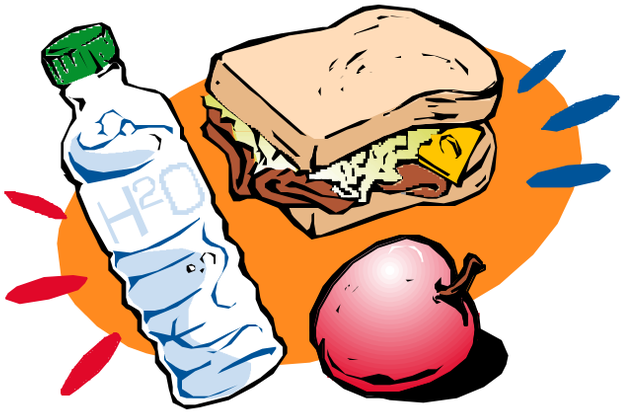
NUTRITION

EAT

TO FUEL

PERFORMANCE



SPORTS NUTRITION-

Eat to Fuel Performance

INTRODUCTION

Good nutrition and optimal training spell success in athletic competition. Athletes who eat a healthy diet:

- ***have the energy to perform at their best.***
- ***heal better after injury***
- ***improve their cognitive development and ability to learn.***

Encourage your athletes to eat well before **the competitive part of their season begins. Emphasize that the foods they eat most of the time can help replenish muscle glycogen to delay the onset of fatigue.**

This kit will help educate your athletes about nutrition to enhance athletic performance and prevent fatigue.

THIS KIT INCLUDES:

- **Sports Nutrition for Coaches**, *providing background information, including suggested Talking Points, Glossary, and References.*

- **18 reproducible Student Handouts.** *They may be handed out individually once per week in season, or reproduced as a part of a preseason mailing sent out with practice schedule.*

- **Parent / Booster Club handouts.**

This information was developed for student athletes, but it may be useful for other teens in need of nutrition information.

WHO WILL USE THIS KIT?

- Coaches and teen athletes
- Parents and teachers of teen athletes
- Health professionals such as school nurses, registered dietitians, physicians
- Extension Nutrition and Health specialists, Family and Consumer Science teachers, Health teachers

OVERALL PROGRAM GOALS:

- To help teen athletes improve the nutritional quality of their diets by improving food choices.
- To encourage teen athletes to practice good nutrition during both pre-season training and the competitive season to help meet their performance goals.

LEARNING OBJECTIVES:

Participants will:

- Understand that being well nourished and hydrated can improve athletic performance and delay fatigue.
- Learn why hydration is important for athletic success; be able to identify kinds and amounts of fluid to consume.
- Understand that eating before and after practice and competition can improve muscle glycogen replacement.
- Improve food choices at these times:
  - Breakfast
  - After morning practice
  - Lunch
  - Before and after afternoon practice
  - Traveling to games
- Understand the best ways to gain or lose weight.
- Recognize the importance of vitamins and minerals in athletic performance.
- Understand when nutrition supplements are safe and effective.

SUGGESTIONS FOR USE:

It is suggested that the coach review the coach's background information in the **Sports Nutrition for Coaches** booklet.

Opportunities to reach teen athletes:

1. Sponsor a nutrition seminar at the beginning of the practice season for teen athletes and parents.

   Suggested speakers include:
   - ISU Cooperative Extension Nutrition and Health Field Specialists; they have a prepared presentation to accompany this kit. Contact your local County Extension Office.

- A registered dietitian. Contact your school food service director or the dietary department of your local hospital. Ask if any Dietitians are members of SCAN, the Sports, Cardiovascular and Wellness Nutrition practice group of the American Dietetic Association. Or E-Mail milfleck@rmi.net and ask for the SCAN member nearest you.
- Your team physician.

2. Reproduce student handouts and give to students one at a time before each practice session. Use Coach's Talking Points to introduce each topic.
3. Reproduce all student handouts and staple together to make Sports Nutrition Booklet; hand out at the beginning of the season.
4. Contact Parent Booster Club or interested parents and suggest they coordinate a Sports Nutrition Seminar for interested athletes and parents.
5. Share information *(you may reproduce this kit for educational purposes)* with key people in your school:
   - Other coaches
   - School Nurse
   - Family and Consumer Science teacher
   - Cheerleader Sponsor
   - Drill Team Sponsor
6. Provide this information to local physicians and/or medical clinic if they do team sports physicals.

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Sports Nutrition

for

COACHES

TOPICS INCLUDED IN THIS BOOKLET

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PART 2. Eating - Before, During and After Competition

PART 3. Weight Management Issues *(including eating disorders)*

PART 4. Supplements, Vitamins and Minerals

PART 5. Parent Helps - Get Them on Your Team!

NAVIGATION FOR PDF FILE

Page layout and Table of Contents pages:
Click on Subject.
Navigation within book:
Clicking on:
Headings *will return to the Table of Conents*
Handout references *will go to the Handout page*

How to Use This Resource

This booklet provides background information for coaches on the following topics:

PART 1. Hydration / Fluids
PART 2. Eating - Before, During and After Competition
PART 3. Weight Management Issues *(including eating disorders)*
PART 4. Supplements, Vitamins and Minerals
PART 5. Parent Helps - Get Them on Your Team!

Each section has corresponding handouts to reproduce for students. Encourage student athletes to take these handouts home to give parents help on choosing healthy foods or share the information with a Parent Booster Club; they may wish to reproduce the handouts as a project.

Coach's Talking Points

Included in each section are several summary points that you may want to bring up as you distribute the student handouts.

References

Scientific references are given for the information presented in this kit; they are included at the end of this booklet. If students or parents wish to have more information, please reproduce the reference pages for them.

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13 . . . . . .**Other Sports Nutrition Resources**

Introduction to Sports Nutrition for Coaches

Good nutrition and optimal training spell success in athletic competition. Athletes who eat a healthy diet have the energy to perform their best. Good nutrition has academic benefits too. [1, 2, 3] ***Being well nourished and hydrated are prerequisites for cognitive development and the ability to learn.*** [2] ***So before the competitive part of the season begins, encourage your athletes to eat well. Emphasize that the foods they eat most of the time from day to day can help replenish their muscle glycogen to delay the onset of fatigue.*** [4-7] ***Begin giving your athletes nutrition training as soon as possible. This kit will help you educate your athletes about nutrition for sports performance.***

▲ What is the best diet for athletes?

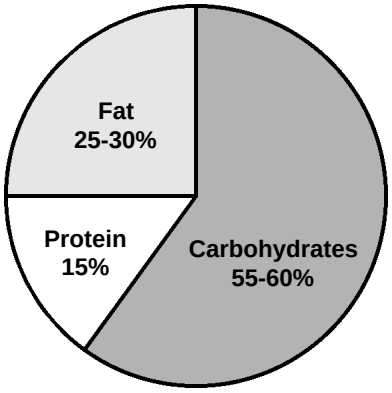
The best diet for athletes is a mixture of carbohydrate, protein and fat. These are the fuels used by the body. Carbohydrate is stored in the liver and muscles as glycogen. Muscle glycogen is critical to directly fueling muscle performance. When muscle glycogen is depleted, the muscles become fatigued and athletes can't perform their best. During exercise, the liver releases glycogen into the bloodstream as blood glucose. The muscles use blood glucose to fuel activity too.

