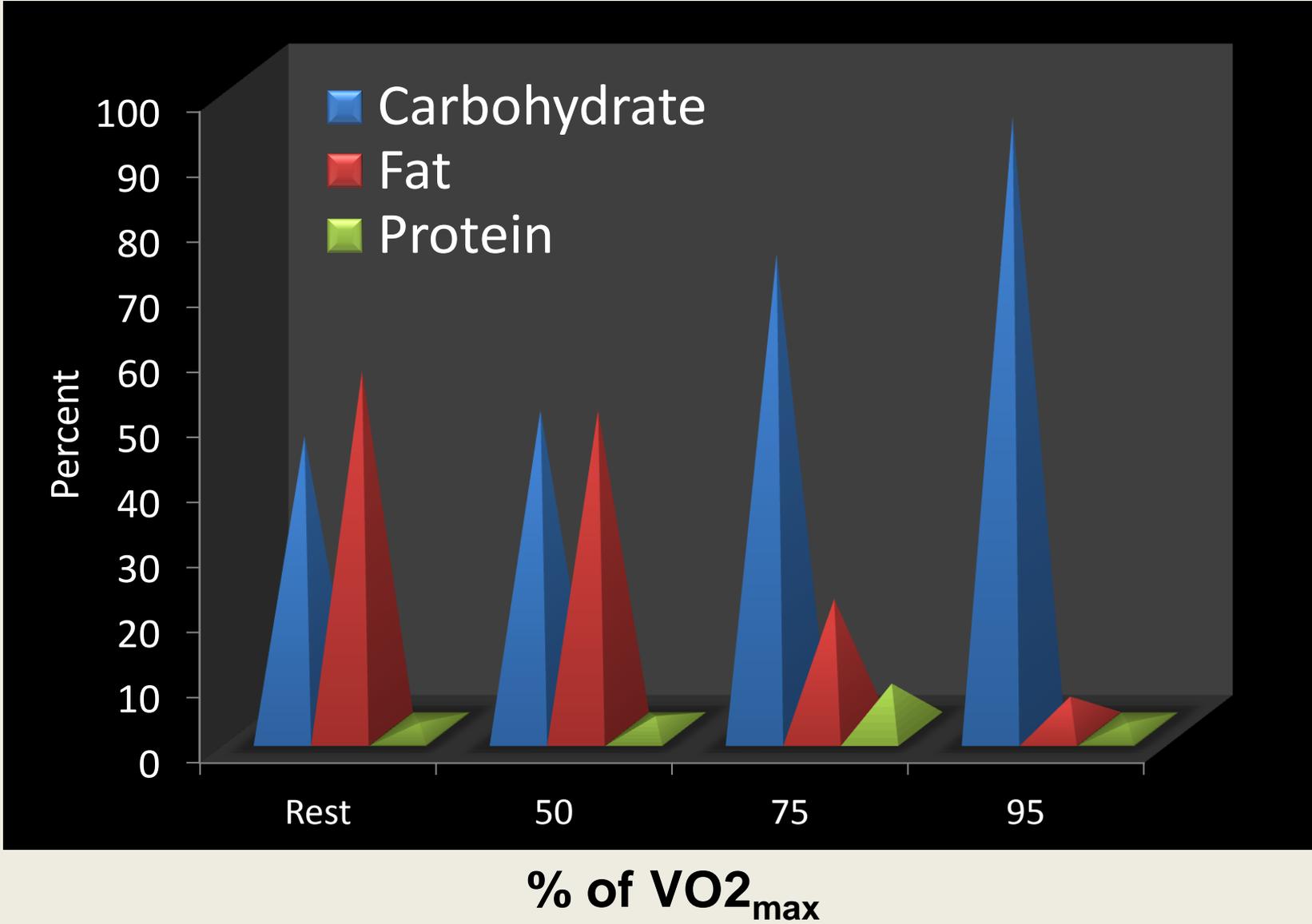
- Necessary for growth and repair of muscles, by providing amino acids.
- Eating too much protein does not lead to increased strength.
 - Can decrease CHO intake
 - Dehydration
- When you transition from an endurance event to a strength event, protein intake increases and CHO intake decreases.

