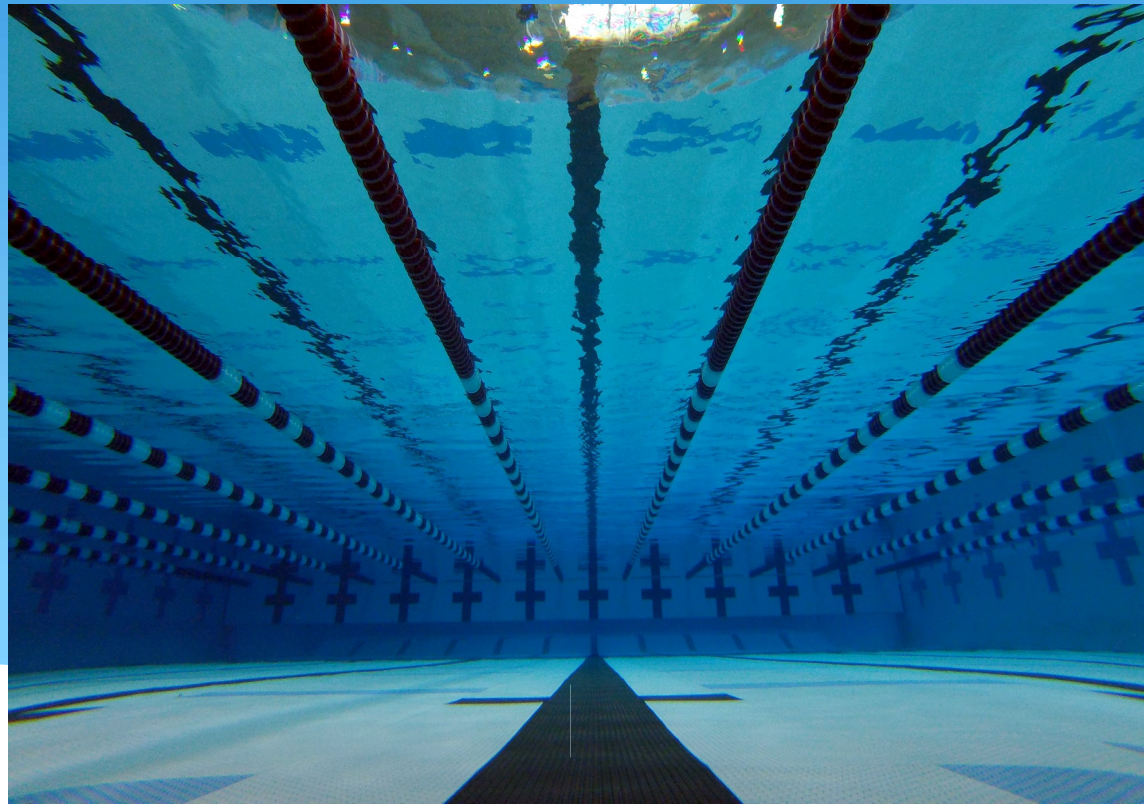


Fueling for Performance: What, When, and How?



Whitney Gingerich, MA, RDN

Words of Wisdom

“Too many athletes show up for training, but they don’t show up for meals. They might as well not bother to show up for training.”

-Boston College Hockey
Coach

The Basics

Macronutrients

Carbohydrate-Rich Foods

- Bread
- Crackers
- Rice
- Pasta
- Quinoa
- Oats
- Corn
- Sugar
- Milk
- Vegetables
- Beans
- Legumes
- Yogurt
- Fruits
- Pretzels
- Potatoes



**Choose whole grains most of the time*

Protein-rich foods



- Chicken
- Turkey
- Fish
- Lean beef
- Lean pork
- Lamb
- Lamb
- Milk, yogurt, cheese
- Eggs
- Nuts and nut butter
- Lentils, beans, tofu

* Get a portion at each meal

Fat-Rich Foods

- Nuts and nut butters
- Seeds
- Olives and olive oil
- Butter
- Oils
- Avocado
- Dressings

