What are the best energy foods?
Grain-foods, Fruits & Vegetables!
(also known as carbohydrates)

Sources of Energy

<table>
<thead>
<tr>
<th>Source</th>
<th>Calories/gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrates</td>
<td>4</td>
</tr>
<tr>
<td>Protein</td>
<td>4</td>
</tr>
<tr>
<td>Alcohol</td>
<td>7</td>
</tr>
<tr>
<td>Fat</td>
<td>9</td>
</tr>
</tbody>
</table>

Carbohydrates fuel the muscles

- Carbohydrates are stored as muscle fuel and blood sugar.

Stored Energy for Exercise

<table>
<thead>
<tr>
<th>Carbohydrate is stored in—</th>
<th>Calories/kg muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle</td>
<td>1,400</td>
</tr>
<tr>
<td>Liver</td>
<td>320</td>
</tr>
<tr>
<td>Blood</td>
<td>80</td>
</tr>
</tbody>
</table>

Fat is stored in—

| Adipose tissue | Muscle fuel | 70,000 |
| Intramuscular  | Muscle fuel | 1,500  |

Based on a 150 lb man with 12% body fat

Training increases muscle glycogen

- Untrained: 13
- Trained: 32
- Carbo-loaded: 35-40
Carbohydrates for rapid recovery

After hard exercise, consume 0.5 to 0.75 g carb/lb*—

- As soon as tolerable 0 - 30 minutes post-exercise
- At next meal 1 - 2 hours post-exercise
- Snacks Every two hours for 6 hours

* a little protein can also be beneficial

Recovery foods

Recommended dose:
- 0.5-0.75 g Carb/lb within 30 min.
- 0.1-0.2 g Pro/lb
Repeat every two hours x 4-6 hours

<table>
<thead>
<tr>
<th>Wt (lb)</th>
<th>Carbs (g)</th>
<th>Pro (g)</th>
<th>Cals</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>75</td>
<td>20</td>
<td>~400</td>
</tr>
<tr>
<td>150</td>
<td>115</td>
<td>30</td>
<td>~600</td>
</tr>
<tr>
<td>200</td>
<td>150</td>
<td>40</td>
<td>~800</td>
</tr>
</tbody>
</table>

Yogurt, flavored, 6 oz 26 8 160
Cheerios w/ milk 32 11 200
Pasta + meat sauce 80 20 450

Refuel with about three times more carbs than protein!

Recovery Fluids

Best choice: a beverage with three times more carb than protein

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Gm Carb/8 oz.</th>
<th>Gm Pro/8 oz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beer</td>
<td>8</td>
<td>--</td>
</tr>
<tr>
<td>Gatorade</td>
<td>14</td>
<td>--</td>
</tr>
<tr>
<td>Coke</td>
<td>26</td>
<td>--</td>
</tr>
<tr>
<td>Cranberry Juice</td>
<td>43</td>
<td>--</td>
</tr>
<tr>
<td>Chocolate milk, Nesquik</td>
<td>29 8</td>
<td></td>
</tr>
<tr>
<td>Muscle Milk</td>
<td>6</td>
<td>15</td>
</tr>
</tbody>
</table>

Low carb diet + Repeated exercise = Fatigue

What kinds of carbs should I eat?

Fruit = “Quality Carbs”

Natural fruit-sugars are preferable to refined sugars

EAT LESS: Refined Sugars
- Soda pop
- Sports drinks
- Candy
- Marshmallows

EAT MORE: Natural sugars
- Orange juice
- Raisins
- All fruits
- Fruit juices
Grains, Beans, Starches = Quality Carbs
*Choose more whole or lightly processed grains*
- Granola, Wheaties, oatmeal
- Rye bread, whole wheat bagel, multi-grain rolls
- Corn tortillas, popcorn, Triscuits
- Chili, lentil soup, hummus, refried beans
- Potato, (brown) rice, (whole wheat) pasta

Building your sports diet
- Carbs: The foundation of each meal
  - Grain-Fruit-Veg: \( \sim 3 - 5 \text{ gm Carb} / \text{lb body weight} \) during intense training
- Protein: Accompaniment to each meal
  - \( \sim 0.5 - 0.75 \text{ gm Prot/ lb body weight} \) (1-1.5 g/kg)
- Fat: A little (healthy) fat at each meal
  - \( \sim 25\% \text{ of total calories} \) (~50-80 g/day)

