

Hydration / Fluids

1.1

Why is water important?

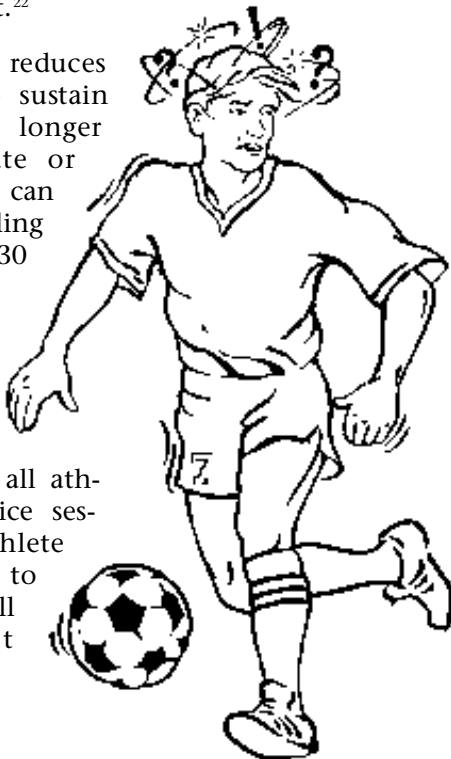
By drinking water, you maintain your body's ability to deliver oxygen and nutrients to the working muscles and all other cells. Water also carries away the waste products created by exercising muscles.

Water (*sweat*) must evaporate off your body to remove the heat generated by your muscles. If you are dehydrated your body must begin using the water content of your blood. Blood volume can get dangerously low in order to produce sweat to protect your body from a high body temperature.

What happens when an athlete does not drink enough water?

Athletes lose concentration, coordination and endurance capacity when they don't replace water lost from sweat.²²

Dehydration reduces the ability to sustain exercise for longer than a minute or two. So if you can pin your wrestling opponent in 30 seconds, you may not worry about hydration. However, endurance is important for all athletes in practice session. Any athlete who needs to train for skill development and fitness must be well hydrated.²³



How can I be confident that I am well hydrated?

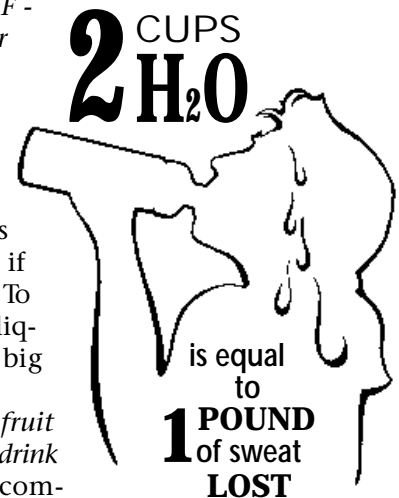
You know you are well hydrated when:

- Your urine is clear to pale yellow. If your urine is the color of apple juice, drink more water.
- You urinate at least 4 times per day.

What beverages are best during practice and competition?

Drink from cold water bottles early and at regular intervals during a 1 hour practice or competition.¹⁰

- Cold water (40°F - that's refrigerator temperature) is absorbed faster.
- A mouthful from a water fountain equals only 1 ounce, if you swallow it! To get a cup of liquid, take 8 big swallows.
- Use a *half fruit juice/half water drink* or a 4%-8% commercial sports drink for events lasting over one hour.^{10,24}
- Drink 1/2 cup to 1 cup of cold water every 15 minutes during exercise to delay fatigue.
- For every pound you have lost during exercise, drink 2 cups of fluid.



Other practical ways to get more fluids day after day:

- 12 ounces calcium fortified orange juice 1 1/2 cups
- Milk on cereal 1 cup
- 1 carton of skim milk at school lunch 1 cup
- One 12-ounce bottle juice, lemonade, flavored water, or punch from vending machine at school 1 1/2 cups
- One 32-ounce water bottle (*athletes eating 3,000 calories per day need more*) 4 cups (to 6 cups)
- 8-ounce shake with evening meal 1 cup
- 1 cup of hot chocolate milk while studying 1 cup

DAILY TOTAL

11 to 14 cups of total fluid



1 cup = 8 ounces liquid

Eat Breakfast

2.1

Too beat to compete?
Start your day a better way!
Eat breakfast.



Why?

To maintain maximum power with better fueled muscles right from the start.

"An improvement in nutrition upon rising and food choices at lunch may have a real, discernible benefit in athletic performance."

In *Sports Nutrition, a guide for the professional.*
Dan Bernardot, Ph. D., RD²⁵

Here are a few examples of foods to choose to help you plan a hearty, carbo - hydrate rich breakfast:

- low-fat granola and a glass of milk
- chocolate milk and leftover pizza
- skim milk over frozen berries in cereal
- egg and toasted English muffin sandwich
- orange juice and peanut butter toast
- cereal with almonds, pecans and milk
- toaster waffles with applesauce
- banana and a cup of hot chocolate milk
- cinnamon toast and yogurt on berries
- melon
- peanut butter on an apple and milk
- calcium fortified orange juice

Eat after morning practice

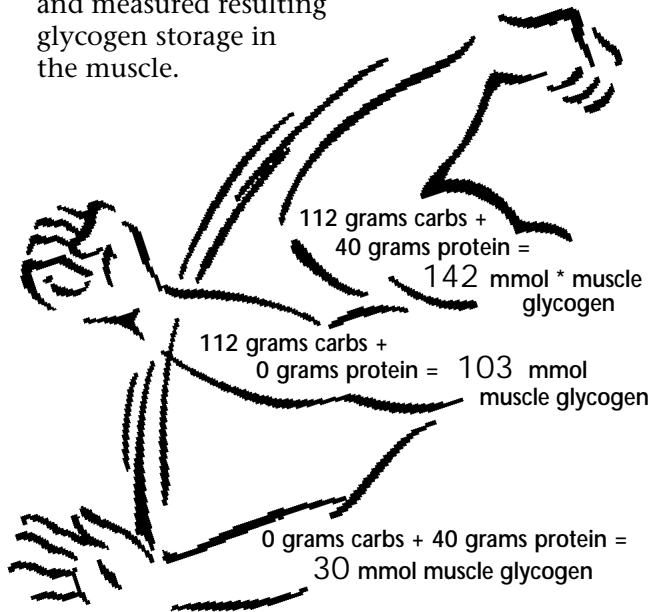
Why?

Food to help athletes recover after practice is important in both endurance exercise and resistance exercise.

"Don't avoid protein in your recovery diet. In fact some protein can actually enhance glycogen replacement in the initial hours after hard exercise,"

Nancy Clark, sports nutritionist.¹²

A research study published in the Journal of Applied Physiology, compared feeding different amounts of protein and carbohydrates and measured resulting glycogen storage in the muscle.



* mmol = micromole

Carbohydrate alone and protein alone did not build glycogen stores as well as carbohydrate eaten with protein.⁷

Feeding	Carb (grams)	Protein (grams)	Glycogen stores 4 hours after exercise (micromoles glycogen/g protein)
1	0	40	+30
2	112	0	+103
3	112	40	+142

Note: 112g carb = 448 calories; 40 g protein = 160 calories

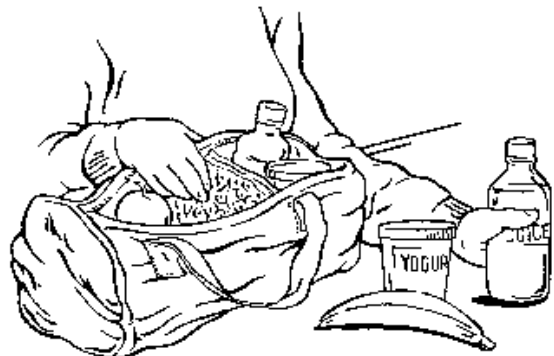
For more information on combining foods to get the carbohydrate/protein ratio used in this study, look at the handout **Eat Right After Practice (Handout 2.5)**

Foods To Bring

Here are a few ideas you can bring from home to eat after morning practice.

