Performance Nutrition

Tools You Can Use

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Today's Discussion

1. Evaluating proper strength-weight ratio for combined events athlete
2. Dietary preparations pre-competition, during competition, between days and post-competition

Body Composition

- Elite Heptathlete
  - FFBMI
- Fat free mass to Height Ratio
- Higher = greater strength/power
  - Essential for power athletes

Performance Nutrition Plan

1. Adequate protein for growth & repair
2. Plenty of carbohydrates for fuel
3. Enough fat to meet remaining energy needs
4. Timing food & fluid intake throughout the day
5. Choosing whole foods
Energy Needs

Table 1: Formulas for Estimating Calorie Needs for Resting Energy Expenditure (REE)†

<table>
<thead>
<tr>
<th>Formula 1:</th>
<th>Males: REE Calories = 11 x body weight in pounds</th>
<th>Females: REE Calories = 10 x body weight in pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formula 2:</td>
<td>Males: REE Calories = 66.47 + 13.75 (weight, kg) + 5 (height, cm) – 6.76 (age, yr)</td>
<td>Females: REE Calories = 655.1 + 9.65 (weight, kg) + 1.84 (height, cm) – 4.68 (age, yr)</td>
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</table>

Activity Level

<table>
<thead>
<tr>
<th>Activity Level</th>
<th>Activity Factor</th>
<th>Male</th>
<th>Female</th>
</tr>
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<tbody>
<tr>
<td>Resting</td>
<td></td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Sedentary</td>
<td></td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Light</td>
<td></td>
<td>1.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td>1.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Very Active</td>
<td></td>
<td>2.1</td>
<td>1.9</td>
</tr>
<tr>
<td>Extremely Active</td>
<td></td>
<td>2.4</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Your Energy Needs

\[
\text{Your REE} \times \text{Your AF} = \text{Your TEE calories}
\]

To maintain weight you need _________ calories/day

Q : Quantity

- The amount of food and drink you need daily to perform your best changes:
  - Training
  - Competition
  - Rest

The Athletes Training Diet

- 3.2 - 4.5 grams carbohydrate per pound body weight
  - Should be 55% - 70% of total calories if adequate calories are consumed
- 0.5 - 0.9 grams protein per pound body weight
  - Should be 12% - 15% of total calories if adequate calories are consumed
- 20% - 30% of total calories from fat

Training Days

- The amount of food and drink you need daily to perform your best changes:
3.2 - 4.5 g CHO/lb BW
~1900 Calories from Carbohydrate
464 g CHO =
• 16 servings of whole grains: – pasta, cereal, breads, rice
• 5 whole fruits or 2½ cups 100% juice
• 4 vegetables: (2 c cooked, 4 c raw)
• 3 cups milk or milk products
• 6 servings of other CHO:
  – 8 oz Sports drinks, 1 tb jam/jelly
For 653 g CHO: add 6 Grains, 2 Fruits, 2 Vegetables, 2 Milk, 2 other CHO

0.5 – 0.9 g PRO/lb BW
~300 Calories from Protein
73 g Protein =
• 7 ounces of meat
  – 1 chicken breast & 3-4 slices of lunch meat
• 2-3 cups milk or milk products
• Grains & Vegetables
131 g Protein =
• 12 ounces of meat
• 4 milk or milk products
• Grains & Vegetables

** Whole Grains and Vegetables have varying small amounts of Protein

T : Timing
• Timing is to success.
• You should be eating every 3-4 hours during the day.
• Your performance nutrition plan will revolve around spreading your food and drink intake throughout the day.