Breakfast Choices: High Fat vs High Carb
- Eggs, 2 fried
- Bacon, 2 slices
- Buttered toast, 2 slices
- Total calories: 500
  - 55% fat, 25% carb

- Cereal, big bowl
- Banana, medium
- Milk (2% fat), 8 ounces
- Total calories: 500
  - 10% fat, 75% carb

Meal choices: High fat vs high carb
- Big Mac
- Small fries
- Total calories: 800
  - 40% fat, 40% carb

- Spaghetti, 2.5 cups
- Tomato sauce, meat balls
- Total calories: 800
  - 20% fat, 60% carb

Food labels: Useful information!
- Ice cream (Haagen Dazs) 1/2 cup = 250 calories

- 20 gm CARB x 4 cal/gm = 80 Carb-cals (32%)
- 17 gm FAT x 9 cal/gm = 150 Fat-cals (60%)
- 5 gm PRO x 4 cal/gm = 20 Pro-cals (8%)
**Carbohydrate-loading for endurance exercise**

Claudia Graetsch-Vasquez, RDN, CDE, CHWC

![Image of pasta](image)

**How to Carbohydrate-Load**

- Maintain familiar, high-carb training diet  
  - Enjoy carbs as the foundation of each meal
- Reduce pre-event training  
  - Muscles need time to get fully fueled
  
  The carbohydrates saved by not exercising get used to “carbo-load” the muscles.

Claudia Graetsch-Vasquez, RDN, CDE, CHWC

**How much protein do I need?**

A little bit...?  
A lot...?

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**To build muscles—**

- Strength training (+ maturity)
- Adequate protein (pre- & post-exercise)
- Extra calories (from carbohydrates)
- Frequent eating throughout the day

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**Protein needs vary**

*Protein needs increase with—*

- Growth
- Start of an exercise program
- Calorie restriction (*dieting, anorexia*)
- Depleted glycogen stores

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**Protein needs**

<table>
<thead>
<tr>
<th>Category</th>
<th>Grams Protein/lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current RDA, sedentary adult</td>
<td>0.4</td>
</tr>
<tr>
<td>Recreational exerciser, adult</td>
<td>0.5 - 0.75</td>
</tr>
<tr>
<td>Competitive athlete</td>
<td>0.6 - 0.8</td>
</tr>
<tr>
<td>Growing teenage athlete</td>
<td>0.9 - 1.0</td>
</tr>
<tr>
<td>Adult building muscle mass</td>
<td>0.7 - 0.8</td>
</tr>
<tr>
<td>Athlete restricting calories</td>
<td>0.8 - 1.0</td>
</tr>
</tbody>
</table>

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**Protein from standard foods**

<table>
<thead>
<tr>
<th>Safe intake/lb</th>
<th>Gm PRO/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS Football player, 200 lbs</td>
<td>0.7 - 1.0</td>
</tr>
<tr>
<td>Marathoner, 150 lbs</td>
<td>0.6 - 0.8</td>
</tr>
<tr>
<td>Young gymnast, 80 lbs</td>
<td>0.9 - 1.0</td>
</tr>
</tbody>
</table>

- 2 lg Egg whites | 7 gm PRO |
- 2 Tb Peanut butter | 8 |
- 16 oz Milk | 16 |
- 1 can Tuna (5 oz) | 25 |
- 6 oz Chicken or Beef | 45 |

Would extra protein supplements help?

**Protein: Supplements vs food**

<table>
<thead>
<tr>
<th>Gm Pro/serv</th>
<th>$ / gm</th>
<th>$ /serv</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greek yogurt, 8 oz</td>
<td>23</td>
<td>.07</td>
</tr>
<tr>
<td>Tuna, 5 oz can</td>
<td>25</td>
<td>.06</td>
</tr>
<tr>
<td>Eggs, 2 large</td>
<td>12</td>
<td>.04</td>
</tr>
<tr>
<td>Instant dry milk, 1/4 c</td>
<td>8</td>
<td>.03</td>
</tr>
<tr>
<td>Protein powder Muscle Milk</td>
<td>16</td>
<td>.08</td>
</tr>
<tr>
<td>Protein Bar PowerBar</td>
<td>20</td>
<td>.06</td>
</tr>
</tbody>
</table>

What about eating meat…?