- sub sandwich with ham and cheese and an orange*
- yogurt, muffin and a bottle of apple juice*
- rye bread and cheese sandwich with a bag of grapes*
- 1/2 cup of nuts and 1 cup of dry cereal and a bottle of orange juice from the vending machine
- banana and peanut butter sandwich and a carton of chocolate milk from the vending machine
- cereal in a disposable bowl with a plastic spoon and vending machine milk
- lean roast beef and tomato on whole wheat bread with a bottle of juice*

* refrigerate the night before



Why?

*"Nothing makes a bigger difference to nutritional status than **the way an athlete eats most of the time**. Eating correctly most of the time sets up an athlete so that eating the right meal before a meet and the right nourishment during the competition can make a difference."*

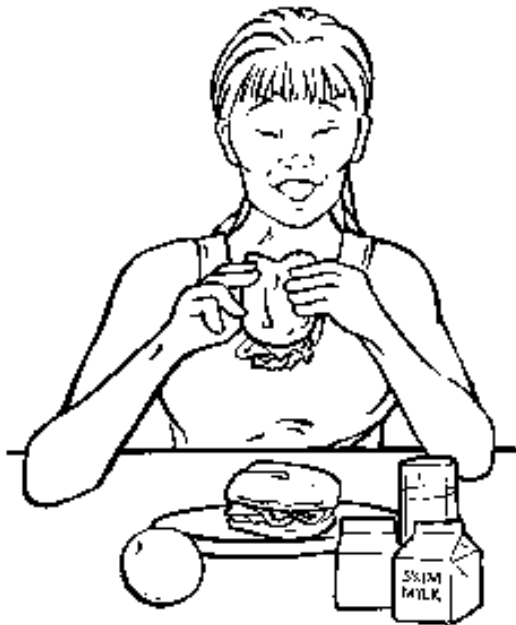
In Sports Nutrition, a guide for the professional,
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Good nutrition has academic benefits.¹⁻³ Being well nourished and hydrated are important for your ability to learn.²

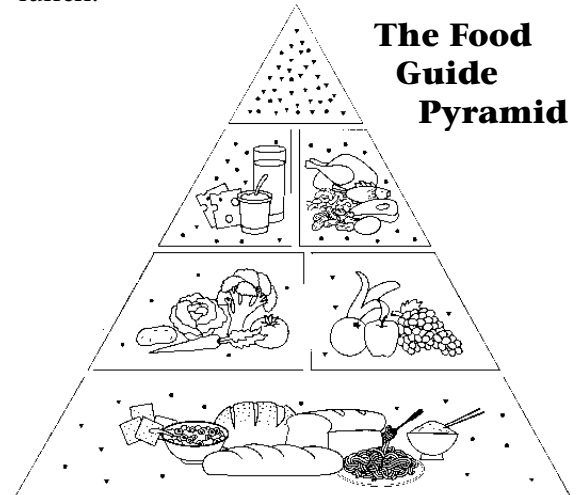
How can an athlete **plan** to eat well most of the time?

Here are a few simple ways to eat more healthfully at lunch time.

1. **Be realistic:** make small changes in what you eat for lunch. Plan to bring one favorite fruit or vegetable from home to have with your school lunch or fast food each day. Put it on a Monday through Friday cycle and give it to your parents for their grocery list, for example: Monday-orange, Tuesday-banana, Wednesday-baby carrots, Thursday-strawberries, Friday-pear.



2. **Be adventurous:** expand your tastes and enjoy a variety of foods. Eat from all of the food groups. Drink milk, juice and water at lunch.



3. **Be flexible:** balance what you eat over the day or several days. No time for long lunch lines on Tuesdays? Bring your lunch. Sunflower seeds and peanuts, fresh baby carrots and a bagel keep well in your locker. If you do not get your calcium rich milk or your Vitamin C rich fruit at that lunch, have a slice of melon and a big glass of milk when you get home. Ask your parents to buy dried apricots and raisins for your bag lunches so you can take fruit to school.
4. **Be sensible:** enjoy all foods, just don't overdo it. You love pizza. That's great, include a piece of fresh fruit with that slice of pizza for lunch. If you always stand in the French fry line at lunch, try the sandwich line for a change and ask for extra tomato and lettuce.
5. Ask your coach for the **Travel Food/Fast Food** handout for more ideas!

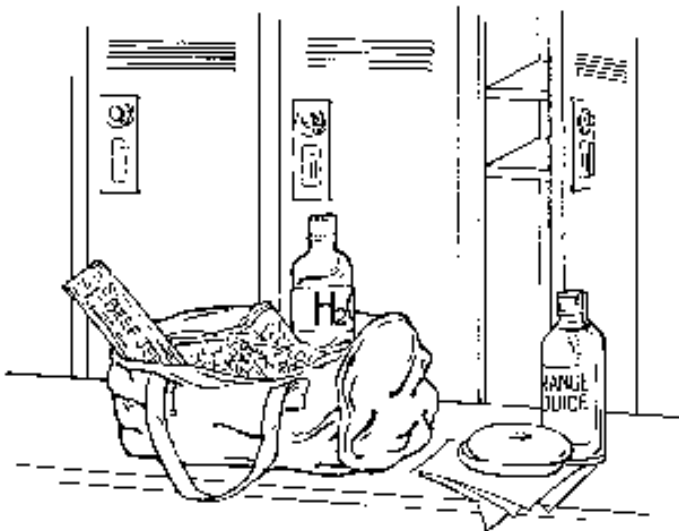
Eat before and after practice

2.4

Why?

Eating before practice gives you energy to burn during your workout. After practice your muscles are most receptive to replacing muscle glycogen, so feed your muscles!

Be prepared! Include your favorite fruits, juices, cereals or breads for before practice, right after practice or on the bus, in your gym bag or backpack or use the list on this page for more high-carbohydrate, moderate-protein ideas.



Food	grams of carbohydrate	grams of protein
1 cup Frosted Mini Wheats	48	6
1 cup Post Waffle Crisp	24	2
1 cup Crispix	25	2
1 cup Honey Nut Cheerios	24	3
1 cup Cocoa Puffs	27	1
1 1/3 cups Kix	26	2
1 cup Life	25	3
1 cup Quaker Honey Graham O's	23	1
1/2 cup raisins	62	2
peanut butter sandwich	35	13
big bagel	45	9
carton skim milk (1 cup)	11	8
1 cup chocolate skim milk	30	9
20 ounce Gatorade *	35	0
16 ounces orange juice	54	0
1 slice of bread	15	3
1 cup watermelon	15	0
big banana	30	0
orange	15	0
big apple	30	0
kiwi	15	0
1/2 cup dried apricots	50	2
beef jerky (1 ounce)	4	12
1/2 cup peanuts	14	20
1/2 cup sunflower seeds	12	16

Nutrient information for above foods comes from food product labels.

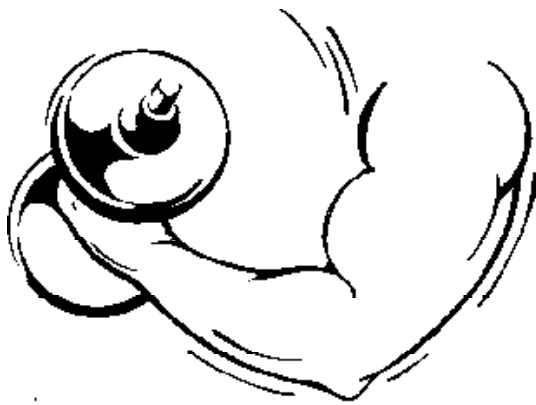
**only a source of water, carbohydrate, sodium and potassium. All other foods listed contain a wider variety of nutrients*

Eat right after practice

2.5

Why?