Fat

- Necessary to provide fatty acids for cellular integrity.
 - Modulates the inflammatory response.
- Saturated fats are pro inflammatory
- Unsaturated fats are less inflammatory:
 - Poly/Mono-fats



Fuel Utilization at Different Exercise Intensities



Strength Training

- The use of resistance to force stress onto a muscle.
- Causes muscle damage and soreness.
- Causes increased CHO and Protein requirements.
- Strength and muscle mass occur during recovery and nutrient intake; but only after you have stressed the muscle.



Nutrition: Strength Training

- **25-35kcal/kg** per day
- **Carbohydrate intake:** more than 6 g/kg
 - 8 g/kg to 10 g/kg
- **Protein intake** : 1.4 g/kg to 1.7 g/kg
- **Fat intake:** remainder of total calories
- **Fluid** :
 - About 1 gallon/day (At least)
 - Estimate also out as 1ml fluid to every 1 calorie (if you need 2,000calories/day than you need at least 2,000ml fluid/day).
- *Conversion of body in pounds to kg: 1 kg is 2.2 pounds. So if you are 185 pounds that is 185 pounds/ 2.2kg = 84kg*

Carbohydrates: 6 grams/kg

- Carbohydrate intake should be:
 - Choose whole grains as your carbohydrate meal choices (breads, bagels, tortillas, cereals, oatmeal, granola bars, crackers, pastas, rice, potatoes, etc.)
 - Fruit and 100% fruit juice
 - Dairy (less than 2% fat)
 - Whole/Complex CHO before exercise
 - Simple CHO during and after exercise

Protein: 1.4-1.7grams/kg

- Choose lean proteins such as chicken or turkey without skin, lean cuts of red meat, fish, low-fat dairy, eggs, beans, tofu, or protein powders.
 - Complex/Slow absorbing during recovery
 - Quick/Fast absorbing before strength exercises and immediately following

Fat: Unsaturated Fats

- Fat intake should be the remainder of total calories with an emphasis on heart-healthy fats
 - Increase intake of healthy fats (peanut butter, nuts, seeds, flaxseed, olive oil, salmon/tuna) and decrease intake of saturated fats (fried foods, baked/packaged goods, and gravy, sauces/spreads)



Strength Training: Meal Planning

- Eat frequent meals and snacks throughout the day (every 1-3 hours).
- Do not skip meals
- Include a whole grain carbohydrate and a lean protein/healthy fat with all meals and snacks to increase satiety.
- Include non-starchy vegetables and fruits with meals and snacks.

Strength Training: Other

- Hydration should be adequate so that urine color is pale yellow throughout the day
 - Rely on water throughout the day and water/sports drinks during exercise
- Include high-sodium foods to replace sodium lost in sweat
 - Crackers, pretzels, baked chips, popcorn, deli meat, beef/turkey jerky, pickles, soups, and frozen/boxed/canned foods, and add table salt at meals
- Consume post-exercise snack as soon as possible (within 30 minutes) after training
- Limit alcohol and fast-food intake

Pre-Exercise Eating: Strength

- Meal timing: 3 to 4 hours before exercise
 - Meal composition: High in low-glycemic carbohydrate (200 g to 300 g) and lean protein, low in fiber and fat
 - Meal hydration: Four hours before activity 17-20 oz water or sports drink

Pre-Exercise Eating: Strength

- Snack timing: 30 minutes to 1 hour before exercise
 - Snack composition: High in carbohydrate, moderate in protein, low in fat and fiber
 - Snack hydration: 5-10 oz water or sports drink