2-4 Hours BEFORE Exercise
• Consume a high carbohydrate, low fat, moderate protein meal
• Choose familiar foods
• Consume about 125 - 300 g of CHO
  – Ex. 125 g CHO, low fat, moderate protein
    Turkey sandwich with 1 slice cheese, 2 slices turkey, 1 tsp. mayonnaise, lettuce and tomato. 1 cup pasta with vegetables and fat free Italian dressing. 1 banana
• Drink at least 16 fl. oz. of fluids

30-60 Minutes BEFORE Exercise
• Consume about 0.3 - 0.5 grams of carbohydrate per pound of body weight
  – Ex. 0.3 g CHO for a 145 # athlete
    1 small banana, 16 oz sports beverage
• Choose familiar foods
• Choose foods low in fiber
• (?) Consume low glycemic index foods
• Drink 1-2 cups fluid 15 minutes before exercise

Note Card Nutrition
Foods with 50 grams of Carbohydrate

| 1.5 cups cooked rice | 1 bean burrito |
| 3 corn tortillas | 2 oz hard candy |
| 3 cups dry cereal | Most energy bars |
| 3 cups cooked pasta | Small cantaloupe |
| 1 cup fruit yogurt | 20 saltine crackers |
| 2 large bananas | 2 cups marinara sauce |
DURING Exercise > 1 hour
- Drink 0.5 - 1.0 cups of fluid every 15 minutes
  - 4% - 8% CHO concentration
  - 0.5 - 0.7 grams/liter sodium
- Consume 30-60 grams carbohydrate per hour:
  - 16 oz Sports Drink
  - 2 Large bananas
  - Most energy bars
  - 9 graham cracker squares

Nutrition to Promote Recovery

Fig. 14.4

Essentials for Recovery

Short Term (24 hrs)
- Glycogen resynthesis
- Timing of Protein (repair, synthesis)
- Rehydration
- Rest

Long Term
- Optimize total calorie & protein intake

Glycogen
- Storage form of CHO in muscles & liver
- During high intensity exercise:
  - CHO for energy mainly from glycogen
  - Once depleted, blood sugar

Restoring Muscle Glycogen
- 0.5 to 0.7 grams CHO/lb body wt
- 145 lbs = 73-102 gm CHO (75)
  - 24 oz sports drink: 45 grams
  - Nature Valley Granola bars: 30 grams
- 175 lbs = 88-123 gm (120)
  - 32 oz sports drink: 60 grams
  - 1 large banana: 30 grams
  - Nature Valley Granola bars: 30 grams
Timing of CHO Intake

Don’t Wait!
- Start within 20-30 minutes of exercise
- At 2-hr intervals following exercise
  - Until next meal
- 5-6 hour recovery period
  - Most rapid glycogen resynthesis

Key Factors

- “The accretion of muscle protein as a result of resistance exercise occurs because of successive periods of positive muscle protein balance.”

  + Protein balance results from a synergistic interaction of exercise and feeding-induced stimulation of muscle protein synthesis.

Hartman et al., 2007 AJCN

Timing Over Quantity

- Amount is easily consumed
  - 1.2-1.8 g/kg body wt
  - Higher needs during initial stages of training
    - Needs taper with training
- TIMING is KEY
  - Before or after resistance exercise

Should Protein be added to the Post-Recovery Nutrition Plan?

- Protein may help with glycogen replenishment when CHO intake is suboptimal
- Effectiveness of protein to enhance glycogen storage may be limited to first hour
- Increase in glycogen restoration with addition of protein
  - Role for recovery snack/meal for sports with very short recovery periods

Ivy et al., Applied Physiol., 2002
Timing of Protein Intake

When 35 g of CHO + 6 g EAA was given pre and post exercise, the greatest response of net muscle protein balance was seen PRE-exercise.

Protein After Resistance Exercise

- Heavy resistance exercise increases protein synthesis/breakdown rates
  - Effect remains for hours after exercise
  - After weight lifting, need to eat
    - Promote Muscle Synthesis
- Key to promoting protein synthesis is positive energy balance

Type of Protein Matters

- Complete protein
  - Essential amino acids stimulate protein synthesis
    - All animal proteins (exc. Gelatin), soybeans
- Consumption with CHO may enhance protein synthesis
  - Milk
- Milk protein (whey and casein) may be directed to periphery while soy stays in splanchnic (abdominal)

General Guideline for Recovery Post-Resistance Exercise

- 6 grams EAA (0.05 g/lb body wt) immediately before or after
  - May lead to improved muscle growth with consistent training
  - Some support for adding 0.23 g CHO / lb body wt
  - Try . . .