Think of eating after exercise as "reloading your muscles" for the next bout of training or competition so the next day you can perform longer before feeling wiped out. Sports nutritionists call that "recovery". Rapid recovery of muscle glycogen after exercise is the fundamental nutrition goal for all athletes.^{5, 26}



Muscle energy

Glycogen is the storage form of glucose for muscle energy. When an athlete's glycogen supply is low, muscles lack the energy to perform their best. Athletes who train daily or compete must maximize glycogen storage. **Athletes can double the amount of glycogen their muscles can hold.**

Athletes can increase muscle energy storage by:

1. training
2. eating high-carbohydrate, moderate-protein snacks right after each workout⁷ and again within two hours of exercise.^{4, 26}
3. eating a daily diet of fruits, vegetables, skim milk and whole grains where 60% of the calories are carbohydrate calories
4. eating a daily diet of 0.5 to 0.75 grams of protein per pound of body weight⁸ (*To calculate your own protein needs, use handout 3.1*)
5. eating a daily diet where 25 to 30% of calories are fat calories.^{4, 6, 10, 12, 24, 26, 27}

Poor muscle glycogen recovery is common in athletes who don't eat enough calories to support their level of activity and in athletes taking steps at the wrong time to control weight (*for example, fasting after practice*).^{6, 12}

Here are examples of foods you can eat when you are done exercising (*left column*) and foods to eat within the next two hours (*right*) to reload your muscles with glycogen^{7, 26}.

EAT RIGHT AFTER PRACTICE	A N D	EAT WITHIN 2 HOURS AFTER PRACTICE
16 oz. bottle of calcium fortified orange juice 1 carton (8 oz.) yogurt 1 apple		1 cup skim milk 1 cup pasta with 1/2 cup of white beans (pasta fagoli) and 1/4 cup Parmesan cheese
20 oz. bottle of sport drink a pop-top can of tuna on 2 slices of whole wheat bread		1 cup chocolate skim milk
16 oz. bottle of vending machine grapefruit juice plum		bagel or bun with 4 oz. of lean deli roast beef
16 oz. bottle of calcium fortified orange juice 1 cup of honey nut dry cereal		2 cups skim milk hamburger on bun
1/4 cup of raisins 1/4 cup peanuts water 1 carton (8 oz.) of yogurt		1 cup skim milk 2 bean burritos, with salsa
16 oz. bottle of calcium fortified orange juice banana		4 oz. lean ground beef on bun (like a Maid-Rite or Sloppy Joe)

Here are a few guidelines for a successful pre-game bus ride.

If your bus ride is one hour or less

Plan ahead!

1. Fill a water bottle with cold water before boarding the bus to keep yourself hydrated.
2. Bring along a bottle of juice to sip. The juice will provide carbohydrates and calories for extra energy.

If your bus ride is one to two hours

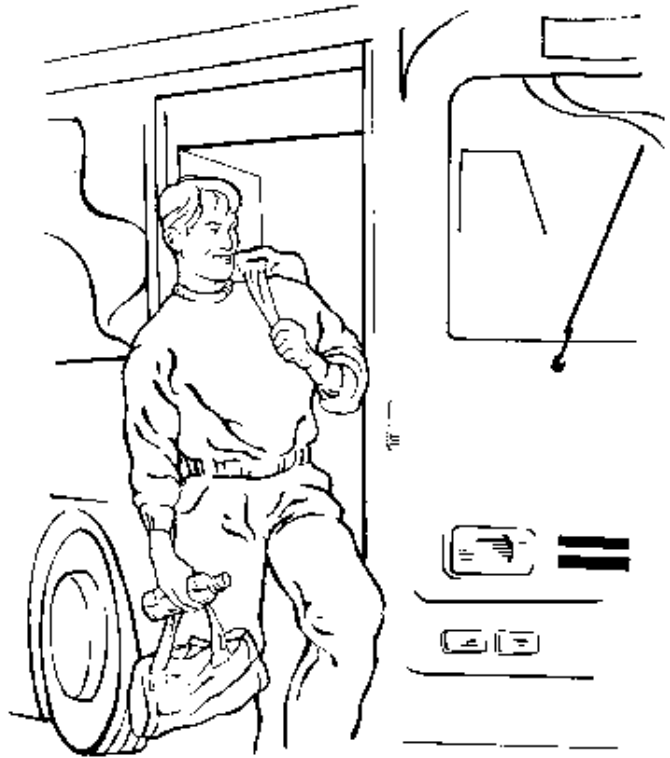
Plan ahead!

1. Fill a water bottle with cold water before boarding the bus. Drink it.
2. Bring along a bottle of juice to sip.
3. Eat your favorite cereal right out of the box or munch on a bagel or banana. These are high carbohydrate foods that are easily digested, may help settle your stomach and prevent a feeling of hunger and weakness during competition.
4. If the team stops at a **convenience store**, limit your pre-game purchases to a combination of these high carbohydrate fuels for your body:
 - any fresh fruit
 - any canned fruit with a pop-top lid
 - any dried fruit like apples, apricots, dried cranberries or raisins
 - chocolate milk, skim milk, juice or sport drink
 - bagels, muffins or cereal

If your bus ride is two to four hours

Plan ahead!

1. Eat a meal before you leave. Your food choices should be rich in carbohydrate with a little protein and very little fat. Fat takes longer to digest and may make you feel sluggish and uncomfortable when you compete.
2. Fill a water bottle with cold water before boarding the bus for hydration.



3. If the team stops for **fast food**, order a fast deli **sandwich** like this:
 - your favorite bread
 - go easy on the mayonnaise or dill spread
 - order mustard or catsup
 - order your favorite lean meat with no more than one slice of cheese
 - extra lettuce and tomato are OK
 - avoid chicken salad and tuna salad (too much mayonnaise)
 - drink chocolate milk, juice or skim milk.
4. If the bus stops for a **fast food breakfast**, select 2 beverages and one breakfast entree among higher carbohydrate choices such as:
 - pancakes with syrup (no butter, sausage or bacon)
 - English muffin with jelly
 - apple bran muffin

Weight Gain

3.1

Fuel = Carbohydrate+Protein+Fat

Athletes can add muscle tissue by putting a demand on muscles and making them work harder. Proper strength training and genetics are the primary keys to a muscular look, but nutrition can contribute. Adding lean body mass or fat free mass with little increase in body fat takes weight training and more calories.

Muscle building needs

1. enough food, including enough carbohydrate
2. enough protein
3. strength training

Not eating enough food? You may be setting yourself up for muscle loss. Young athletes, eager to work hard, must be aware that loss of muscle mass follows a low calorie intake. **Muscle building needs calories.**

Exercise increases protein need in endurance athletes^{9, 29, 30}. Distance runners, soccer players and swimmers are just a few examples of the many athletes who need to **do the math:**

The Math

To estimate the number of grams of protein you need per day, multiply your body weight in pounds by .5 for an adequate amount of protein or multiply the number of pounds you weigh by .75 for the high end of the range for adequate protein.

1. Your body weight in pounds x .5 = ___grams of protein per day
2. Weight in pounds x .75 = ___grams of protein per day

Example:

This athlete should eat between 65 and 97 grams of protein per day

130 pound teen athlete
 $130 \times .5 = 65$ grams of protein
 $130 \times .75 = 97$ grams of protein

Example:

This athlete should eat between 85 and 127 grams of protein per day

170 pound teen athlete
 $170 \times .5 = 85$ grams of protein
 $170 \times .75 = 127$ grams of protein

Vegetarian athletes will want to eat plenty of calories from a variety of legumes,^{33, 34} nuts, seeds, grains, fruits and vegetables to have a healthful diet. Use fortified soy milk if you don't drink milk.



Here's an example of how to estimate your daily protein intake. Use this situation to determine how much protein the athlete Pat needs to add to the day's food intake. Use the chart at the right to help determine your daily protein intake.

SITUATION: Pat weighs 130 pounds and wants more muscle. Pat did "**The Math**" (on the other side) and knows that 97 grams of protein a day is the goal. Answer the questions below.