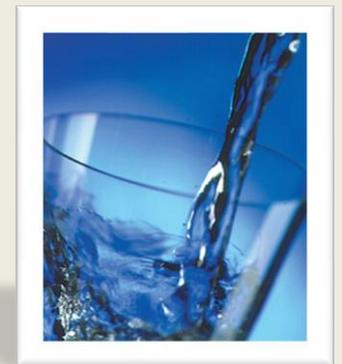


Eating During Exercise: Strength

- Carbohydrate should be provided for exercise lasting over an hour.
- Timing: Consume 30 g to 60 g carbohydrate/hour spaced every 15 to 20 minutes (after the first hour).
- Composition: Moderate-glycemic carbohydrate with small amounts of protein, low in fat and fiber (granola bars, crackers, high-carbohydrate/moderate-protein energy bars, dry whole grain cereal, fruit, carbohydrate/protein shakes).

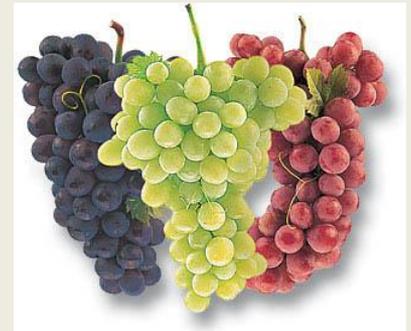
Hydration During Exercise: Strength

- Hydration: Dependent on sweat rate
 - Average: 5-10 oz water or sports drink every 15 to 20 minutes
 - Sports drinks
 - Replace electrolytes lost with sports drink or foods high in sodium/potassium



Post-Exercise Eating: Strength

- Snack timing: Within 30 minutes post-exercise
- Snack composition: 4:1 ratio of high-glycemic carbohydrate to lean protein
 - Recommended amount: 1.0 g to 1.5 g carbohydrate/kg; 10 g to 20 g high-quality protein

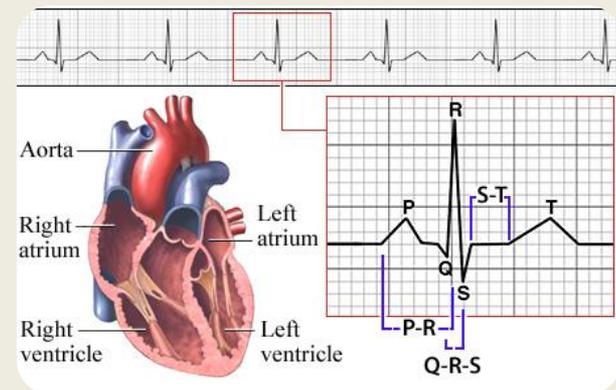


Post-Exercise Eating: Strength

- Meal timing: 2 hours after exercise (continue meals in 2-hour intervals up to 6 hours)
- Meal composition: Moderate-glycemic carbohydrate and lean protein, low in fiber and fat
 - Recommended amount: 1.0 -1.5 g CHO/kg
- Hydration: 16-24 oz water or sports drink for every pound lost during exercise

Endurance Training

- Generally refers to aerobic exercises.
- Focus is programming the energy pathways and building cardiovascular strength.
- Muscle strength is important, but mass can hinder performance.

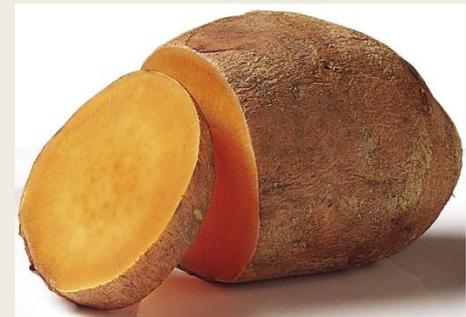


Nutrition: Endurance Training

- **25-35kcal/kg** per day
- **Carbohydrate intake:** 5-12 g/kg
- **Protein intake** : 1.2 g/kg to 1.7 g/kg
- **Fat intake**: 0.8 g/kg to 1.0 g/kg
- **Fluid** :
 - About 1 gallon/day (At least)
 - Estimate also out as 1ml fluid to every 1 calorie (if you need 2,000calories/day than you need at least 2,000ml fluid/day).
- *Conversion of body in pounds to kg: 1 kg is 2.2 pounds. So if you are 185 pounds that is $185 \text{ pounds} / 2.2\text{kg} = 84\text{kg}$*