- **Fatty** red meat can be bad for health
  *Limit greasy burgers, pepperoni, bacon, sausage.*
- **Lean** red meat is excellent for:
  - Iron - to prevent anemia
  - Zinc - to help with healing

Iron deficiency in female athletes

Anemia in female varsity college athletes:
- 20% of volleyball and basketball players
- 50% of soccer players

A recipe for anemia:
- Red meat? **NO**
- Iron-enriched breakfast cereal? **NO**
- Heavy menstrual losses? **YES**

Iron in foods

<table>
<thead>
<tr>
<th>RDA: Men, 8 mg</th>
<th>Women, 18 mg</th>
<th>Iron (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuna, 1 can</td>
<td></td>
<td>2*</td>
</tr>
<tr>
<td>Chicken leg, 4 oz</td>
<td></td>
<td>2*</td>
</tr>
<tr>
<td>Beef, 4 oz</td>
<td></td>
<td>3*</td>
</tr>
<tr>
<td>Spinach, 1/2 cup cooked</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Raisins, 1/3 cup</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Oatmeal, 1/2 c dry, unenriched</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Bran flakes, 1 oz enriched</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

*Iron from meats is absorbed better than iron from vegetables, fruits, grains.*
Tips for Vegetarian Athletes

• Eat generous portions of beans, tofu, peanut butter
  - Plant proteins are not concentrated sources of protein.
    1/2 cup beans  only 6 g protein
    1/4 cake tofu  only 6-8 g
    2 tbsp peanut butter only 7-8 g

• Milk, yogurt & cheese are protein boosters
  1 cup low-fat milk  8 g protein
  1 oz cheese  8 g
  1 cup Greek yogurt 23 g

Should I take vitamin supplements?

Does exercise increase vitamin needs?

Do athletes need extra vitamins & minerals?

A review of 90 studies examining vitamin and mineral status in athletes’ blood suggests–

• Athletes & non-athletes had similar vitamin status
• Exception: Athletes had lower serum ferritin (iron)
• Stronger vitamin status ≠ better performance (apart from anemia)

CONCLUSION: Athletes generally eat extra vitamins!

For vitamins: Eat healthful foods!

The more you exercise–
• the more food you can eat.
• the more vitamins you can get.

Vitamins are re-used, not used up.

Guide to Good Eating

DON’T JUST EAT; EAT RIGHT–
Breads, cereals, whole grains
Foundation of every meal—for muscle-fuel, fiber, B-vitamins

At each meal choose foods made from–
Wheat  Rice  Oats  Corn

At least half your grains should be whole grains
DON'T JUST EAT; EAT RIGHT—

**Fruits & vegetables**
A generous amount with each meal (fiber, carbs, phytochemicals, C, A)

*Best fruit choices include:*
- Oranges
- Grapefruit
- Melons
- Bananas
- Berries
- Kiwi

*Best vegetable choices are colorful:*
- Broccoli
- Spinach
- Carrots
- Peppers
- Tomato
- Squash

DON'T JUST EAT; EAT RIGHT—

**Calcium-rich foods**
3 - 4 low-fat servings daily

- 1 cup Milk or Yogurt, low-fat
- 1.5 oz. Cheese, low-fat
- 2 cups Cottage cheese, low-fat

*Non-dairy sources*
- 8 oz. Soy milk or Tofu
- 1 cup Calcium-enriched orange juice
- 1.5 cup Broccoli, kale, leafy green vegetables
- 3-4 oz. Salmon or sardines with bones

DON'T JUST EAT; EAT RIGHT—

**Protein-rich foods**
Small amount at each meal for protein, iron, zinc

- Chicken, turkey, fish
- Lean beef, pork, lamb
- Milk, yogurt, cheese*
- Eggs
- Nuts, peanut butter
- Lentils, beans, tofu

*Poor sources of iron and zinc*

DON'T JUST EAT; EAT RIGHT—

**Pre-exercise fuel improves performance**

7 subjects, carbo-loaded x 3 days; biked hard to exhaustion

*Trial A: No breakfast*

109 minutes to exhaustion

*Trial B: With breakfast* (400 cals)

136 minutes to exhaustion

DON'T JUST EAT; EAT RIGHT—

**Pre-exercise meal timing**

- Large meal: 4 - 6 hours
- Lighter meal: 2 - 3 hours
- Snack: 0.5 - 1 hour

*Timing varies with:*
- Intensity of exercise
- Personal tolerance to food

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**Pre-exercise food guidelines**