	<u>Servings x grams of protein</u>	<u>Total grams of protein</u>
Pat eats:		
4 ounces of meat	4 ounces x 7g	28
a bagel (3 ounces) (count bread as 3 grams protein per ounce)	3 ounces x 3g	9
a sandwich for lunch (2 bread)	2 slices x 3g	6
1 ounce lean deli meat in sandwich	1 ounce x 7g	7
2 cups of pasta at night (1/2 c is 1 serving)	4 half cups x 3g	12
peanut butter on an apple while doing homework	1 serving x 8g	8
		<hr style="width: 100px; margin-left: auto; margin-right: 0;"/> 8
		70 grams of protein

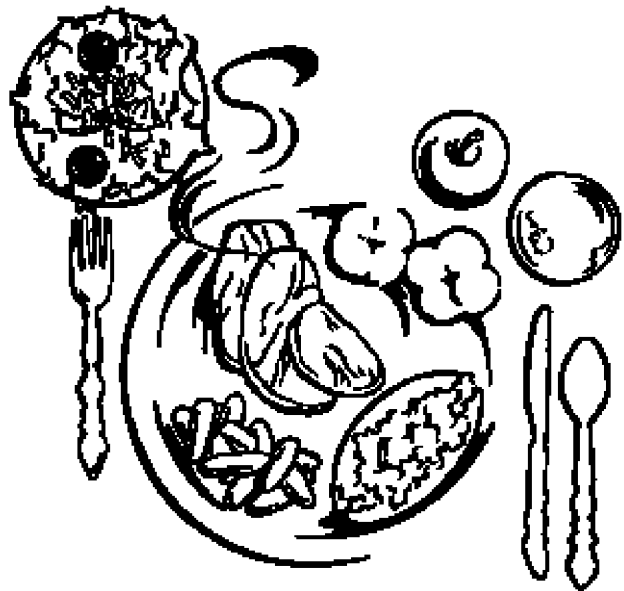
Pat needs 27 grams more protein. How does he add this?

Where's the milk? 3 glasses of milk will provide 24 grams of protein.

Where is the vegetable? Vegetables provide small amounts of protein. A pasta sauce made of cooked vegetables (or tomato sauce) would add 3 grams protein.

Foods contain different amounts of protein. Use this chart to determine how much protein you eat each day.

<u>Grams of protein</u>	<u>Serving size</u>
8	1 cup skim milk
7	1 whole egg
7	1 ounce of lean beef or pork
7	1 ounce of chicken or turkey
7	1 ounce of fish
4	1 Tb. peanut butter
3	1/3 cup rice
3	1/3 cup kidney beans
3	1/3 cup chick peas
3	1/2 cup cooked oatmeal
3	1/3 cup lentils
3	1 slice bread (1 ounce)
3	1/2 cup pasta



Planning to lose weight?

Use these tips to fuel your body for sport and academic challenges while you lose weight:

Lose weight gradually:

- A one pound per week weight loss is a good goal. (*You lose muscle during rapid weight loss.*)
- Train aerobically and weight train.
- Eat three small meals and 2 snacks each day.
- Eat a high-carbohydrate, moderate-protein snack after practice and competition.

Plan your meals and snacks to meet your nutritional needs:

- Limit regular pop or soda, drink water in place of sports drinks when it's not hot or humid, eat less sugary snacks, fried foods, and other high-fat foods.
- Drink 8 to 11 cups of water each day.
- Drink 4 cups of skim milk
- Drink 1 glass of orange juice or another 100-percent fruit-juice each day.
- Use the checklist on the back to make sure you're eating the bare necessities.



Don't fast or starve yourself:

- Never skip meals and always eat after exercise.
- Eat to fuel your intense training and to help you grow to your potential.
- Starvation is sports sabotage! You'll just drag through bad workouts and fatigue early in competition.
- Ideally, you can lose weight gradually over months before your most competitive time. That way you can keep your concentration on academics, aerobic conditioning and resistance training while managing your weight—not dieting during your most important sport's season.

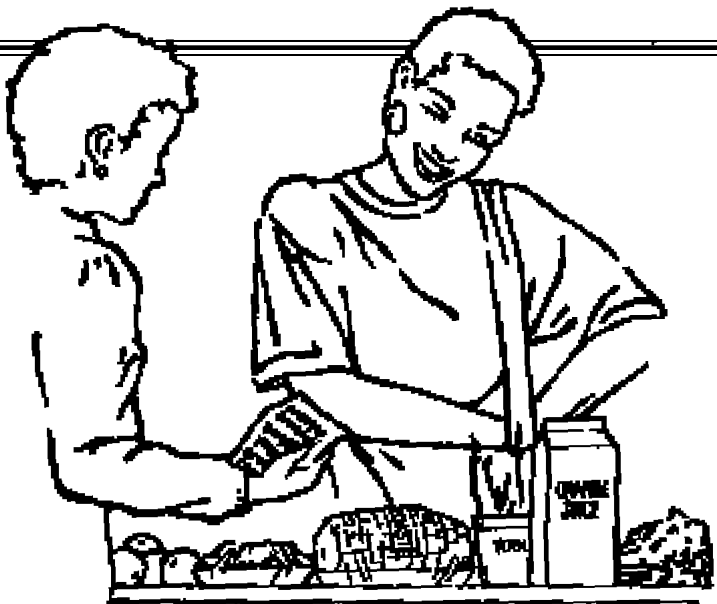


The Bare Necessities

Use this checklist to see if you are missing nutritious foods you need in a day. You should put a check on each empty square. Each square represents a serving. Missing a check may indicate missing the minimal amount of foods or drinks you need to feel energetic and healthy.