▲ Carbohydrate 55-60% of calories (energy)

Eating high carbohydrate foods before, during and after exercise will delay the onset of fatigue and allow the athlete to exercise for a longer period of time.

▲ Protein 15% of calories (energy)

Protein is needed for building and repairing muscle tissue. How much protein do athletes need? That depends on body size, age, intensity of the sport and calorie intake. An athlete's normal protein intake (15% of total calories) is generally adequate as long as enough calories are being eaten.[8, 9] Some young athletes (such as cross country runners, wrestlers, and swimmers) do not eat enough calories and thus don't get the recommended[8] .5 to .75 grams of protein per pound of body weight per day. These athletes may need a more protein-dense diet.



▲ Fat 25-30% of calories (energy)

Athletes need fat in their diet. Fat is a source of energy during exercise. Fat's function in food is a carrier of fat-soluble vitamins. Fat spares protein as an energy source, so protein is available to build and repair muscle and tissue. Many female athletes have become obsessed with fat. As a result, they avoid foods from the meat and dairy groups. Coaches need to provide healthy messages about eating a variety of foods including high protein foods which naturally contain some fat.

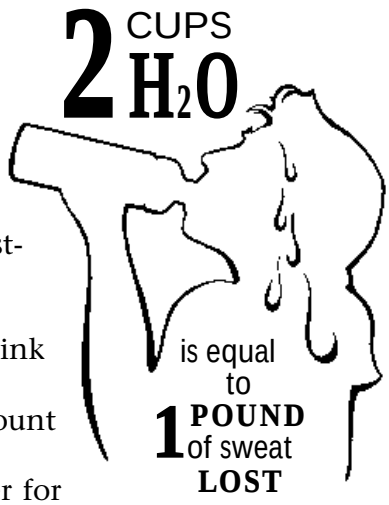
▲ BECOME A FOOD COACH. Send the drug-free message to your athletes: food fuels performance.

What should you expect by adding the title Food Coach to your resume? You may be rewarded by your athletes.

- staying healthier during the season
- healing better after injury
- maintaining a higher level of academic and athletic performance year after year.

PART 1: Hydration / Fluids

Water is the single most important nutrient for the body.
It promotes the health, safety and optimal physical performance of the high school athlete. The American College of Sports Medicine (ACSM) recommends:[10]



1. Eat a nutritionally balanced diet and drink adequate fluids during the 24 hour period before an event.
2. Drink 2 cups of fluid 2 hours before exercise.
3. During exercise, drink early and at regular intervals in an attempt to replace all of the water lost through sweat.
4. Drink cool fluids in large enough containers that allow adequate volumes to be ingested with ease. Cool water is best for activity lasting less than one hour.
5. For exercise events lasting longer than one hour:
   - consume 1/2 cup to 1 cup of a 4% to 8% carbohydrate sports drink every 15 minutes in order to delay fatigue
   - or drink 1/2 cup to 1 cup of fruit juice diluted with an equal amount of cool water every 15 minutes to delay fatigue.
6. Weigh before and after exercise. Drink two 8 ounce cups of water for every pound lost during exercise.

STUDENT HANDOUTS:
Use the reproducible master **1.1 Hydration/Fluids** so the process of becoming hydrated and replacing body water losses becomes easy for your athletes.

COACHES TALKING POINTS:
- Read the six American College of Sports Medicine (ACSM) recommendations above to your team when you give them 1.1 Hydration/Fluids.
- Remind them that muscle cramps are one sign of dehydration.
- Heat injury is 100% avoidable [22]

PART 2: Eating - Before, during and after competition

Time to eat is constantly being squeezed out of a high school athlete's busy day.

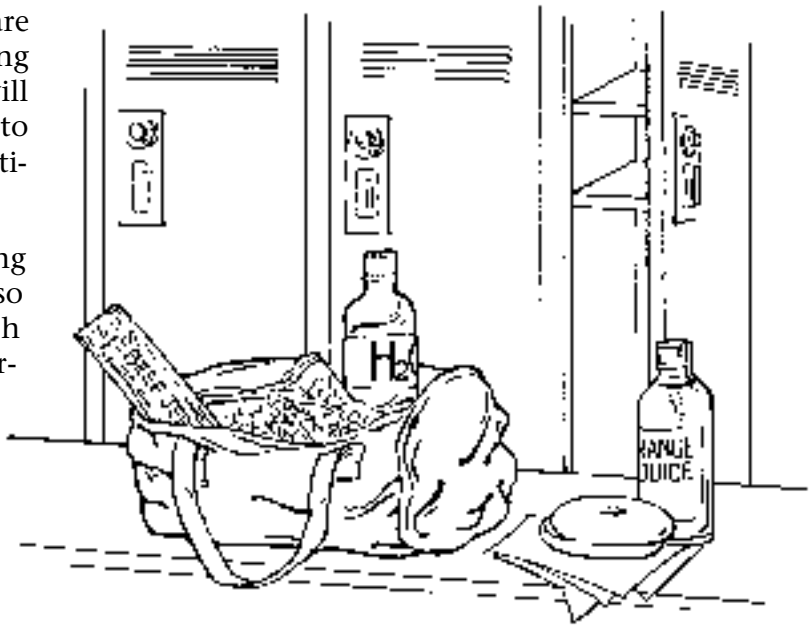
- *School starts too early to suit many adolescents.*
- *Student-athletes who are serious about homework are often studying past midnight.*
- *When the alarm rings at home, there is just enough time to shower, dress and bolt for the door.*
- *After a morning of classes, the lunch line is so long, there may be only seven minutes left to eat the food they bought.*
- *An afternoon of classes is followed by practice.*

A sip of water from the fountain gives your athletes one ounce of water before a long stretch of practice or weight training. A bagel for lunch is all the athlete had time to eat. Welcome to every day high school nutrition issues. Inadequate total energy and fluid intake is common among many growing, young athletes.

When the sports medicine professionals arranged with coaches of Olympic hopefuls to test eating every 2.5 hours, the coaches were to make significant changes. The coaches had to stop practice and make sure the athletes ate before practice resumed. But the coaches saw immediate performance benefits. At USA Gymnastics, it became policy that the athletes ate every 2.5 hours. They cited the athlete's ability to maintain maximal power indicating "better fueled" muscles as the reason for accommodating frequent breaks to eat.[11]

What does this mean for your high school athletes?

Skipping breakfast and eating little for lunch does not fuel muscles for long hours of practice. Encourage your athletes to eat breakfast, lunch and a high carbohydrate snack before and after practice to fuel muscle glycogen stores. Watch <u>if</u> they eat. If your athletes are doing radical things such as skipping meals or eliminating food groups they will hurt performance. You may be able to help them change before intense competition begins.