- Carbohydrate-rich
- Low fat
- Moderate protein
- Extra fluids
- Appropriate portions
- Tried and true

**What’s good for quick energy before exercise...?**

**Pre-exercise sugar**

- Generally enhances performance (but not health)
- May cause hypoglycemia and needless fatigue if you are “sugar sensitive”

**Safest best:** Avoid sweets 15 - 45 minutes pre-exercise

**The best energy boosters**

**BREAKFAST and LUNCH!**

- Prevent the need for quick energy
- Eat before you run out of fuel.

**Breakfast: Better than a quick fix**

**STUDY:** Athletes with low glycogen stores biked hard for 45 minutes, then sprinted for 15 minutes

<table>
<thead>
<tr>
<th>Trial</th>
<th>Improvements during final sprint</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1. Baseline: No fuel, only water</td>
<td>---</td>
</tr>
<tr>
<td>#2. Sugar (180 cals glucose) + water</td>
<td>+10%</td>
</tr>
<tr>
<td>#3. Energy bar (270 cals) + water</td>
<td>+10%</td>
</tr>
<tr>
<td>#4. Breakfast 4 hrs before + Energy bar + water (800 cals)</td>
<td>+20%</td>
</tr>
</tbody>
</table>

**What’s best for energy during exercise?**

*For exercise >1 hour, maintain blood glucose with—*

- Sports drinks
- Diluted juices (1/2 strength)
- Energy bars, gels, gummy candy + water
- Banana, raisins, dried fruit

*Target 100 - 300 calories of carbs/hour after the first hour*
What about coffee …?

...Does caffeine enhance performance?

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Caffeine and exercise

Pro: May make exercise seem easier and enhance performance.

Con: May cause nervousness, upset stomach, and “coffee jitters.”

Each person responds differently. Know your body!

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Caffeine: Individual responses

STUDY: 10 subjects, 6 trials--3 with caffeine
Exercise test: 30 minutes progressively harder cycling
Caffeine dose: 3 mg caffeine/lb 1 hour pre-exercise
Measured: Total work performed (calories)

Improvements with caffeine (calories burned)

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Caffeine in foods & drugs

Coke, 12 oz can 35 mg
Clif Shot, mocha 50
Excedrin, 1 tablet 65
Red Bull, 8 oz. can 80
Vivarin, 1 tablet 200
Coffee, 12 oz mug 150

Dose that aids performance: 1.5 to 4 mg caffeine/lb body wt
About 225 to 600 mg caffeine for 150 lb person

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What's best for fluids?

Energy drink?
Fitness water
Tap Water?
Vitamin-water?
Sports Drink?
Recovery drink?

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Fluid choices

* For exercise <60 minutes: water
* For exercise >60 minutes: water + carbs

Target 100-250 calories/hour from a beverage with 50-80 cal/8 oz

Gatorade 6 % Carb 50 Cals/8 oz.
PowerAde 7 % 70
Cola 11 % 100
Apple juice 12 % 120

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**Fluid goals**

- **Prevent** dehydration
- Drink before you are thirsty!

**Dehydration hurts performance**

<table>
<thead>
<tr>
<th>Percent Dehydration</th>
<th>Lbs. lost</th>
<th>Physical Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>1.5</td>
<td>Increased body temperature</td>
</tr>
<tr>
<td>3%</td>
<td>4.5</td>
<td>Impaired performance</td>
</tr>
<tr>
<td>5%</td>
<td>7.5</td>
<td>G.I. problems, heat exhaustion</td>
</tr>
<tr>
<td>7%</td>
<td>10.5</td>
<td>Hallucinations</td>
</tr>
<tr>
<td>10%</td>
<td>15.0</td>
<td>Circulatory collapse</td>
</tr>
</tbody>
</table>

**Symptoms of dehydration**

- Dark urine
- Small volume of urine
- Elevated heart rate
- Headache

Urine Color Chart*

1-3 = adequately hydrated

*Source: L. Armstrong PhD

**Fluid guidelines**

<table>
<thead>
<tr>
<th>Event</th>
<th>Fluid goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 hours pre-exercise</td>
<td>16 - 24 ounces</td>
</tr>
<tr>
<td>15 minutes pre-exercise</td>
<td>8 - 16 ounces</td>
</tr>
<tr>
<td>Every 15 minutes during</td>
<td>6 - 12 ounces</td>
</tr>
<tr>
<td>After exercise</td>
<td>Until urine is pale</td>
</tr>
<tr>
<td>Daily</td>
<td>Enough to urinate</td>
</tr>
<tr>
<td></td>
<td>every 2 - 4 hours</td>
</tr>
</tbody>
</table>