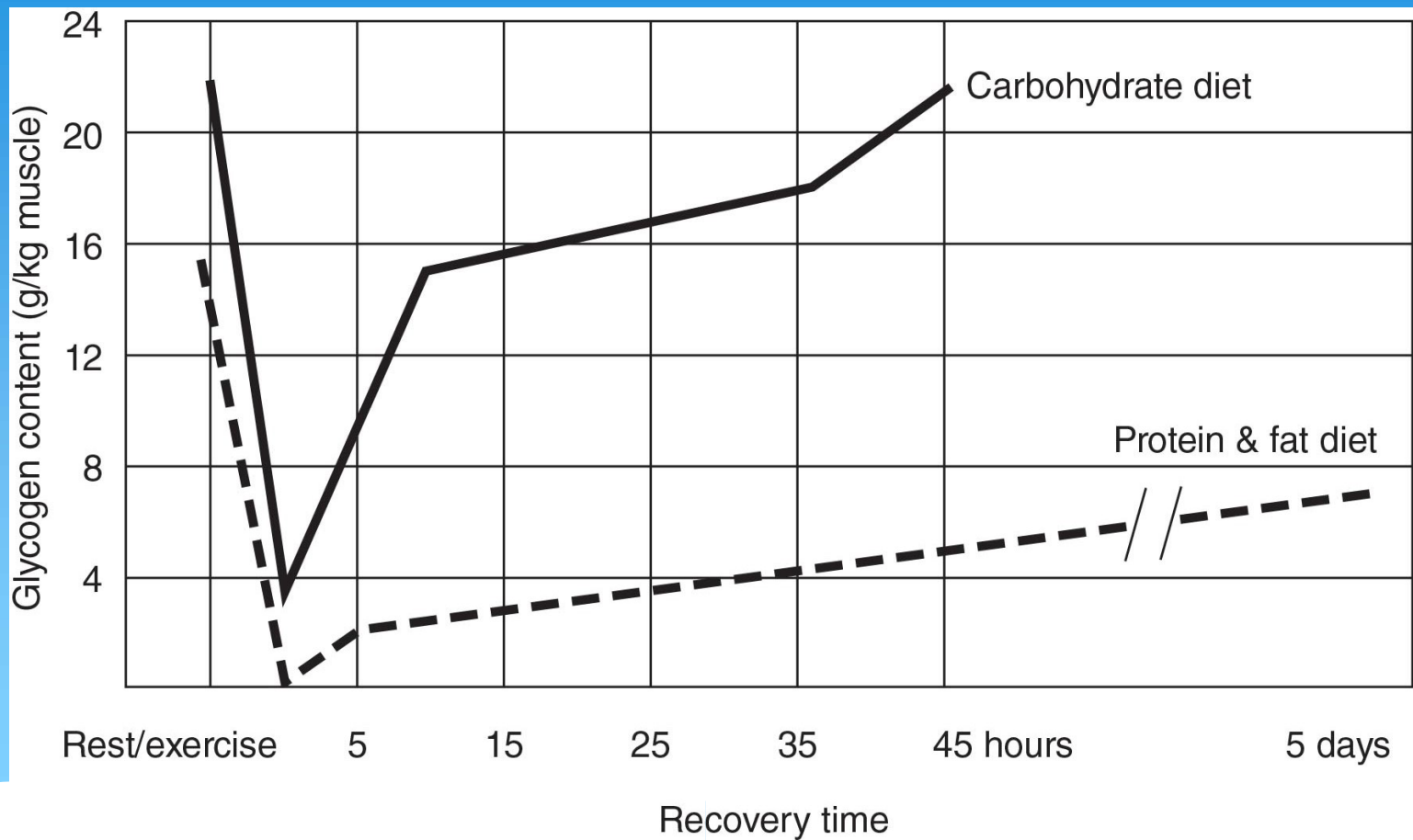


What's best to eat for energy?

Carbohydrates!



Carbohydrates fuel the muscles



Reprinted, by permission, from J. Bergström, et al., 1967.

Ice Hockey Study

- During a hockey game, muscle glycogen declines 38-88%.

A motion analysis of elite ice hockey teams showed:

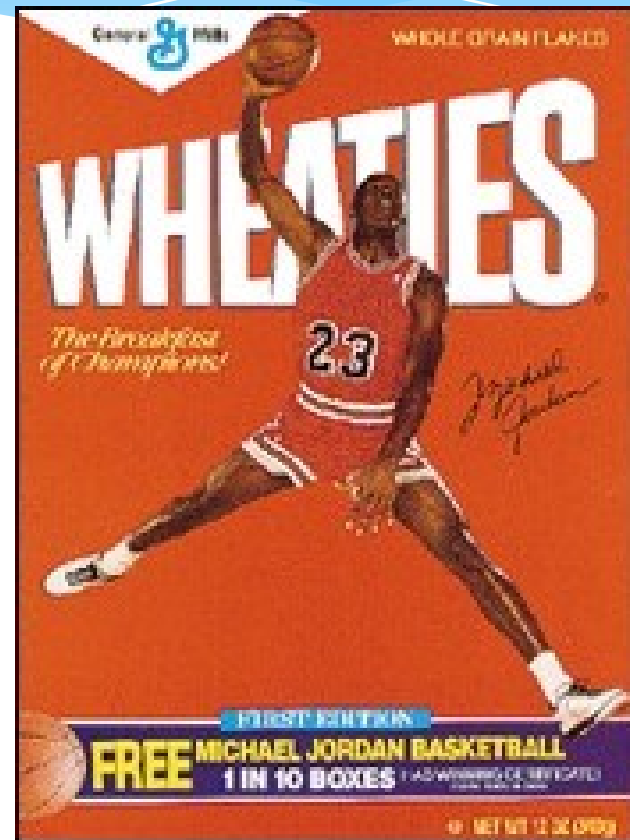
- Players with high (60%) carb diet skated 30% farther and faster than the players who ate standard diet (40% carb).
- Players on the high-carb diet skated 11% farther in the final quarter

What kinds of carbs should I eat?