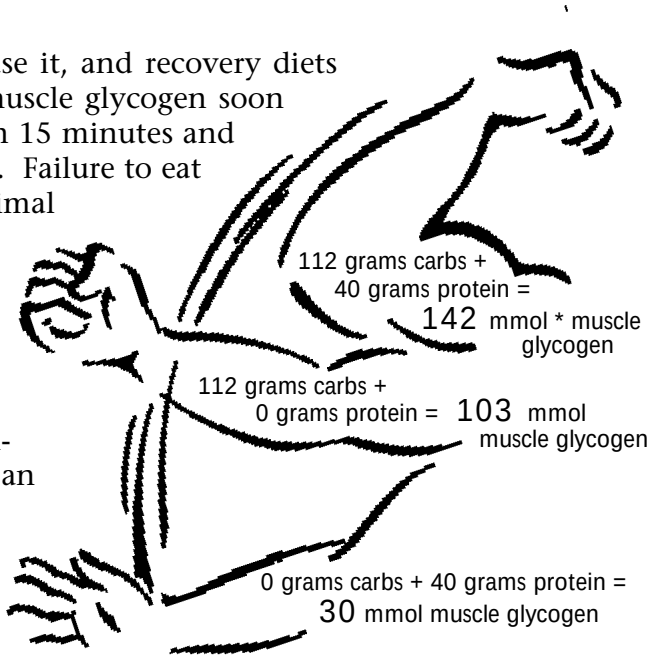


Food to help athletes recover after long hours of training or competition is also important. It's important in both endurance exercise and resistance exercise. Protein *(even if it must come from body protein or muscle)* will be used for energy when any person does not eat enough calories, carbohydrate or protein.

Recovery Diets Work!

If coaches see something that works, they will use it, and recovery diets work! Muscles are most receptive to replacing muscle glycogen soon after a hard workout.[4] Athletes should eat within 15 minutes and again within 2 hours of training and competition. Failure to eat after practice and competition may hinder optimal glycogen recovery and endurance.[6]

"Don't avoid protein in your recovery diet. In fact, some protein can actually enhance glycogen replacement in the initial hours after hard exercise," says Nancy Clark in her Sports Nutrition Guidebook.[7, 12] How much food does a young athlete need after practice or competition? Here is an example: one 16-ounce bottle of orange juice, 4 ounces of lean beef on a bagel and a plum! Those are pretty tasty and convenient foods if you have morning or summer workouts. However, if the foods are kept from morning until after-school, you may need a little refrigerator space or an ice pack to keep the foods at the right temperature.



*mmol = *micromoles of muscle glycogen per gram of protein*

STUDENT HANDOUTS:

Use the following reproducible masters as a packet or just photocopy them back-to-back and hand out one page per week for three weeks to provide student-athletes with practical ideas on what to eat before, during and after practice and competition for optimal performance.

2.1 Eat breakfast
2.2 Eat after morning practice
2.3 Eat lunch
2.4 Eat before and after practice
2.5 Eat after practice for better recovery
2.6 Travel food/ Fast food

COACH'S TALKING POINTS:

- Take time to eat.
- Don't skip meals.
- Eat great snacks if you miss a meal.
- Build your muscle energy reserves. Use some of the ideas on these handouts.
- Show the handouts to your parents so they grocery shop for the food you need for energy. Hang them on the refrigerator door as a reminder.

PART 3: Weight Management Issues

Many athletes competing in sports that require wearing a swimsuit, shorts, singlet or leotard are very concerned about their appearance. When your young athletes look and feel great, then they will go out and perform at their best. Your school and parents want energetic, healthy kids to promote the school spirit. The kids look to their coach to help them compete at their best level. Using the reproducible handouts from this kit will help you teach them how nutrition and sports research can be used to their advantage!

Weight gain

Student athletes may come to you with weight gain requests and an interest in getting muscular. Use the handout **3.1 Weight Gain** for the team members who want to gain weight, increase lean body mass and evaluate her or his protein level.

Athletes can add muscle tissue by putting a demand on muscles and making them work harder. Muscle will grow when it is challenged to lift more weight. Proper strength training and genetic endowment 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 planning and calories.[8, 9]

Plan on recommending a balanced diet. Athletes should be encouraged to eat fruits, vegetables, whole grains, meat and drink milk.[13] Once a well-balanced diet is achieved, the athlete can focus on adding 400 more calories per day from a variety of foods.[12]

Being leaner

High school athletes are interested in achieving a "buff" appearance through trying to increase muscle and reduce body fat. In sports where athletes have to produce a tremendous amount of speed or elevation through the air, keeping their body fat low may be an advantage. Judges and other athletes expect to see bodies that flow through the moves of the sport.

Positive eating and exercise

A task oriented environment works best to encourage positive eating and exercise for the leaner, more muscular look. Here are three examples of **tasks:**

1. fill a water bottle at the start of practice and drink from it throughout practice.
2. come to practice with a high carbohydrate snack or have the money to buy juice and a snack from the vending machine.
3. go to the weight room for resistance training a couple days every week and do aerobic exercise every day.

These tasks are very different from weigh-ins. Daily weigh-ins are **outcome:** what the body weighs at that time. There are many variables affecting an individual's weight on a given day: whether or not a meal was eaten, fluid status, menstrual cycle, or the effect of medicine. An individual athlete may want to weigh him or herself before and after exercise to monitor fluid status and drink 2 cups of water for every pound lost, but a coach should not use the scale to overemphasize weight loss.

Avoiding weigh-ins can help reduce the incidence of disordered eating[11.]

Unnecessary weigh-ins can keep a growing athlete from eating that high-carbohydrate, nutrient dense snack needed for muscle glycogen. Some athletes expecting to be weighed skip meals and have low energy levels at morning practice and again after school. Low calorie intakes can have far reaching effects. When coaches for one team banned weigh-ins in the gym, the girls started

having normal menstrual function. When a girl's period stops for three months or more, it is not just a body fat issue, it is also an issue of psychological stress, low calorie intake, and low iron intake. In girls track and field, amenorrhea (periods cease), and stress fractures are common. To speed the development of bone density so that it matches muscle mass increase, and so that normal menses occur, encourage athletes to eat. [11, 14-16]

Eating disorder risk

Sometimes the student athlete who seems most in control of her or his life, who focuses constantly on improving, and who strives for perfection is the person who is most at risk for an eating disorder.

Watch for preoccupation with food, calories and weight through these red flags of eating disorders:[28]

1. Athletes who never eat because they are too busy, forgot, have too many classes, but say they feel in control when they are empty.
2. Female athletes who stop menstruating.[31]
3. Athletes who lose a large amount of weight in a short period of time.
4. Athletes who avoid food-related activities such as team meals, post-exercise snacks and team banquets. Parents may report their child never eats with the family anymore.
5. Athletes who criticize their own body.
6. Athletes who use diuretics or laxatives.
7. Athletes who make frequent trips to the bathroom after eating.
8. Athletes who withdraw and have low self-esteem.
9. Athletes with declining performance and practice levels.
10. Athletes who limit a whole category of food they will eat.[47] **For example**, research by Liskov, et. al. concludes that vegetarian diets, a socially acceptable reason for limiting food intake, masked an eating disorder in nine of the 22 eating disordered adults studied. The research method was a survey mailed to 108 graduates of the past 10 classes of the Yale dietetic internships. 79 graduates responded. 22 identified themselves as having an eating disorder. Nine of those with eating disorders were vegetarians. Only 11 of the 57 non-eating disordered responders were vegetarians. The researchers concluded that vegetarianism among dietetic interns may be an indicator of an eating disorder in some instances.[17]

Emphasize

Emphasize what really counts for your sport: healthful eating, skill development, practice sessions, training, effort and attitude. Student handout **3.2 Weight Loss** may be given to selected athletes. Good candidates might be those student-athletes who approach you because they want to lose weight. Reproduce handout **3.3 Bare Necessities** on the back of **3.2.** This guide will help insure that students eat a ***minimal*** amount of food from each of the food groups. Remember, a student might burn 600 calories at one of your practices. This plan is not for weight maintenance; it's for weight loss. The off-season is best for working on weight loss.

