Overview: Protein

- Protein Requirements
  - Intake for athletes
  - Adequate calories

- Supplements vs. Food
  - High protein diet

- Building Muscle
  - Protein before, during & after exercise

- Recovery Nutrition
  - Protein: Timing, Type, Amount
The **most important** fuel for the muscle is:

a. Protein  
b. Carbohydrates  
c. Fat  
d. Creatine
3 Related Energy Systems

1. Immediate Energy
   - Creatine Phosphate

2. Anaerobic System
   - Glucose

3. Aerobic System
   - Glucose
   - Fat
   - Protein (not significant)
Carbohydrates Spare Protein

- Protein is NOT the most important fuel for muscles. **Carbohydrates most important fuel**
- During Exercise:
  - With adequate carbs – protein provides 5% of fuel for muscle
  - When glycogen low – protein provides 15% of fuel for muscle

- The best use of protein is for structural (muscle growth & repair) rather than energy
- Carbohydrate intake adequate to meet energy needs, protein is saved for muscle repair & growth.
Protein Recommendations

RDA (Recommended Dietary Allowance) for protein is .8 grams/kg of body weight

Endurance athletes need 1.2-1.4 g/kg/bw

Strength athletes need 1.4-1.7 g/kg/bw

Intermittent sports 1.2-1.6 grams/kg/bw
How much protein do you need?

- Weekly exerciser needs 1 g/kg/bw
- Endurance athletes need 1.2-1.4 g/kg/bw
- Strength athletes need 1.4-1.7 g/kg/bw
- Intermittent sports 1.2-1.6 grams/kg/bw

\[
\text{Weight (lbs)} \div 2.2 = \text{kg body weight}
\]

\[(\text{kg body weight}) \times \text{protein grams/day}\]
Adequate Calorie Intake

Athletes with adequate calorie intake tend to have adequate protein intake

If caloric intake is inadequate:
- Protein used for energy during rest & exercise
- During exercise, the majority of the protein used for energy comes from muscle
- When protein continues to be an energy source – muscle mass decreases.
Gold Standard Whey Powder

“consists of proteins strategically broken down (hydrolyzed) into smaller pieces called peptides for faster utilization by the body.”

**Challenge Statement #1:** Protein supplements (like Gold Standard), help the body increase muscle size & strength better than protein from food.

Agree or Disagree with statement – Why?
Supplement vs Food

- NO evidence that hydrolyzed or micronized protein is better than protein from food (EAA)
  - Overall, supplements are NOT more easily absorbed
  - Absorption differs only if athlete fasting/low calorie diet
  - Whey absorbed faster than casein, only when no carbs & fat

- Supplements not regulated by FDA & claims don’t have to be true

- Protein supplements convenient but offer no advantage

- Protein from food stimulates muscle growth as well as supplements...many studies show food more effective.
Good Sources of Protein

- Contain all 9 EAA
- 1 oz. meat, fish, chicken, eggs = 6-8 grams protein
- ½ cup milk or yogurt = 8 g protein
- Food list in *Eating for Endurance* - pg. 63
# Combining Plant Groups

Combine any 2 food categories to provide all 9 EAA

<table>
<thead>
<tr>
<th>Grains</th>
<th>Legumes</th>
<th>Seeds &amp; Nuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>Beans</td>
<td>Almonds</td>
</tr>
<tr>
<td>Wheat</td>
<td>Lentils</td>
<td>Cashews</td>
</tr>
<tr>
<td>Oats</td>
<td>Peanuts &amp; Peanut butter</td>
<td>All other nuts &amp; seeds</td>
</tr>
</tbody>
</table>
Important...Calorie Intake!

- Adequate calorie intake more important than protein intake to increase muscle mass.

- Your total calorie intake more important than timing your protein intake before or after workouts for building muscle.