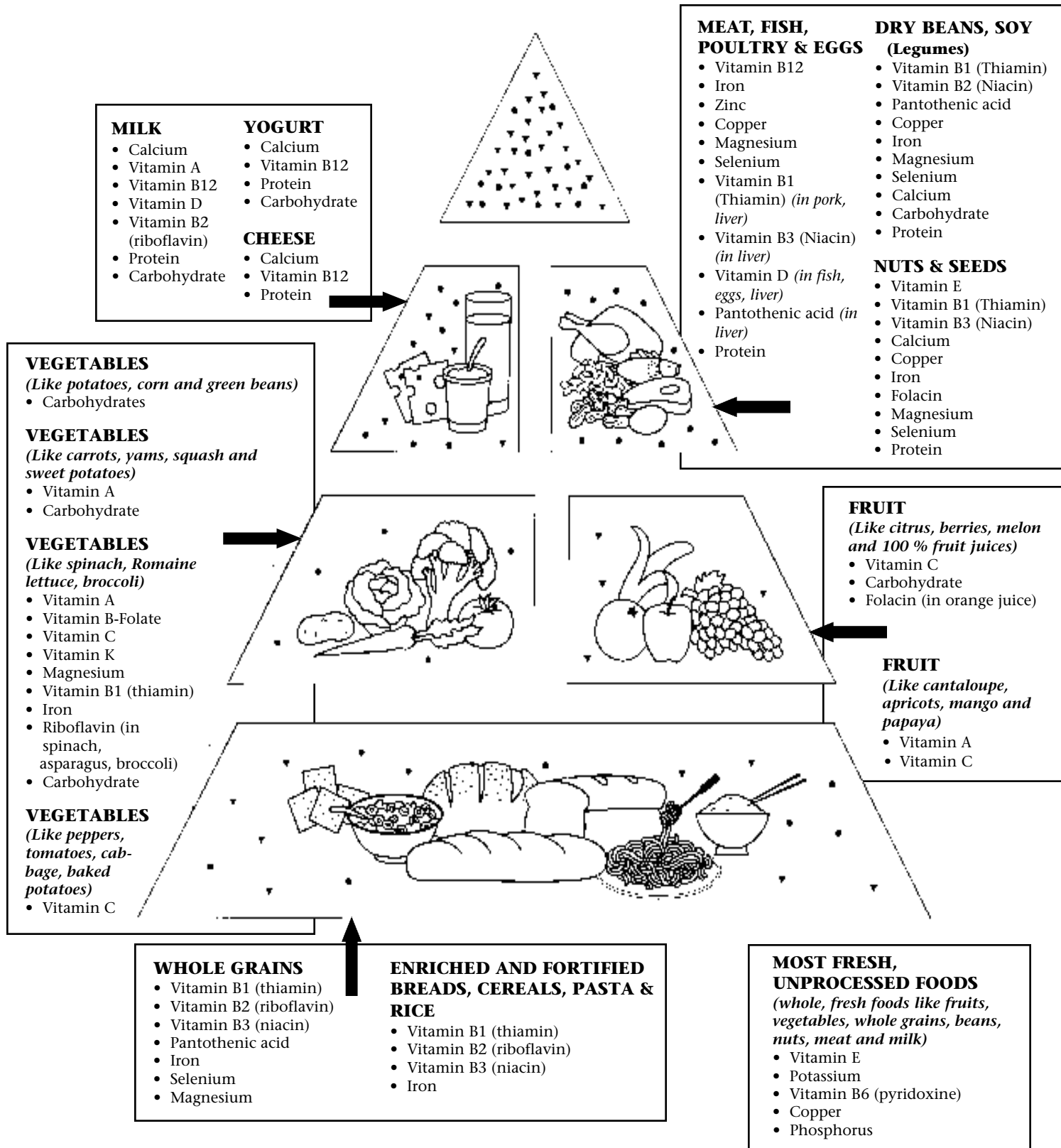
OPTIONS

- orange juice, 8 ounces
- 1 fruit
- skim milk, low-fat, light or plain yogurt, 8 ounces
- water, 8 ounces
- cereal at breakfast or breads like a small bagel, English muffin, (very little jelly, little or no cream cheese or margarine) bun at lunch or flour taco shells or a pita, 1 cup of rice, or pasta after practice
- 2 to 3 ounces of lean meat or fish
- or*
- 1/2 cup beans or nuts, or an egg
- a vegetable like 1/4 of a bag of baby whole carrots, 1/2 cup of coleslaw, broccoli, tomatoes, sweet potatoes or peppers



Eat food for vitamins and minerals

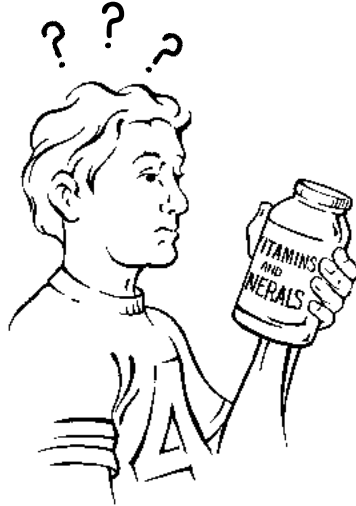
Use this Food Guide Pyramid to choose important vitamins and minerals.



Vitamin & Mineral Supplements

Do vitamin and mineral supplements give athletes a competitive edge?

Vitamin and mineral supplements do not improve performance when the diet is adequate. Only foods provide an athlete with the energy nutrients: carbohydrate, protein and fat. The vitamins that help convert food into energy can be found in food.



When is taking a supplement justified?

Vegetarians and athletes on low calorie diets may choose to take a vitamin/ mineral supplement of 100% of the Recommended Dietary Allowances (RDA) once per day. The only thing the supplement will help is if there is a deficiency of a particular vitamin or mineral.

Is it effective to take single vitamins or minerals?

If a physician diagnosed a deficiency after seeing your lab work or a Registered Dietitian did a nutrition assessment and a specific supplement was advised, follow their advice. However, doses of some vitamins just 5 times the RDA can be toxic. Taking a large dose of one vitamin or mineral can interfere with the absorption of other vitamins and minerals. For example:

- iron supplements reduce the absorption of zinc
- folate supplements reduce the absorption of zinc
- manganese supplements worsen iron deficiency
- Vitamin C reduces copper absorption

Antioxidant Vitamins

Vitamin C and Vitamin E may protect your cells following prolonged endurance exercise but do not improve performance⁴⁶. If you must take pills, you should know that 60 mg of Vitamin C and 30 IU of Vitamin E are the Recommended Dietary Allowance (RDA). Look at the more appetizing ways you can get more Vitamin C.

Vitamin C

Fruits & vegetables

Vitamin C milligrams

broccoli, 1 cup	.116
frozen strawberries, 1 cup	.106
orange juice, 1 cup	.97
Brussels sprouts, 1 cup	.97
edible pod peas, 1 cup	.87
fresh strawberries, 1 cup	.85
grapefruit juice, 1 cup	.83
cranberry apple juice, 1 cup	.81
kiwi, 1	.75
orange, 1	.70
cantaloupe, 1 cup	.68
tomato soup, 1 cup	.68
green pepper, 1 cup	.51
pink grapefruit, 1/2	.47
collards, 1 cup	.45
spinach, 1 cup fresh	.40
butternut squash, 1 cup	.37
coleslaw, 1 cup	.33
scalloped potato, 1 cup	.26
tomato, 1	.22
baked potato, 1 small	.20

Vitamin E

Vitamin E is found in many fresh foods. Whole grains, vegetables and nuts are good sources of Vitamin E. Processed convenience foods like snack foods and frozen meals are not good sources of Vitamin E.

Why do athletes need calcium?

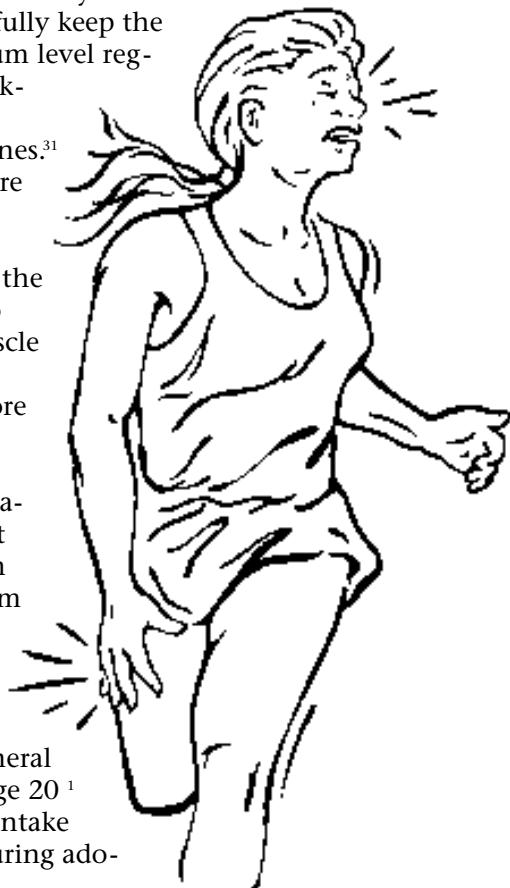
- calcium helps build dense bones
- female athletes who stop menstruating are at risk for poor bone development and may need more calcium-rich foods
- calcium is lost from the body in sweat, urine and feces

Why does everyone need calcium?

- for muscle contractions
- for dense bone formation and bone strength
- for blood clotting
- for nerve impulse transmission across cells

How common is calcium deficiency?

- impaired muscle contraction,¹⁹ muscle cramps¹⁹ and later-osteoporosis may be deficiency symptoms, but the body hormones carefully keep the blood calcium level regulated by taking calcium from the bones.³¹
- no one is sure why people get muscle cramps. Try the following to prevent muscle cramping:
 - Drink more water
 - Eat fruits and vegetables to get potassium
 - Drink skim milk
- most of the accumulation of bone mineral occurs by age 20¹ so calcium intake is critical during adolescence¹
- milk-avoiding teen girls also have lower intakes of Vitamin A, B6, B12, folic acid, riboflavin, and magnesium compared to those who drink milk.



So what if my diet is low in calcium?