Any handouts on sports nutrition will raise the nutrition awareness of student athletes and may lead to questions about weight, body composition and eating habits. The pace of change in sports nutrition may be slow, but it can be rewarding when a student athlete makes the commitment to eat better. He or she may feel better, miss fewer practices and perform better. Athletes performing well serve as role models, influencing other teammates and friends to eat well.

STUDENT HANDOUTS:

3.1 Weight Gain
3.2 Weight Loss

COACH'S TALKING POINTS:

- Talk with an athlete one-to-one when body weight is the subject.
- Copy this section for the school nurse, counselor and parents if you suspect an eating disorder in one of your student-athletes.

PART 4: Supplements, Vitamins and Minerals

Do vitamin and mineral supplements give athletes a competitive edge?

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

Give the **4.1 Eat Food for Vitamins and Minerals** handout and photocopy **4.2 Vitamins and Mineral Supplements** on the back for all of your athletes.

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 RDA once per day. The only thing the supplement will help is if there is a deficiency of a particular vitamin or mineral.

How do you know what's in a supplement?

FDA has approved rules for "Supplement Facts" labels; they should be appearing on supplements in the near future. Similar to the Nutrition Facts label on foods, the Supplement Facts panel will provide consumers with information on 14 nutrients, when present at significant levels, and other vitamins and dietary ingredients for which no Dietary Reference Intakes have been established, among other information.

Is it effective to take single vitamins or minerals?

If a physician diagnosed a deficiency after seeing the student's lab work or a Registered Dietitian did a nutrition assessment and a specific supplement was advised, follow 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.

Three Minerals of particular importance to teens

"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]

- **Calcium**

  Calcium is used for muscle contractions, bone formation and for nerve transmission.

  The **Calcium** fact sheet will give your student-athletes strategies and guidelines for practical ways to improve their calcium intake and maximize the unique contributions of specific foods.

- **Iron**

  Iron is critical to oxygen use. If you coach athletes performing endurance-aerobic work, you want an adequate intake of iron rich food. [19] Iron deficiency is the most common nutrient deficiency in the USA. **Teens and females are the highest risk group.** [20] Endurance athletes lose iron in sweat, urine, feces and gastrointestinal bleeding.

- **Zinc**

  Zinc is important for healing injuries, oxygen activation, growth and electron transport. [21] Zinc helps immune function and healing after an injury. Insulin needs zinc and every cell uses zinc to help produce CO_2 and dispose of CO_2.

  Zinc is part of more than 70 enzymes involved in the metabolism of protein, carbohydrate and fat. Zinc has a role in sexual maturation, appetite and normal taste sensitivity. The best food sources are meat protein because high fiber grains have phytic acid, which binds zinc, making it less available for absorption. Like iron, zinc from animal foods is more bioavailable than from plants. Meat provides about 70% of the zinc consumed in the United States. [1]

  Eating moderate amounts of lean meat along with healthier food choices in other food groups may be necessary to meet current dietary recommendations [13] of iron and zinc according to the Bogalusa Heart Study. Vegetarian athletes eliminate the most biologically active and best absorbed form of iron and zinc[33] when they eliminate meat intake. [13] Plan to give the **Iron** handout to all female athletes and males losing weight or eating little meat. Give the whole team the **Zinc** handout.

Supplements

Ergogenic aids are supposed to improve athletic performance. Some supplements simply don't work. Help your athletes use safe, effective performance enhancers with information from handouts **4.6** and **4.7.**

STUDENT HANDOUTS:

4.1 Eat Food for Vitamins and Minerals
4.2 Vitamin and Mineral Supplements
4.3 Calcium
4.4 Zinc
4.5 Iron
4.6 Supplements for Muscle Gain
4.7 Creatine, a supplement with mixed results

COACH'S TALKING POINTS:

- **The only time a vitamin/ mineral supplement will help improve athletic performance or endurance is when there is a deficiency of a particular vitamin or mineral.** Look over handout **4.1** and **4.2** early in the season and make improvements in your food choices to boost your vitamin/ mineral intake.
- **Dietary supplement manufacturers do not have to test their products for safety or effectiveness.** Use handouts **4.3** to **4.7** in a packet for each athlete or hand out one topic on supplements per week to give your athletes a truly competitive edge — knowledge!

PART 5: Parents

Schools with a winning tradition often have an edge: parents who contribute! To encourage your parent support group or athletic club to contribute more to team needs, use the ideas from handouts **5.1** and **5.2**. The parents of your student-athletes are invaluable to your sports program. Help them work to raise funds, feed the team and sponsor better nourished athletes.

Glossary

amenorrhea Absence of menstruation for three months, sometimes observed in female athletes who do not eat enough, are under stress or have a low amount of body fat. Amenorrhea is abnormal and has the undesirable consequence of perhaps bone loss and osteoporosis.

amino acids Protein's nitrogen containing structural components. Recommended amount of dietary protein intake is 15% of calories. Good dietary sources include lean meat (such as sirloin, round steak), eggs, skinless chicken breast, beans (such as soy, garbanzo, red, black, pinto and lentils), nuts, nut butters, seeds and skim milk.

ATP (Adenosine triphosphate) Biochemical that is a source of energy available for use by the body.

calorie A measure of heat energy, abbreviated as kcal for kilocalorie.

carbohydrate Nutrient starches and sugars which are digested and absorbed, becoming glucose for cellular energy or glycogen for muscular energy or glycogen for storage in the liver. Carbohydrate eaten above energy needs will be stored as body fat. Recommended dietary intake is 55 to 60 percent of calories (energy) from carbohydrate. Good dietary sources are skim milk, fruits, vegetables, whole grain breads and cereals, rice and pasta.

creatine Creatine is a nitrogen-containing, high energy compound eaten when one eats meat or fish. However, we primarily obtain creatine from our body's ability to make it. Creatine acts as a reservoir of energy for muscle contraction, also called phosphocreatine or creatine monophosphate. During physical performance it transfers energy to make ATP.

ergogenic Work producing, performance enhancing.

fat A nutrient that the body will burn for energy or store as body fat. Recommended dietary intake is 25 to 30 percent of calories (energy) from fat. Fat promotes the absorption of fat-soluble vitamins. Fat occurs naturally in nuts, nut butters, seeds, meat, cheese and is often added in food processing and with condiments such as mayonnaise, margarine and salad dressings. Fat eaten above energy needs will be stored as body fat.

fuel Energy from carbohydrate, protein and fat in food.

glycogen The storage form of carbohydrate to give direct energy to muscles. When one exercises at high intensity, active muscles use stored fuel first (muscle glycogen). When muscle glycogen is low, one must slow down.

legume A dry or mature bean with a high protein content (around 3 to 4 grams of protein per 1/3 cup legume eaten). Black-eyed peas, chick peas, lima beans, kidney beans, baked beans and chili beans are just a few examples.

minerals Nutrients critical to growth and development found in food. Examples include calcium, iron, copper and zinc.

nutrient dense food A food with a low number of calories relative to its rich nutrient contribution. Vegetables, skim milk, fruit and lean meat are often used as examples of nutrient dense foods because of low calories and high amounts of vitamins and minerals.

protein A nutrient made of amino acids used by the body primarily for structure of body tissues including muscle, and for functions such as enzymes and many hormones. Neurotransmitters and antibodies are proteins. Protein maintains acid-base balance, fluid balance and provides energy. Protein eaten above energy needs will be stored as body fat. Sources of protein include meat, soy, milk, nuts, eggs, grains, legumes and vegetables.