- If you can’t gain muscle weight, you probably are not eating enough calories.
High Protein Diet

- All proteins have an amine (NH$_2$) group
- When protein is **used for energy**, it is stripped of the NH$_2$ group
- NH$_2$ forms urea, carried via the blood to the kidneys where it is excreted as urine.
High Protein Diet

- Places stress on kidney
  - Body has to excrete NH2 in form of urea
  - This increases the body’s water loss via urine

- Failure to increase fluids leads to dehydration & compromised performance

- Drink plenty of fluids to stay hydrated if choosing a high protein diet
Before Exercise

*Post muscle growth is improved when protein is consumed *prior to exercise* (amino acids are available)*

*Old Advice:*
- Consume protein 1-hour prior

*New Advice:*
- Consume protein 1-4 hours prior to exercise.

- Majority of food is carbs with some protein
- Don’t train hungry
During Exercise

- Protein (amino acids) uptake does not increase during intense resistance training (weight lifting).
- Proteins (amino acids) are not used for energy during workout.
Challenge Question #2

After intense weight training, how long does it take to rebuild muscle?

a) 1 hour
b) 2 hours
c) 6 hours
d) 24 hours
After Exercise

- Protein is **key nutrient** for post exercise muscle recovery.

- Amino acid uptake increases after intense training indicating that amino acids are used for muscle repair.

- This post exercise muscle repair is why athletes have higher protein needs.
After: Recovery Nutrition

Normal responses to strenuous exercise:
- Muscle protein degradation
- Decrease of the immune system
  - Temporary suppresses immune function
  - Increases inflammation

Recovery nutrition:
- Minimize muscle breakdown & inflammation
- Consume carbs & protein after exercise:
  - 30-60 minutes after exercise to stop muscle breakdown “metabolic window”
  - Again 2 hours later for muscle growth
After: Timing of Protein

- 30-60 minutes after exercise, nutrition can decrease muscle breakdown & begin muscle repair.
  - Protein 30-60 minutes after exercise to stop muscle breakdown.

- Protein 2 hours later to increase muscle growth.

- Post meals with protein contribute to muscle gain up to 24 hours.
After: What type of protein?

- High quality protein (milk, yogurt, eggs, meat, soy) supports muscle gain.

- Milk protein (whey & casein) has slight edge over soy protein.
  - More studies needed
  - Whey found in yogurt and cottage cheese
  - Casein found in milk
After: How much protein?

- Current research shows range of 6-20 grams of high quality protein (all 9 EAA)
- No benefit with >20 grams of protein
- Results depend on fasting, intensity of exercise, gender, etc.
# NEW: Post Exercise Recovery

<table>
<thead>
<tr>
<th>Endurance Athlete</th>
<th>Strength Athlete</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:1 Carbs to Protein Ratio</td>
<td>2:1 Carbs to Protein Ratio</td>
</tr>
<tr>
<td><em>30 min.</em> after exercise &amp; again <em>2 hours later.</em></td>
<td><em>30 min.</em> after exercise &amp; again <em>2 hours later.</em></td>
</tr>
<tr>
<td>Carbs: 1.5 g/kg of body wt.</td>
<td>Carbs: 1.5 g/kg of body wt.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Triathlete weighing 175 lbs (79 kg)</td>
<td>Power Lifter weighing 175 lbs (79 kg)</td>
</tr>
<tr>
<td>Carbs: 79 x 1.5 g/kg = 119 g.</td>
<td>Carbs: 79 x 1.5 g/kg = 119 g.</td>
</tr>
<tr>
<td>Protein = 30 g.</td>
<td>Protein = 60 g.</td>
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</tbody>
</table>
How Long to Build Muscle?

- Muscle growth occurs when production exceeds breakdown over a period of time.
- It takes at least 24 hours to rebuild muscle proteins after intense exercise.
- Much more research is needed to determine the role protein plays before, during, and after exercise.
Recommendations

**Before**: Protein included in meal/snack

**After**: Consume 6-20 g. protein 30 min & 2 hours
- Milk protein (whey & casein) slightly better than soy
- 4:1 Carb to Protein ratio for Endurance & 2:1 Strength athletes

Athletes have higher protein needs due to muscle repair after exercise

Balanced diet most important
- Muscle gain occurs during the 24-hours post exercise
- Protein from food builds muscle & very effective.
- Do not over consume protein
- Drink plenty of fluids