Low calcium intakes for athletes may result in:

- stunted growth
- stress fractures
- osteoporosis later in life

Sources of calcium that are well absorbed and equivalent to the 300 mg of calcium in an 8 ounce glass of milk

- 1 cup milk
- 1 cup chocolate milk
- 1 cup buttermilk
- 1 cup calcium fortified orange juice
- 1 cup pudding made with milk
- 1/4 cup grated Parmesan cheese
- 1/2 cup part skim ricotta cheese
- 1 1/2-2 ounces American cheese
- 1 piece of lasagna
- 1 cup homemade macaroni and cheese
- 1 cheese enchilada
- 1 grilled cheese sandwich
- 1 Reuben sandwich
- 1 corned beef and Swiss cheese on rye

Food sources of 300 mg of calcium that are less well absorbed

- 3/4 cup dry roasted soybeans
- 1 cup almonds

Food sources of calcium equal to 150 mg calcium

- 1/2 cup frozen collard greens, cooked
- 3/4 cup tofu
- 1 cup cooked bok choy
- 1 1/4 cups navy beans or Great Northern beans
- 1 1/2 cups cooked kale
- 2 cups cooked broccoli

Zinc

4.4

Why do athletes need zinc?

- zinc is critical to the metabolism of carbohydrate, protein and fat
- optimum nutrient metabolism is crucial for top performance

Why does everyone need zinc?

- zinc has a role in growth and sexual maturation, appetite and normal taste sensitivity



Is low zinc intake a problem?

- marginal zinc intake is common among people who eat little red meat
- the best food sources are meat protein
- high fiber grains have phytic acid, which binds zinc making it less available for absorption

So what if I'm low in zinc?

Low zinc intakes result in:

- every cell in the body uses zinc to help produce and dispose of carbon dioxide
- five to six ounces of lean meat along with healthier food choices in other food groups may be necessary to meet current dietary recommendations¹³ especially for zinc

<u>Food sources</u>	<u>milligrams of zinc</u>
1 beef burrito	5.8
1 cup chili	5.1
1 cup dry roasted peanuts	4.8
3 ounces round steak	4.7
1 cup drained clam meat	4.3
3 ounces 85% lean ground beef	4.1
1 bean burrito	2.3
1 cup non fat yogurt	2.2
1 cup black beans	1.9
3 ounces roasted turkey	1.7
3.5 ounces shrimp	1.5
11 ounces dried mixed fruit	1.4
1 can water packed tuna	1.3
3 ounces trout	1.1
1 cup oatmeal	1.1
1 fried chicken breast9

What about pills?

Eat food instead of using vitamin and mineral supplements.

- Taking a zinc and iron pill at the same time lowers zinc absorption. No such effect is seen when eating iron and zinc from food. ¹
- Zinc supplements can lead to toxicity. The result: reduced immune response and poor copper nutrition. ¹

"Minerals have the potential to influence physical performance. Studies report suboptimal intakes of minerals, particularly among athletes who are actively attempting to lose weight to meet standards for competition."

H. Lukaski, *Human Nutrition Research Center* ¹⁸

Why do athletes need iron?

- iron is necessary for oxygen transfer
- endurance athletes lose iron in sweat
- growing athletes enlarge their blood cell mass, and deposit myoglobin in muscle (athletes will be stronger and last longer)



Why does everyone need iron?

- we need iron to synthesize hemoglobin
- hemoglobin carries oxygen from the lungs
- iron in myoglobin receives the transported oxygen storing the oxygen in the muscle for use in contractions
- in an iron deficient state but before hemoglobin is low enough to be considered anemia, performance declines ¹

How common is iron deficiency?

- iron deficiency is the most common nutrient deficiency in the USA
- teens and females are the highest risk groups for iron deficiency ^{20,21}

So what if my diet is low in iron?

Low iron intakes result in:

- fatigue
- iron deficiency decreases immune function and academic performance
- iron deficiency anemia symptoms include apathy, short attention span, irritability and reduced ability to learn ¹

Where do I get iron?

- Many foods contain iron, but this iron is not always easily absorbed by your body. There are two types of iron in food - **heme** and **non-heme** iron.
- **Heme** iron is found in meat, poultry and fish and is much more easily absorbed by the body than **nonheme** iron which is found mainly in plant foods. Much of the **nonheme** iron is not available for absorption. See the chart on back for iron content.

How do I improve iron absorption?

- **Remember the Meat Factor.** Meat, poultry and fish also contain a special quality called the **Meat Factor** which helps the body absorb more nonheme iron. For example, if you eat meat and vegetables together, you absorb more iron from the vegetables than if you eat the vegetables alone.
- **Include Vitamin C Foods** such as fruits and vegetables which help the body absorb more nonheme iron. Eating citrus fruits like orange juice and grapefruit with your cereal will help your body absorb more iron from the cereal than if you eat the cereal alone.

IRON ABSORPTION HELPERS. Include these foods in your meals to help your body absorb more iron.

Vitamin C Foods:

Strawberries	Orange juice	Cauliflower
Cantaloupe	Grapefruit	Tomato
Orange	Grapefruit juice	Potato
Green pepper	Broccoli	Cabbage

Meats:

Beef	Chicken
Pork	Fish
Lamb	Shell fish
Veal	

(OVER)

Heme iron found in meat, poultry and fish is more easily absorbed by the body than **nonheme** iron which is found mainly in plant foods.

FOODS WHICH CONTAIN HEME IRON AS WELL AS NONHEME IRON¹

(These foods are also absorption helpers)

	Total Iron (in mg) Content	Iron Available for Absorption
Meat/Poultry/Fish <i>(3 oz./ cooked/ lean only)</i>		
Beef, liver, pan-fried	-5.34	-.60
Beef, chuck, arm pot roast, braised	-3.22	-.48
Beef, sirloin steak, broiled	-2.85	-.42
Ground beef, lean, broiled	-1.79	-.27
Pork, tenderloin, roasted	-1.31	-.15
Pork, ham, boneless, 5-11% fat	-1.19	-.14
Turkey, breast, roasted	-.99	-.14
Chicken, breast, roasted	-0.88	-.13
Fish, tuna, white meat, canned	-.51	-.06
Fish, salmon, sockeye, dry heat	-.47	-.06

FOODS WHICH CONTAIN ONLY NONHEME IRON

	Total Iron (in mg) Content	Iron Available for Absorption
Cereals/Grains		
Raisin bran (enriched), dry, 1/2 cup	-4.50	-.23
Whole wheat bread, 1 slice	-1.00	-.05
White rice (enriched), 1/2 cup	-0.90	-.05
Fruits/Vegetables		
Potato, baked with skin, 1 medium	-2.75	-.14
Peas, cooked, 1/2 cup	-1.26	-.06
Apricots, dried, 7 halves	-1.16	-.06
Prunes, dried, 3 medium	-0.84	.04
Spinach, raw, 1/2 cup	-0.76	-.04
Banana, 1 medium	-0.35	.02
Beans/Legumes/Other		
Molasses, cane, blackstrap, 1 tablespoon	-5.05	-.25
Kidney beans, boiled, 1/2 cup	-2.58	-.13
Tofu (2-1/2 x 2-3/4 x 1 in.)	-2.30	-.12
Egg, whole	-1.00	-.05
Peanut butter, 2 tablespoons	-0.60	-.03
Baked beans, canned, plain, 1/2 cup	-0.37	-.02
Milk, low-fat, 1 cup	-0.12	-.01

¹ Adapted from National Live Stock and Meat Board, *Iron in Human Nutrition*, 1990.

Supplements for Muscle Gain

4.6

Situation:

Matt, a varsity basketball center walks into a mall nutrition store and tells the clerk he wants more muscle but not necessarily a lot of weight gain. The clerk sells him \$50 worth of amino acids (1 jar) and \$50 of other supplements. The varsity basketball player goes to summer camp with the supplements and takes the supplements.



What happened to Matt?