RDA Recommended Dietary Allowances.[1] Recommended Dietary Allowances are the levels of intake of essential nutrients that the Food and Nutrition Board (on the basis of scientific knowledge), judge to be adequate to meet the known needs of almost all healthy individuals; RDA's are set high enough to provide a margin of safety.

vegan A person who eats no animal products. Vegans can have an adequate diet if they take a B12 supplement; drink a fortified soy milk; and eat calcium set tofu (calcium has been added to tofu), Chinese mustard greens, kale or broccoli to help ensure adequate calcium nutrition. They must also eat a variety of seeds, nuts, nut butters, vegetables and legumes every day for adequate protein intake. Like other growing teen athletes, vegan student-athletes should eat many fresh and dried fruits and a variety of foods including whole grains.

vegetarian A person who limits some animal products in their diet.

vitamins Nutrients needed in small amounts and supplied by food. For example, whole grains and cereals are rich in B vitamins, milk is rich in riboflavin and vitamin D, and leafy green vegetables are rich in folate. Orange juice, melon, berries and vegetables are rich in vitamin C, while deep orange fruits (apricots, cantaloupe), vegetables (sweet potatoes, carrots), and milk are rich in vitamin A.

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Other Sports Nutrition Resources

Title	Source	Comments
Food Power , a coach's guide to improving performance	National Dairy Council, 1995 Cost: $14.25 Stock # 0140N Call 800-426-8271	Good handouts for athletes
MVE TV-The Channel for Moderation, V ariety and Exercise Grades 7-12	National Cattlemen's Beef Association, 1994 Coaches and PE teachers can get a free copy; send request on school stationary to Iowa Beef Industry Council, PO Box 451, Ames, IA 50010	Video, teacher's guide and handouts. A fun fast way to teach variety in food choices and label reading.
Mirror, Mirror. A Resource Guide for Helping Adolescents Develop a Positive Body Image and Maintain a Healthy Weight. Grades 7-12	National Cattlemen's Beef Association, 1992 Coaches and PE teachers can get a free copy; send request on school stationary to Iowa Beef Industry Council, PO Box 451, Ames, IA 50010	A resource packet for school professionals to use with teens who have concerns about body weight, shape and image. Great section for eating disorder references and referrals.
Nancy Clark's Spor ts Nutrition Guidebook	ISBN 0-87322-730-1 1997. Cost: about $15.95	Easy to follow, fun to read, very convincing.
Eating for Endurance	Ellen Coleman, 3rd edition, Bull Publishing, 1997. Cost: $14.95	Straightforward at the college level. Supplements, sports drinks and sports bars are reviewed.
Nutrition and the Female Athlete	Jamie Ruud, MS, RD ISBN: 0-8493-7917-2, 1996 Cost: $39.95 800-272-7737	Practical advice. Each chapter is "mini-course." Subjects include: body weight and composition, how to achieve . healthy competitive weight, more
The Ultimate Spor ts Nutrition Handbook	Suzanne Steen and Ellen Coleman ISBN: 0-923521-34-8 Cost: $14.95 Bull Publishing, 1996	Coaches, parents and high school athletes will love the ease of applying this know-ledge to their individual sport. Included you'll find nutrition and eating for short duration events, sports without rest periods and everything in-between.
Sport s Nutrition for V egetarians	Fact sheet by American Dietetic Association's Vegetarian Nutrition practice group Cost: less than $5	Call 410-366-8343
To find a spor ts nutritionist	Sports, Cardiovascular and Wellness Nutrition practice group of the ADA	Call 719-475-7751 or E-Mail milfleck@rmi.net

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This kit was developed with a grant from Land O'Lakes/Farmland Beef and Member Cooperatives across Iowa

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Hydration / Fluids

1.1

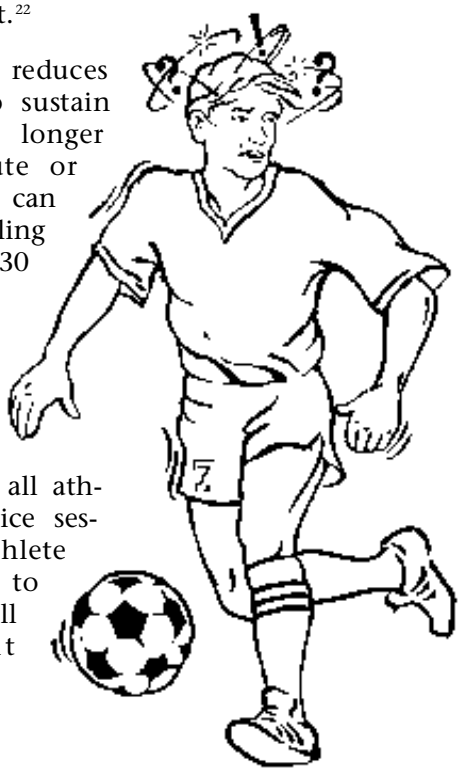
Why is water important?

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 fittness must be well hydrated.[23]

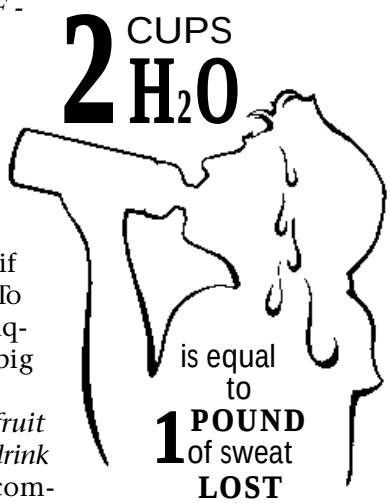
How can I be confident that I am well hydrated?

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*

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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., RD [25]

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

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Eat after morning practice

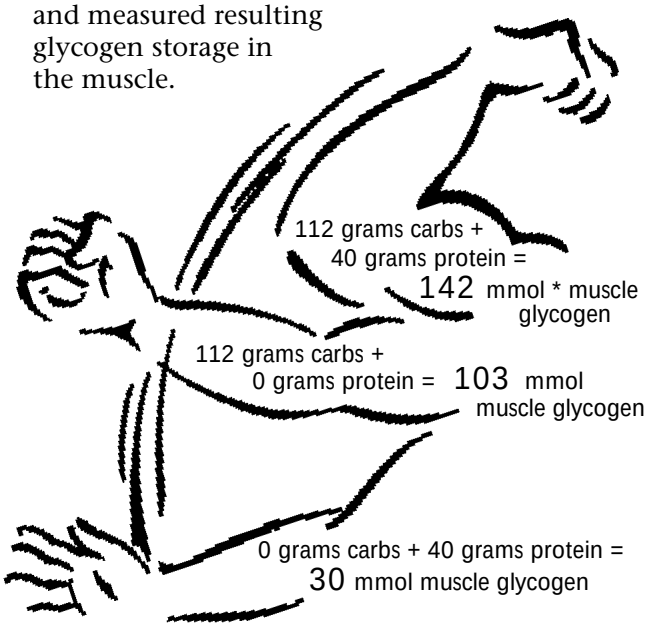
2.2

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

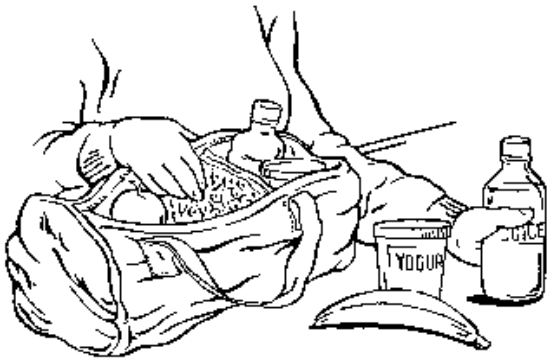
For more information on combining foods to get the carbohydrate/protein ratio used in this study, look at the handout **Eat Right After Practice (Handout 2.5)**

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*



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Eat Lunch

2.3

Why?