**Sodium losses during exercise**

One pound of sweat loss contains 450 - 700 mg. sodium
Losses in 1 hour hard exercise in heat: 900 - 2,800 mg.
Sodium content of the body: 97,000 mg (42 tsp salt)

<table>
<thead>
<tr>
<th>Replacements</th>
<th>mg sodium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coke, 8 oz.</td>
<td>1 Cheese stick, 1 oz</td>
</tr>
<tr>
<td>Endurolytes, 1 capsule</td>
<td>40 Pizza, 1 slice</td>
</tr>
<tr>
<td>Gatorade, 8 oz.</td>
<td>110 Salt, 1/4 teaspoon</td>
</tr>
<tr>
<td>Gatorade Endurance</td>
<td>200 Soup, 1 can</td>
</tr>
</tbody>
</table>
**Sodium replacement**

Consuming additional salt—

- While training: *not necessary*
  
  The typical athlete’s diet provides enough sodium

- During moderate exercise: *not necessary*

- During ultra-distance events: *wise choice*

---

**Hard Gainers**

*Overfeeding Study with 12 sets of identical twins*—

- Overfed 1,000 calories per day x 100 days

- Sedentary lifestyle in metabolic ward

- Weight gain range: 9 - 29 lbs  
  
  Average: 18 lbs

- Weight gain: similar with each pair of twins

---

**How can I gain weight healthfully?**

*Consistently*

eat **three full meals** every day

plus

afternoon and bedtime **snacks.**

---

**Weight gain tip**

_Eat larger portions._

---

**Drink calorie-boosting fluids**

For 230 calories:

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Amount</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cranapple juice</td>
<td>12 oz.</td>
<td>$ .55</td>
</tr>
<tr>
<td>Instant Breakfast</td>
<td>8 oz.</td>
<td>$ .55</td>
</tr>
<tr>
<td>Ensure Plus</td>
<td>8 oz.</td>
<td>$1.50</td>
</tr>
</tbody>
</table>
Choose calorie-dense foods

<table>
<thead>
<tr>
<th>Food</th>
<th>Calories/cup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange juice</td>
<td>110</td>
</tr>
<tr>
<td>Cranberry juice</td>
<td>170</td>
</tr>
<tr>
<td>Cheerios</td>
<td>90</td>
</tr>
<tr>
<td>Granola</td>
<td>500</td>
</tr>
<tr>
<td>Green beans</td>
<td>40</td>
</tr>
<tr>
<td>Corn</td>
<td>140</td>
</tr>
</tbody>
</table>

Weight gain tip
Do strengthening exercises to build muscles.

How can I lose weight and have energy to exercise?

Weight loss tip-
Enjoy a satisfying breakfast and lunch, then have a lighter dinner.

Minimum calories for most athletes—

<table>
<thead>
<tr>
<th></th>
<th>Breakfast/Snack</th>
<th>Lunch/Snack</th>
<th>Dinner/Snack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>700-800</td>
<td>700-800</td>
<td>700-800</td>
</tr>
<tr>
<td>Female</td>
<td>500-600</td>
<td>500-600</td>
<td>500-600</td>
</tr>
</tbody>
</table>

Weight loss tip-
Limit fatty & fried foods

- Butter
- Margarine
- Mayonnaise
- Oil
- Cheese
- Chips
- Salad dressing
- French fries

Weight loss tip-
Fuel muscles with wholesome carbohydrates

- Bran cereal
- Whole wheat bagels
- Potato
- Fruits
- Multi-grain breads
- Vegetables
Weight loss tip-

Be realistic with weight goals!

Weight loss targets–
- Females: 1/2 - 1 lb / week
- Males: 1 - 2 lb / week

Weight loss warning-

Don’t get too thin!

The thinnest athlete ≠ the best athlete

Words of sports nutrition wisdom

When you eat well,
- You feel better and
- You exercise better

You will always win with good nutrition!