Matt felt he gained muscle mass. Why? Matt is growing. His basketball camp provided intense training. Matt's male hormones promote natural muscle growth. Both the intense training and normal growth would result in increased muscle mass without taking any supplements.

Why do athletes continue to take supplements like amino acids, when they don't achieve results?

Look over these facts and decide for yourself.

Amino acid claims:

- Increase release of human growth hormone
- Promote muscle growth
- Increase strength

Amino acid facts:

- Weight lifting and endurance training increase growth hormone levels, *amino acids don't.* *
- Combining amino acid supplements with exercise does not increase growth hormone levels above those achieved with exercise*

Amino acid supplement content:

200-500 milligrams of amino acids per tablet

Compare to one ounce of meat:

7000 milligrams of amino acid per ounce

* *Reference: Lambert, M.I. et al Failure of commercial oral amino acid supplements to increase serum growth hormone concentrations in male body builders. Int. J. Sports Nutr. 3:290-297, 1993.*

Supplements without Scientific Support

Athletes take supplements to give themselves an edge over the competition. An effective supplement should improve athletic performance over the usual level. The following is a list of popular ergogenic aids, or "performance enhancers" which have **not** been proven to be effective. *Our thanks to Ellen Coleman, RD, MA, MPH, Sports Nutritionist, for providing the information for this section.*

What's not proven to improve performance:

- | | |
|------------------------------|--|
| Amino acids ³⁵ | Glandulars (extracts from testes, pituitary or adrenals) ³⁶ |
| Boron ³⁶ | Inosine ^{36, 43} |
| Carnitine ³⁶ | Medium Chain Triglycerides (MCT oil) ³⁶ |
| Choline ³⁶ | Omega 3 Fatty Acids ³⁶ |
| Chromium ^{37, 38} | Similax ⁴⁴ |
| Coenzyme Q10 ³⁹ | Vitamin B12 ³⁶ |
| DHEA ⁴⁰ | Yohimbine ⁴⁵ |
| Gamma-Oryzanol ⁴¹ | |
| Ginseng ⁴² | |

Creatine, a supplement with mixed results

4.7

A few more years of research may be needed before nutrition scientists agree on the safety and effectiveness of creatine.²

Creatine: Creatine phosphate is a high-energy compound stored in muscle. It is sometimes taken to improve performance in brief maximal exercise lasting less than 30 seconds. One study using 5 grams fed 4 times per day for 5 days, **then only 5 grams per day from the sixth day on** did result in improvement in brief maximal exercise lasting less than 30 seconds. The research article to support this is:

Maximal exercise lasting less than 30 seconds: Greenhaff, P.L. Creatine and its application as an ergogenic aid. *Int. J. Sports Nutr.* 5(Suppl):S100-S110, 1995.

Creatine is not always effective. Some athletes take creatine supplements in an effort to increase strength or increase creatine uptake by muscle cells. But the following research documented creatine's ineffectiveness in swimmers and runners. Here are the articles:

Swimming sprints: Burke, L.M. Effect of oral creatine supplementation on single-effort sprint performance in elite swimmers. *Int. J. Sports Nutr.* 6:222-223, 1996.

Running: Redondo, D.R. et.al. The effect of oral creatine monohydrate supplementation on running velocity. *Int. J. Sports Nutr.* 6: 213-221, 1996.

Other points to remember:

Few regulations apply to the supplement and health food industry

1. **Supplements do not have to be tested for safety or effectiveness** to be sold in the United States.³²
2. When you buy creatine, herbs, amino acids or any food-related supplement, you can not be sure of the amount of active ingredient the pills actually contain.
3. **Use food, not supplements, to fuel performance.** Your training program and optimal nutrition are critical to improving performance.
4. Use sound nutritional strategies, rather than powders or unproven supplements.



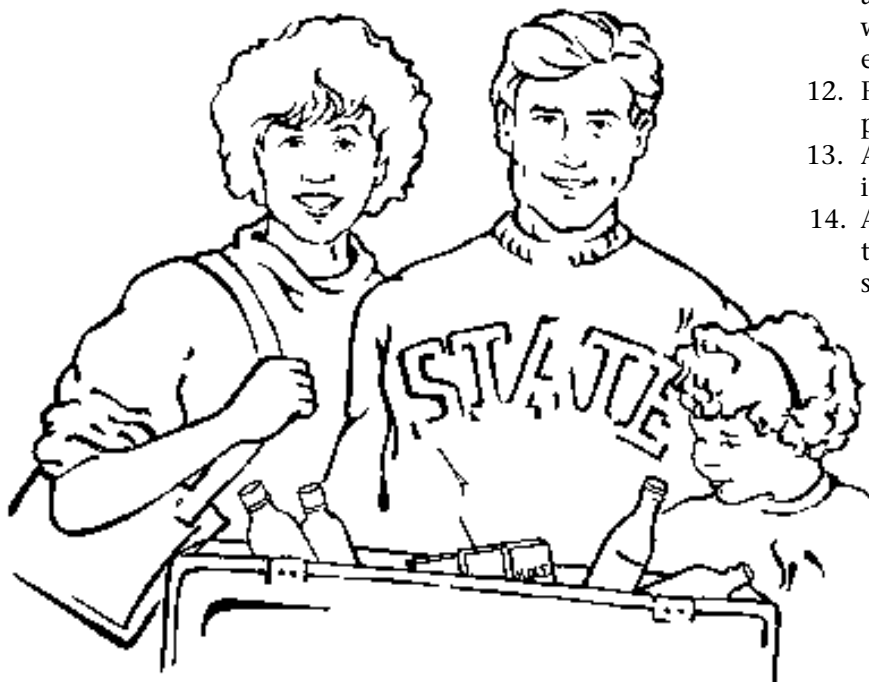
Dr. Dan Bernardot, nutritionist for the USA women's gymnastics team, said¹¹ this about athletes' ability to maintain anaerobic power and anaerobic endurance in a speech to the American Dietetic Association:

"The gymnasts during the Olympics, all of them every day, they all had at least 2 to 3 ounces of red meat every day—at least. We had filet mignon every day, we had red meat incorporated into other foods every day. There are a lot of reasons for this, but one of them is we had done a creatine monohydrate study. (From the results) we thought it may be because the red meat gives them a little bit more of the amino acids they need to manufacture creatine or because red meat supplies the creatine directly. Whatever the reason, we decided we are going to incorporate the science into practice. We made sure that when they were eating they would have red meat available."¹¹

The medical safety of creatine supplementation has not been evaluated well enough. Little data is available regarding the safety of young, growing athletes supplementing the diet with creatine during times of training. Most important is the fact that meat supplies the creatine your muscle needs.

*Dear Parents,
We're pleased to have your son or daughter on our athletic team. Parents often wonder what they can do to help the team and student athletes. Helping your athlete eat a balanced diet is important. Your athlete should have received hand-outs about healthy eating, including lists of food appropriate for different times of day. Use these guidelines as shopping lists to make healthy food choices available at home; eating right should help your student both in their competition and in the classroom.*

Here are a few practical suggestions for Athletic Booster Clubs that would help make nutrition for performance and improved endurance much more possible. Note that some take only organization, while others require money.



GREAT DONATIONS OR ACTIVITIES from parent booster clubs and high school athletic associations:

1. A team refrigerator for storing after-practice snacks.
2. A vending machine near the gym stocked with 100% fruit juices.
3. Coolers full of ice for post-competition sandwiches.
4. A cooler filled with calcium-fortified orange juice.
5. Concession stands stocked with bananas, canned fruit with pop-top lids, and lean meat sandwiches athletes can eat during all-day events.
6. A case of cereal which can be eaten right out of the box.
7. A few dozen bagels for the bus ride to the meet.
8. A cooler of yogurt and juices for after practice.
9. Cold watermelon and cantaloupe sliced after an August or September practice, oranges and sandwiches after fall and winter practices.
10. A parent sponsored pasta supper to kick off the season and to provide time to organize sports nutrition needs with the coach.
11. Parent sponsored coolers of post-competition meals (divide interested parents into groups, assign each one a cooler to fill with sandwiches, fruit, juices, etc. for one dozen players).
12. Fruit, milk and cereal for after early morning practices.
13. A pancake breakfast for after Saturday morning practice.
14. A summer barbecue after practice to provide time to organize the season snack calendar sign-up for parents.
 15. Two ten gallon thermal ice water containers for practice, events and bus rides.
 16. A "food-grant" team of parents who work for local grocers, the local bagel shop, the local dairy, bakery or food manufacturers may ask for donations of food for their team.
 17. Money for a bus with a bathroom for long rides to away games.