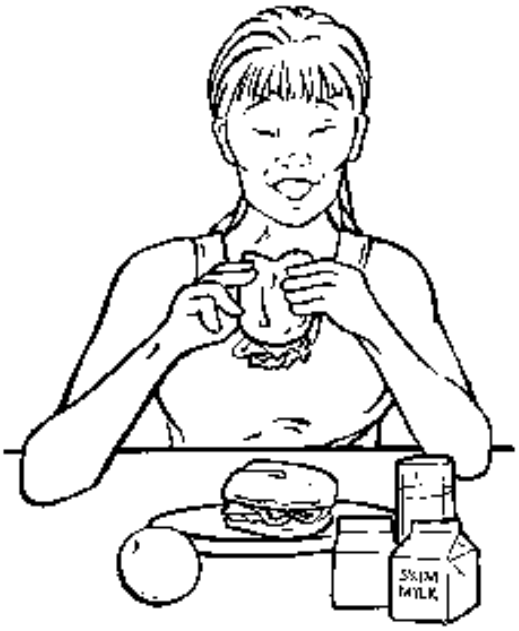
> *"Nothing makes a bigger difference to nutritional status than **the way an athlete eats most of the time.** Eating correctly most of the time sets up an athlete so that eating the right meal before a meet and the right nourishment during the com - petition can make a difference."*
>
> In Sports Nutrition, a guide for the professional,
> Dan Bernardot, Ph.D., RD [25]

Good nutrition has academic benefits.[1-3] Being well nourished and hydrated are important for your ability to learn.[2]

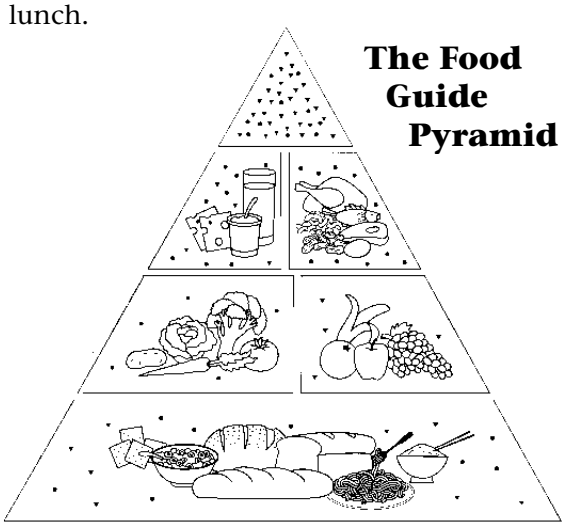
How can an athlete **plan** to eat well most of the time?

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!

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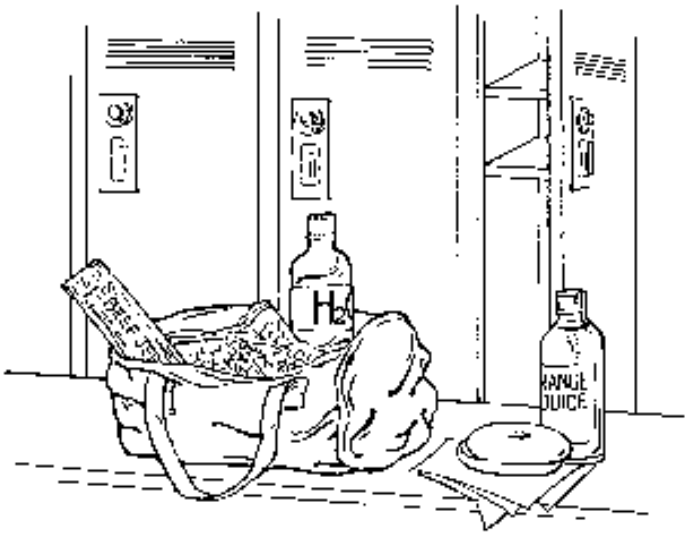
Eat before and after practice

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*

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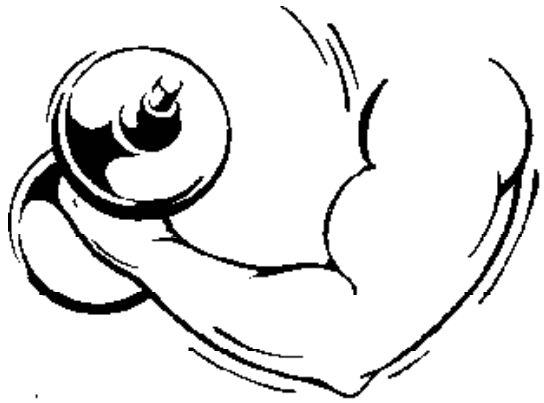
Eat right after practice

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 workout[7] 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 weight[8] *(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	AND	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)

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Travel Food / Fast Food

2.6

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

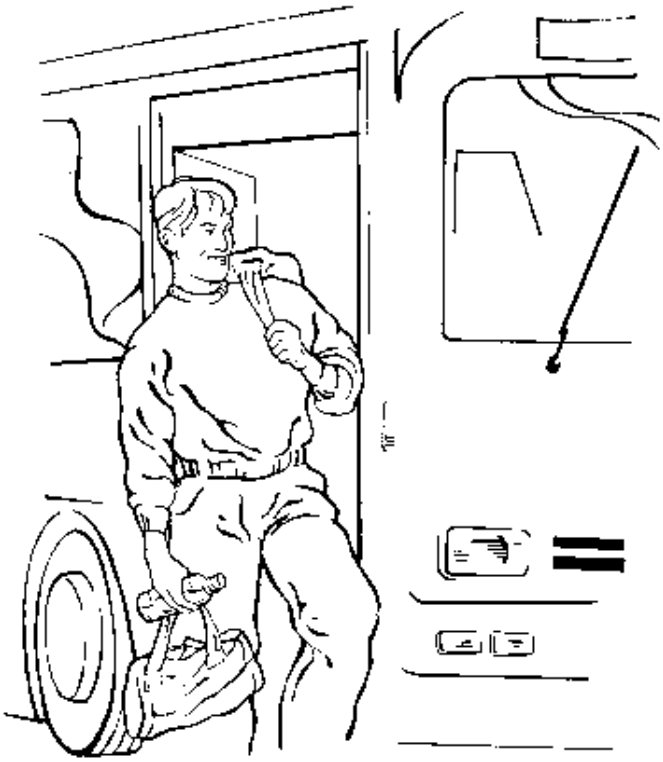
Plan ahead!