Carbohydrates: 5-12gm/kg

- 5 g/kg to 7 g/kg for moderate-duration and low-intensity training.
- 7 g/kg to 12 g/kg for moderate to heavy training
- 10 g/kg to 12 g/kg for extreme training



Carbohydrates: Endurance

- Choose whole, high-fiber grains as your carbohydrate meal choices (breads, bagels, tortillas, cereals, oatmeal, granola bars, crackers, pastas, rice, potatoes, etc.)
- Simple for small snacks: fruit, fruit juice, peanut butter, candy bars, low fat dairy.

Protein: 1.2-1.7 g/kg : Endurance

- Choose lean proteins such as chicken or turkey without skin, lean cuts of red meat, fish, low-fat dairy, eggs, beans, tofu, rice, protein powder
- Limit protein immediately before an endurance event.
 - Limit slow absorbing protein (Casein, complex foods).

Fat: 0.8 -1.0 g/kg: Endurance

- Increase intake of healthy fats (peanut butter, nuts, seeds, flaxseed, olive oil, salmon/tuna).
- Decrease intake of saturated fats (fried foods, baked/packaged goods, most breakfast meats, butter, margarine).



Endurance: Meal Planning

- Eat frequent meals and snacks throughout the day
- Do not skip meals
- Include a whole grain carbohydrate and a lean protein/healthy fat with all meals and snacks to increase satiety
- Include non-starchy vegetable and fruits with meals and snacks

Endurance: Other

- Hydration should be adequate so that urine color is pale yellow throughout the day
 - Rely on water throughout the day and water/sports drinks during exercise
- Consume post-exercise snack as soon as possible (within 45 minutes) after training
- Limit alcohol intake

Pre-Exercise Eating: Endurance

- Meal timing: 3 to 4 hours before exercise
- Meal composition: High in low-glycemic carbohydrate (200 g to 300 g) and lean protein, low in fiber and fat
- Meal hydration: Four hours before activity 17 - 20 oz water or sports drink

Pre-Exercise Eating: Endurance

- Snack timing: 30-60 minutes before exercise
- Snack composition: High in carbohydrate, moderate in protein, low in fat and fiber
- Snack hydration: 5-10 oz water or sports drink

During-Exercise Eating: Endurance

- Carbohydrate intake should begin shortly after the onset of activity
- Timing: Consume 30-60 g CHO/hour spaced every 15 to 20 minutes
- Composition: High-glycemic carbohydrate such as sports drinks/gels/blocks/beans, fruit, high-carbohydrate bars with moderate protein, crackers, etc.
- Hydration: Dependent on sweat rate
 - Average: 5-10 oz water or sports drink every 15 to 20 minutes
 - Sports drinks
 - Replace electrolytes lost via sports drink or foods high in sodium/potassium

Post-Exercise Eating: Endurance

- Snack timing: Within 45 minutes post-exercise
- Snack composition: 4:1 ratio of high-glycemic carbohydrate to lean protein
 - Recommended amount: 1.0 -1.5 g carbohydrate/kg

Post-Exercise Eating: Endurance

- Meal timing: 2 hours after exercise (continue meals in 2-hour intervals up to 6 hours)
- Meal composition: High in low- to moderate-glycemic carbohydrate and lean protein, low in fiber and fat
 - Recommended amount: 1.0 -1.5 g carbohydrate/kg
- Hydration: 16 -24 oz water or sports drink for every pound lost during exercise

Similarities

- Always eating (1-3 hours)
- Complex foods before training and during recovery.
- Simple foods immediately before and during exercise.
- Consume nutrients immediately after an exercise session.
- Hydration and CHO are depleted by both exercise events.