For more Team Meal ideas, menus and recipes for quick meals for teen athletes and their families, contact your local ISU Cooperative Extension office OR the Iowa Beef Industry Council, P.O. Box 451, Ames, IA 50010 515-296-2305



Team Meals

5.2

Dear Parent/Booster Club,

Team meals prior to a competition are often an important tradition as well as a time for boosting team spirit.

The team meal can also be an important nutrition boost for your athlete. So, make sure the team meal is nutritionally sound. Athletes need more than just carbohydrates for energy. Their fuel (food) should include protein, carbohydrates and fat (yes, a little fat) as well as enough calories for each team member. A balanced meal (foods from all the five food groups) means your athlete will get some of all the nutrients they need to enhance their performance and prevent fatigue (and perform well academically). Limiting team meals to just high carbohydrate foods will not provide the nutrients a growing athlete needs.

Try this team meal. It contains foods from each group of the Food Guide Pyramid.



- Veggie Tray and Dip**
- Pasta with Low Fat Meat Sauce and Parmesan Cheese**
- Whole Wheat Rolls and French Bread**
- Skim or 1% Milk, Water**
- Fresh Fruit Tray**



PREPARATION TIPS: These are general guidelines. Individual appetites will vary according to individual athletes and their sport, so plan accordingly.

PARENT TIP: To help in preparation of the team meal, assign parent volunteers something to bring. Five parents could each bring a fruit all chopped, ready for the Fruit Tray or to make a Fruit Salad: orange sections, kiwi in slices, blueberries, melon slices, grapes. Four parents could each bring a vegetable all cleaned, cut and ready to serve: 2 pounds carrots, 1 head celery, 4 cucumbers, 1 head broccoli. One parent could bring the dip.

Water...offer plenty of cold water. Muscles need hydrating before the game.

VEGGIE TRAY

If they can eat it with their hands, it's likely to get eaten! Make the veggies and dip an "appetizer" by setting out ahead of time as they arrive; hungry athletes will eat the veggies if that's all that's available.

Assorted vegetables:

- carrots (or baby carrots)
- celery
- broccoli
- cauliflower
- green or red pepper strips
- cucumber slices

To prepare veggies, clean and cut into bite-sized pieces ahead of time; store in Zip-lock bags. Serve with dip if desired.

POPEYE'S DIP

Don't call it Spinach Dip...this tasty dip is a way to get more vegetables in your teens.

- 1 pkg. (10 oz.) frozen chopped spinach, thawed & drained
- 1 cup light sour cream
- 1 cup plain yogurt
- 1 pkg. dry vegetable soup mix
- 1/2 cup green onions, finely chopped
- 1 can water chestnuts, finely chopped (optional)
- 3 ounces dried beef, finely chopped (optional)

Squeeze moisture out of spinach. Combine all ingredients and chill at least 3 hours. Makes about 4 cups; plan on 1/4 cup per person. Serve with vegetables.

PASTA WITH LOW FAT MEAT SAUCE AND PARMESAN CHEESE

This quantity makes 8 to 12 servings of Meat Sauce. Use these amounts to multiply times the number of servings needed for your team. (*Some athletes may eat more than one serving!*) Plan on serving 1 to 1-1/2 cups of Meat Sauce for each 2 cups of pasta. Make grated Parmesan cheese available to add calcium to teen's diets.

2 pounds lean rinsed ground beef*
 2 jars or cans (28 to 30 oz.) pasta sauce
 Parmesan cheese
 Cooked spaghetti**

Brown ground beef in large kettle or saucepan, stirring occasionally, until no pink remains. Drain fat. Place ground beef crumbles in strainer or large colander. Rinse with hot tap water, about 1 quart per pound of beef. Stir to remove water. Place beef crumbles and pasta sauce in kettle and heat until simmering. Use a 1 cup measuring cup or 8-ounce ladle to serve. Makes about 12 cups of meat sauce.

SAFETY TIP: keep meat sauce hot, at least 140° F., for holding and serving.

* RINSED GROUND BEEF (see below)

**SPAGHETTI: Prepare spaghetti as directed. 16 oz. dry spaghetti makes 8 cups cooked. Plan on 2 to 4 cups of cooked spaghetti per athlete. If you use a shape like shell or elbow macaroni, 1 cup dry equals about 2-1/2 cups cooked.

SPAGHETTI HINT : Have two pots of water boiling as athletes arrive. Cook 2 pounds of pasta in each pot; this should feed 8 teens per pot of pasta.

WHOLE WHEAT ROLLS OR FRENCH BREAD

Add fiber and nutrients with whole wheat rolls.

- Warm rolls in 400° F. oven on cookie sheet to serve crispy and unbuttered.
- Slice loaves of French bread (spread *lightly* with softened margarine if desired) and wrap in aluminum foil; heat in 350° F oven for 15 minutes.
- Or slice loaf of French bread lengthwise into two pieces. Spread *lightly* with margarine and broil for 3 to 5 minutes; cut into 2-inch slices.
- Other options: serve bread sticks or homemade bread from parent's bread machines.

FRESH FRUIT TRAY

Choose a variety of fruits; cut all into "finger food" that teens enjoy. (*If fruit is leftover, package, refrigerate and send with the team on the road trip.*) Set out on trays or bowls.

Good choices:

orange wedges	melon slices	apple wedges*
grapes	blueberries	banana chunks*
fresh strawberries	dried apricots	any fruit in season
kiwi fruit	pineapple	

* Apples and bananas turn brown quickly. Either cut these at serving time or dip cut fruit into orange or lemon juice to delay browning.

Rinsed Ground Beef

Rinsing cooked, crumbled ground beef with hot tap water is a simple way to reduce fat by 50% or more!

What about nutrition? Over 90% of nutrients are retained: protein, iron, zinc and B-vitamins.

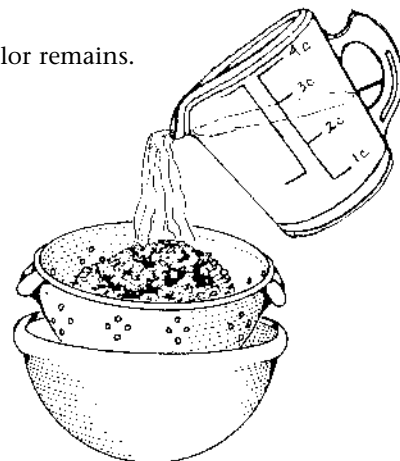
What about taste? Rinsing reduces the flavor slightly, but most cooked, crumbled ground beef is used in seasoned dishes like chili, taco meat, spaghetti sauce.

Here's how...

1. Brown ground beef in skillet over medium heat, stirring until no pink color remains. Cook onions or peppers with the beef, if desired.
2. Pour off any fat.
3. Optional: place crumbled beef on two layers of paper towels and blot.
4. Place beef (*and onions, peppers*) in strainer or colander over bowl.
5. Rinse with 1 quart very hot tapwater.
6. Let drain 5 minutes. Proceed as recipe directs.

Compare calories and fat for 3 ounces cooked, rinsed ground beef*

	<u>Calories</u>	<u>Fat</u>
70% lean ground beef, rinsed	135	.6.1 g
80% lean ground beef, rinsed	130	.5.3 g
90% lean ground beef, rinsed	122	.3.8 g



*Data from Iowa State University Research, 1992. This research used the technique described above, including the blotting procedure.