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

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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 x .5 = 65 grams of protein
130 x .75 = 97 grams of protein

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

170 pound teen athlete
170 x .5 = 85 grams of protein
170 x .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.

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(OVER)

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.

	Servings x grams of protein	Total grams of protein
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
		70 grams of protein

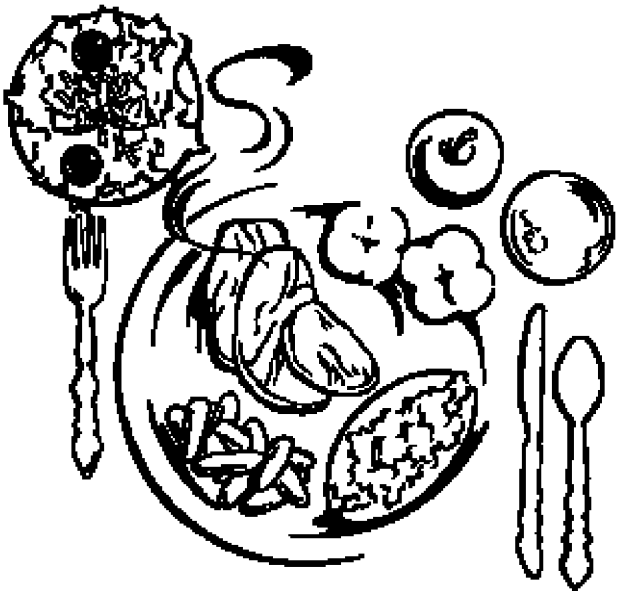
Pat needs 27 grams more protein. How does he add this?

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.

Grams of protein	Serving size
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



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Weight Loss

3.2

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.

(OVER)

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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 serv - ing. 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

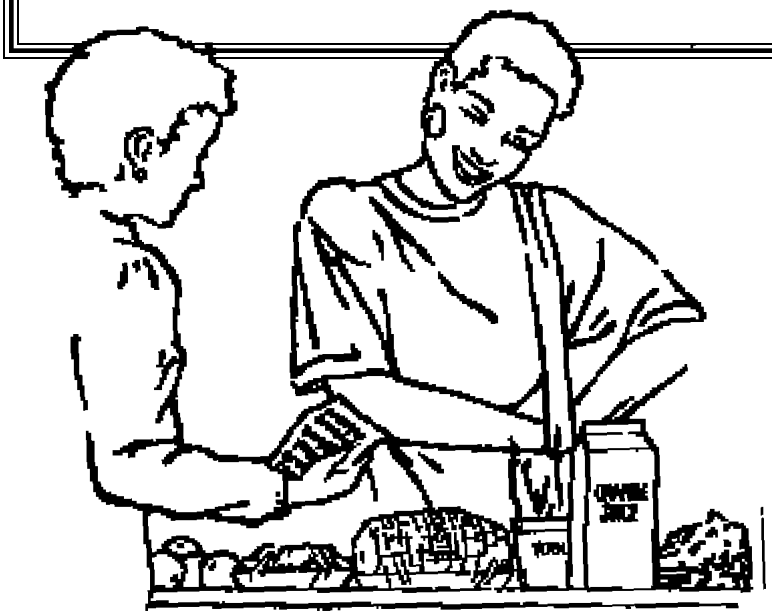
❒❒❒❒❒❒ cereal at breakfast or breads like a small bagel, English muffin, (very little jelly, little or no cream cheese or margarine) bun at lunch or flour taco shells or a pita, 1 cup of rice, or pasta after practice

❒❒ 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



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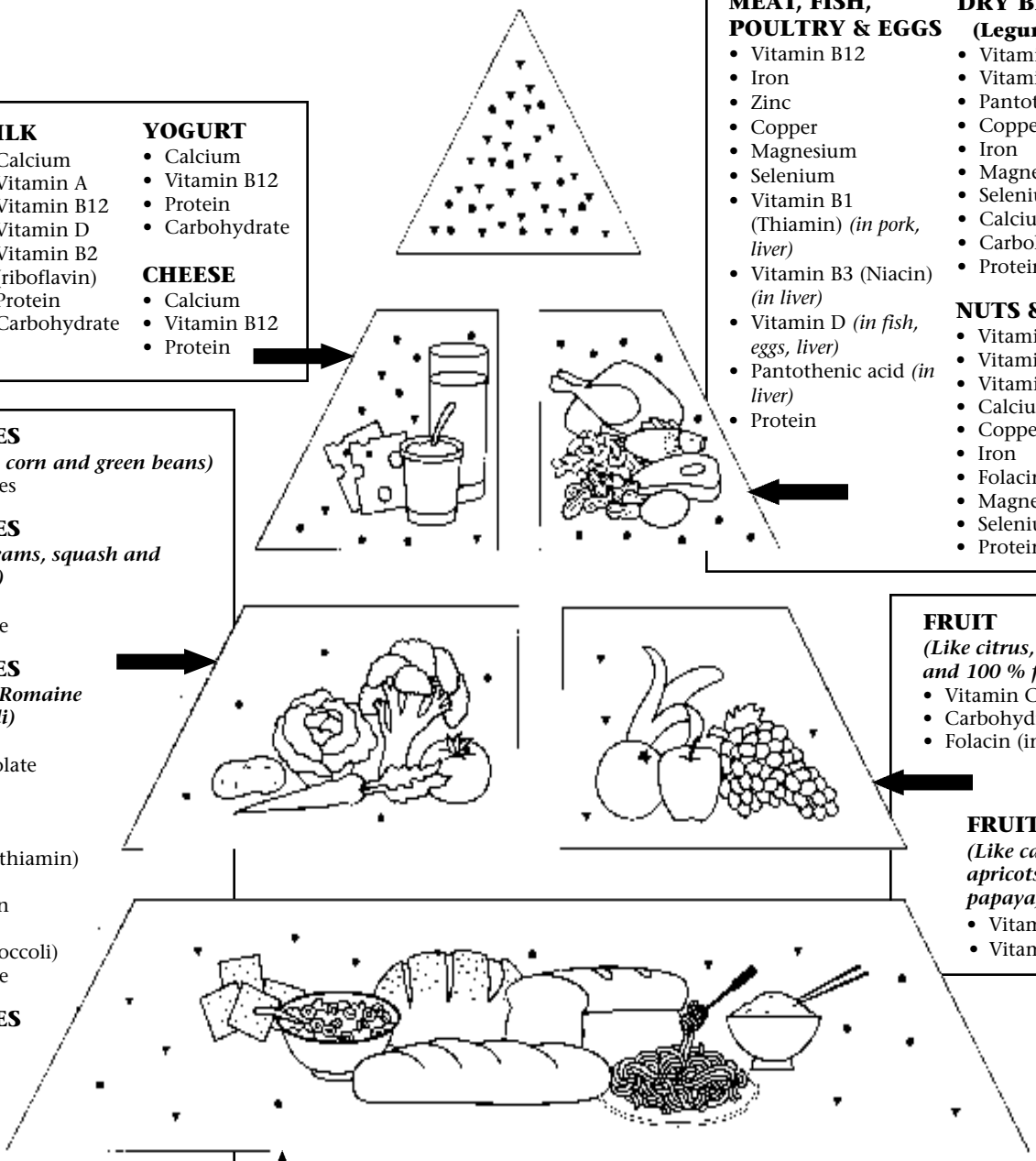
Eat food for vitamins and minerals