Fluid Requirements

- Before exercise:
 - 16 oz/1 pint – 2 hours before
 - Drink additional ½ pint - 20 min before exercise if expecting workout hard in hot weather/warm environment
- During exercise
 - 4-16 oz every 15 minutes (1/2 – 2 quarts per hour)
 - Every “gulp” is one ounce
 - Don’t drink to the point of cramping, but don’t rely on thirst
- After activity
 - 16-24 oz / lb body weight lost
 - Or “one pint per pound”
 - Electrolyte CHO beverage for more than 60 minutes of training

Food sources of carbohydrate: Quick References

- Starches (15 grams/serving)
 - 1 slice bread (whole grain preferable before exercise, and white bread preferable after exercise)
 - ¼ bagel
 - ½ cup cooked cereal or ¾ cup cold cereal
 - 1/3 cup cooked pasta or rice
 - 1 serving fruit, fruit juice
- Starchy Vegetables (15 g/serving)
 - ½ cup cooked beans, peas, corn or mashed potatoes
 - ¼ cup baked potato

Food sources of protein: Quick References

An ounce of meat or fish has approximately 7 grams of protein.

Meat

- Hamburger patty, 4 oz – 28 g
- Steak, 6 oz – 42 g
- Chicken breast, 3.5 oz – 30g
- Fish fillets are 6 grams/oz
- Tuna, 6 oz can - 40 g
- Pork loin 4 oz – 29 g
- Ham, 3 oz serving – 19 grams
- Egg, large - 6 g
- Milk, 1 cup - 8 g
- Cottage cheese, ½ cup - 15 g
- Peanut butter, 2 g
Tablespoons - 8 g
- Most beans about 7-10 g / ½
cup cooked beans

Supplements

- Dietary Supplement Health and Education Act (DSHEA): 1994
 - Dietary supplements are NOT regulated or tested like drugs
 - Manufacturers are free to market supplements without proof of safety or efficacy
 - No FDA approval needed to sell
 - No established dosage guidelines
 - No purity restrictions
- Be Careful with supplements!



Supplements: Stay Away from...

- Androstenedione
- -dione
- Prohormones
- OTC Anabolic
- **DMAA/Geranium oil**
- **HCG**
- **JACK3D/OXYLITE Pro**
- **DHEA**
- Hydroxycut
- NO explode or other vasodilators.
- Metabolic boosters/Weight loss
- Tribulus Terrestris
- Ephedrine
- Mega doses Fat Soluble Vitamins
- Yohimbine
- Detox/Cleanse/Fasting supplements

Supplements Resources



ConsumerLab.com A for-profit organization that provides independent testing and information on dietary supplements. Subscription is required. <http://humanperformanceresourcecenter.org/dietary->



[Natural Products Association \(NPA\)](http://NaturalProductsAssociation.org) A non-profit organization that offers product testing of dietary supplement through it's TruLabel and GMP certification programs. The Association was the first organization to offer a third-party GMP certification program specific to the manufacturing of dietary supplements and dietary ingredients.



[The Navy/Marine Corps Public Health Center](http://NavyMarineCorpsPHC.org) The Navy/Marine Corps Public Health Center's (NMCPHC) portal for information on dietary supplements.



[NSF International](http://NSFInternational.org) A non-profit organization that offers programs and services to augment and support the work of regulatory officials. One of its roles is to provide product testing and certification for dietary supplements.



[Office of Dietary Supplements](http://OfficeofDietarySupplements.nih.gov) The Office of Dietary Supplements (ODS) at the National Institutes of Health (NIH) provides evidence-based information, guidelines, and resources on dietary supplements, supports research, and provides research results.



[United States Army Public Health Command \(Provisional\)](http://ArmyPHC.org) The Army's portal for providing information and resources on dietary supplements for service members, their families, and health care providers.



[United States Pharmacopeias \(USP\)](http://USP.org) A non-governmental company that sets standards for the quality, purity, strength, and consistency of dietary supplements. USP's standards are recognized and used in more than 130 countries around the globe.

More Information

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