Food Intake

8:30 AM: Sports drinks (creatine)
9:00 AM: OJ, Scrambled eggs (2), grapes, whole wheat toast (2 slices)
11:00 AM: Banana, water (6 oz)
Practice 2-6 PM
  - water, propel, Gatorade (total 20 oz)
6:15 PM: Sports Bar (high protein)
7:30 PM: Grilled chicken breast, french fries, baked beans
Multivitamin, flaxseed oil

Hydration

Hartman et al, 2007, AJCN
Indices of Hydration

<table>
<thead>
<tr>
<th>Condition</th>
<th>% Body Weight Change*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well hydrated</td>
<td>+1 to -1</td>
</tr>
<tr>
<td>Minimal dehydration</td>
<td>-1 to -3</td>
</tr>
<tr>
<td>Significant dehydration</td>
<td>-3 to -5</td>
</tr>
<tr>
<td>Serious dehydration</td>
<td>&gt;5</td>
</tr>
</tbody>
</table>

* % Body Wt Change = \[(\text{pre-exercise wt} – \text{post-exercise wt}) / \text{pre-exercise wt}\) x 100

Fluid Replacement Guidelines

**Within 2 hrs Before Exercise**
- 14 - 22 ounces cool fluid
- 7 - 10 ounces cool fluid

**Within 10-20 min Before Exercise**
- 6 - 12 ounces every 15 - 20 min

Fluid Replacement Guidelines

**During Exercise**
- 6 - 12 ounces every 15 - 20 min

Fluid Replacement Guidelines

**Before 170 lbs**
- After 168 lbs
- Loss = 2 lbs

Calculating Fluid Needs

- **Sweat Calculation Rate**
  \[
  \frac{\text{PreEx Wt (g)} - \text{PostEx Wt}}{\text{Exercise time (h)}} + \frac{\text{Fluid Intake (ml)}}{\text{Urine Vol}}
  \]

- **1 ml sweat loss = 1 g wt loss**
- **1 oz fluid = 29.5 ml**

Fluid Choices

<table>
<thead>
<tr>
<th>Duration</th>
<th>Fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 60 minutes</td>
<td>Water</td>
</tr>
<tr>
<td>&gt; 60 minutes</td>
<td>Water + Carbohydrate (CHO)</td>
</tr>
</tbody>
</table>
Vitamin Water

“Packed with nutrients to help you do whatever it is you do”

≈150 Calories/20 oz bottle Sweetened w/ fructose

Recovery AFTER Exercise

- Eat high glycemic index foods
  - Sports drinks
  - Watermelon
  - Cheerios

- High quality protein
  - Milk, tuna, soy/whey, M/F/P

- Replace fluid losses
  - Drink at least 3 cups per pound of body weight lost

Special Considerations for Competition Days

- Follow same guidelines as for training with these additional considerations:
  - Timing & Amount of CHO
  - Consumption of Protein
  - Fluid Intake

Optimizing Recovery for Second Day of Competition

Take Home Message:
- Start Day 1 CHO Loaded
- Replenish CHO throughout day 1
- Reload CHO during recovery between days

Short-Term Recovery

Take Home Messages:
- CHO IMMEDIATELY!!!!
  - Fluid and CHO
  - What about protein?

Is it Total Calories or CHO that Matters?

- 24 hr recovery time
  - 10 g/CHO/kg body weight
Type of CHO for Recovery

- GI in first few hours after exercise
- Lower GI in subsequent hours

Drink it Slowly or All At Once?

- As Fast As Possible
- Over 4 Hours

Post-Season/ Rest Days

- Continue to eat every 3-4 hours
  - Watch snacking & portion size
- Continue to stay hydrated
  - No need for sports drinks
  - How much?? ADD
- Choose whole foods

Energy Drinks: Are They for Sport?