4.1

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



MILK
- Calcium
- Vitamin A
- Vitamin B12
- Vitamin D
- Vitamin B2 (riboflavin)
- Protein
- Carbohydrate

YOGURT
- Calcium
- Vitamin B12
- Protein
- Carbohydrate

CHEESE
- Calcium
- Vitamin B12
- Protein

MEAT, FISH, POULTRY & EGGS
- Vitamin B12
- Iron
- Zinc
- Copper
- Magnesium
- Selenium
- Vitamin B1 (Thiamin) *(in pork, liver)*
- Vitamin B3 (Niacin) *(in liver)*
- Vitamin D *(in fish, eggs, liver)*
- Pantothenic acid *(in liver)*
- Protein

DRY BEANS, SOY (Legumes)
- Vitamin B1 (Thiamin)
- Vitamin B2 (Niacin)
- Pantothenic acid
- Copper
- Iron
- Magnesium
- Selenium
- Calcium
- Carbohydrate
- Protein

NUTS & SEEDS
- Vitamin E
- Vitamin B1 (Thiamin)
- Vitamin B3 (Niacin)
- Calcium
- Copper
- Iron
- Folacin
- Magnesium
- Selenium
- Protein

VEGETABLES
(Like potatoes, corn and green beans)
- Carbohydrates

VEGETABLES
(Like carrots, yams, squash and sweet potatoes)
- Vitamin A
- Carbohydrate

VEGETABLES
(Like spinach, Romaine lettuce, broccoli)
- Vitamin A
- Vitamin B-Folate
- Vitamin C
- Vitamin K
- Magnesium
- Vitamin B1 (thiamin)
- Iron
- Riboflavin (in spinach, asparagus, broccoli)
- Carbohydrate

VEGETABLES
(Like peppers, tomatoes, cabbage, baked potatoes)
- Vitamin C

FRUIT
(Like citrus, berries, melon and 100 % fruit juices)
- Vitamin C
- Carbohydrate
- Folacin (in orange juice)

FRUIT
(Like cantaloupe, apricots, mango and papaya)
- Vitamin A
- Vitamin C

WHOLE GRAINS
- Vitamin B1 (thiamin)
- Vitamin B2 (riboflavin)
- Vitamin B3 (niacin)
- Pantothenic acid
- Iron
- Selenium
- Magnesium

ENRICHED AND FORTIFIED BREADS, CEREALS, PASTA & RICE
- Vitamin B1 (thiamin)
- Vitamin B2 (riboflavin)
- Vitamin B3 (niacin)
- Iron

MOST FRESH, UNPROCESSED FOODS
(whole, fresh foods like fruits, vegetables, whole grains, beans, nuts, meat and milk)
- Vitamin E
- Potassium
- Vitamin B6 (pyridoxine)
- Copper
- Phosphorus

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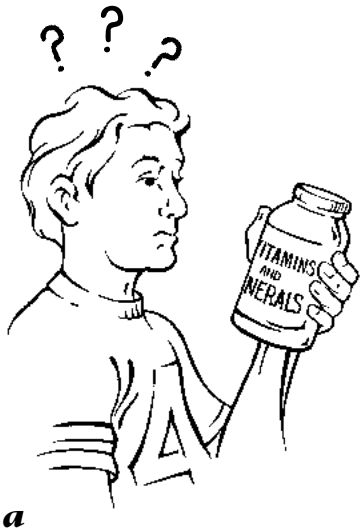
Vitamin & Mineral Supplements

4.2

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 asessment 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 performance[46]. 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.

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Calcium

4.3

Why do athletes need calcium?

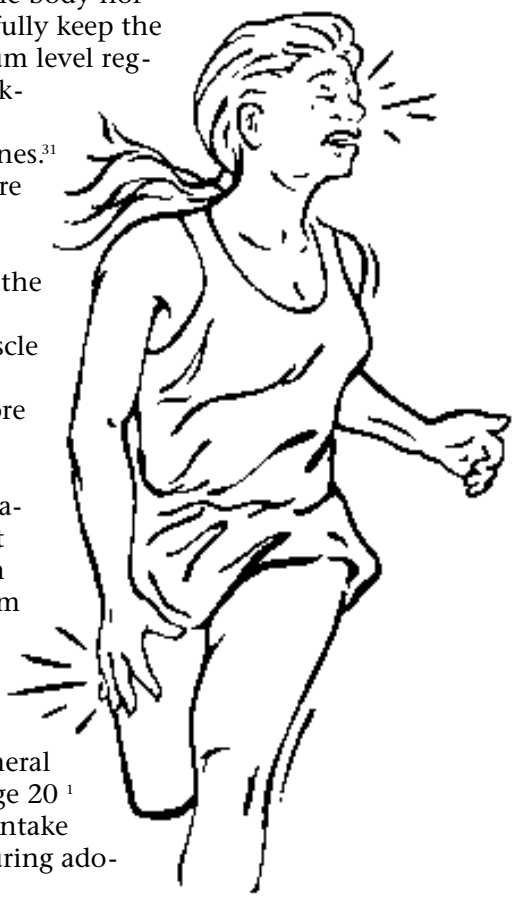
- calcium helps build dense bones
- female athletes who stop menstruating are at risk for poor bone development and may need more calcium-rich foods
- calcium is lost from the body in sweat, urine and feces

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 cramps[19] 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 20[1] so calcium intake is critical during adolescence[1]
- 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

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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 6 ounces of lean meat along with healthier food choices in other food groups may be necessary to meet current dietary recommendations[13] especially for zinc

Food sources	milligrams of zinc
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 breast	.9

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]

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Iron

4.5

"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 **nonheme** 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	

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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 IRON[1]

(These foods are also absorption helpers)

	Total Iron (in mg) Content	Iron Available for Absorption
Meat/Poultry/Fish *(3 oz./ cooked/ lean only)*		
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.*

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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 per formance:

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

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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, said[11] 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.

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Parent Information

5.1

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 handouts 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

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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 impor - tant nutrition boost for your athlete. So, make sure the team meal is nutri - tionally 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 ingre - dients and chill at least 3 hours. Makes about 4 cups; plan on 1/4 cup per person. Serve with vegetables.

(OVER)

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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

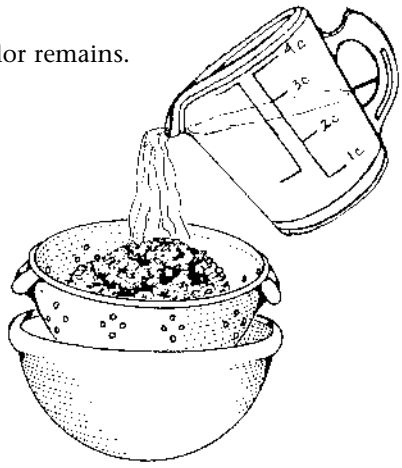
Rinsing cooked, crumbled ground beef with hot tap water is a simple way to reduce fat by 50% or more!

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***

	Calories	Fat
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.*

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