Energy Drinks 101

- Basic definition: beverages that combine fluid and “energy”
  - “Energy”
    - Carbohydrate, protein, fat
  - Typical commercial energy drinks contain:
    - Water, carbohydrate, caffeine (key ingredient)
    - Additional ingredients: herbs, amino acids/protein, electrolytes, MCT, simple sugars, vitamins & minerals

Ergogenic Claims

- Boost energy levels
- Burn fat
- Increase muscle mass
- Supply vitamins & minerals for energy production
- Boost endurance
- Improve brain function
What’s the Research Say?

• **VERY limited**
  • Some research with Red Bull
    – In trained athletes consumption was associated with the ingredients taurine and caffeine
      - Taurine: derivative of cysteine thought to be a CNS neurotransmitter or neuromodulator
        - ??May improve cardiac contractility and/or readiness potential??
      - Far too little research to make recommendations for use

Are They For Sport?

3 Main Considerations/Concerns:

1. Sugar concentration – too high for fluid replacement during AND after exercise
   • May cause GI distress if consumed too close to start of exercise

2. Questionable ingredients:
   - Herbs, amino acids, MCTs, lack scientific support and long-term safety data
   - Adverse interactions with medications

3. High caffeine content –
   1. Excess for ergogenic benefit, could cause dizziness, laxative effect

The Bottom Line

• **Plain water and sports drinks formulated with the appropriate concentration of carbohydrate and electrolytes for rapid fluid absorption before, during, and after exercise offer safe and effective alternatives to the costly and questionably effective “energy drink” in improving sports performance and recovery!**

How to use Nutritional Strategies to help you meet your goals

Practice of proven beneficial strategies of fluid and CHO ingestion and replacement before, during, and after exercise to enhance performance.

A foundation of healthy eating practices throughout training and development.

Bottom Line

• Most active people & athletes consume adequate protein for muscle growth
• Attention should be focused on adequate calorie intake (CHO mainly) to spare protein for tissue growth, maintenance, & repair
• Timing & quality of protein may be more important than quantity
• Nutrition cannot replace a proper exercise training program for muscle growth

Perfect, Practice, Perform

1. Perfect Performance Nutrition Plan
   – Work with Sports Dietitian

2. Practice Performance Nutrition Plan
   – Record & give feedback

3. Perform your Best!
The Athlete's Kitchen

**Make Nutrient Dense Choices**

Choose this . . . • Over This . . .

- 1 gram fiber
- 4-7 grams fiber

- MED, Plain
  - 130 calories
  - No fat
  - 1 cup
  - 8 grams protein
  - Vitamins/Minerals

- MED
  - 370 calories
  - 20 grams fat
  - 1 cup
  - No protein
  - Sugar water

**Fluids to Stock**

- Water
- 100% Juice
- Low-Fat milk
- Sports Drink
- Fruit
- Sports drink mix
- Bottled water

**Carbohydrates to Stock**

- Low-fat/Fat free Milk products
  - Milk, yogurt, cheese

- Fresh fruit
  - Frozen, fresh
  - Baggy of cut fruit

- Vegetables
  - Frozen, bagged, fresh
  - Baggy of cut veggies

- Canned fruit (in juice)
- Canned vegetables (low sodium)
- Whole grain cereals, oatmeal, cream of wheat
- Quick cook rice
- Pastas, crackers, breads
- Granola bars, sports bars

**Protein to Stock**

- Low-fat/Fat free Milk products
  - Milk, yogurt, cheese (cottage)

- Chicken breast

- Cold cuts (turkey, ham, lean roast beef)

- Lean cuts of beef (sirloin, tenderloin, ground)

- Fish
  - Frozen is fine
Protein to Stock

- Canned tuna, salmon, chicken
- Beans (all varieties)
  - Dry or canned

FAT

- Solid at room temperature
- Liquid at room temperature

Putting Together a Quick Peak Performance Meal

- Factors for Success:
  - Planning ahead
  - Stocked pantry/fridge
  - A few basic skills

Planning Ahead

- Wake up in time for breakfast
  - Allow 1-4 hours before exercise
- Bring water with you
- Pack your bag
  - Water, fruits, granola bars, chocolate milk

Thank You!

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