Grains, Beans, Starches = Quality Carbs

- A staple with every meal!
 - Granola, cereal, oatmeal
 - Whole grain breads, tortillas and pastas
 - Whole grain crackers
 - Chili, lentil soup, hummus, refried beans
 - Potato and (brown) rice



Fruit and Vegetables = Quality Carbs

EAT LESS: Refined Sugars

- * Soda
- * Sports drinks
- * Candy
- * Artificial fruit Juice

EAT MORE: Natural sugars

- * Fruits
- * Vegetables
- * Natural fruit or vegetables juice/smoothies

****Natural fruit-sugars are preferable to refined sugars***

Breakfast: Low vs High Carb

Eggs, 2 fried

Bacon, 2 slices

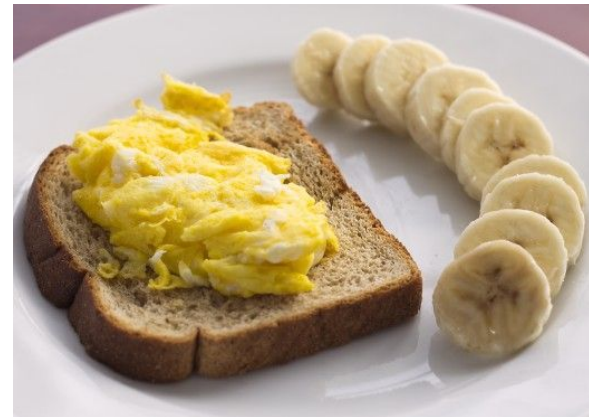
Buttered toast, 2 slices



Eggs, 2 Fried

Banana, medium

2 slice whole wheat toast



Lunch/Dinner: Low vs High Carb

- ½ cup pasta
- 8 meat balls



- 2 cups whole wheat pasta
- 3-4 meatballs
- Sautéed vegetable



How Much Carb Do I Need?

- Several Methods:
 - Calorie first
 - 60% carb, 15% protein, 25% fat
 - Carb first
 - Visual
 - Athlete's plate

150 lb Swimmer	
Estimated carb needs:	3-5g/lb
Grams per day	450-750
Calories per day	3,000-5,000

What's best to repair and build muscle?

Protein!



Building Muscle

- Strength training + maturity
- Adequate protein (pre- & post-exercise)
- Extra calories (from carbohydrates)
- Frequent eating throughout the day (protein/carb)
- Protein snack before bed
 - Cottage cheese, turkey roll up, beef jerky, cheese stick



Protein needs increase with:

- Growth
- Start of an exercise program
- Calorie restriction (*dieting, anorexia*)
- Depleted glycogen stores
 - Body builders use protein for energy whereas endurance athletes use carbohydrate

How much protein does your body require?

	g Pro/lb
Current RDA	0.4
Athletic adult	0.5-0.75
Growing teen athlete	0.7-1.0
Adult building muscle mass	0.7-0.1
Adult restricting calories	0.8-1.0

Protein in standard foods

	Weight (lbs)	Recommended intake	Grams protein per day	Ounces of protein per day
HS Football Player	200	0.7 – 1.0	140-200	20-29
Marathon runner	150	0.6 - 0.8	90 - 120	13-17
Teenage swimmer	140	0.7 – 1.0	98 - 140	14-20

Protein source	Amount	Grams Protein
Peanut butter	2 tablespoons	8
Eggs	2	12
Milk	16 ounces	16
Tuna	5-oz can	25
Chicken breast	6 ounces	45

Food labels: Useful information!

Fat →

Carbs →

Protein →

Nutrition Facts	
8 servings per container	
Serving size	2/3 cup (55g)
Amount per serving	
Calories	230
% Daily Value*	
Total Fat 8g	10%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 160mg	7%
Total Carbohydrate 37g	13%
Dietary Fiber 4g	14%
Total Sugars 12g	
Includes 10g Added Sugars	20%
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

When should I eat before I exercise?

- Large meal: 4 - 6 hours
- Snack: .5 - 1 hour
- Timing varies with:
 - Intensity of exercise
 - Personal tolerance



Pre-exercise food guidelines

- Carbohydrate-based
- Low fat (<5g/fat/serving)
- Low to moderate protein
- Extra fluids
- Appropriate portions (trial and error)
- Tried and true



Pre-Exercise Foods

- * Cereal with low fat milk
- * Oatmeal
- * Banana
- * Yogurt
- * English muffin
- * Bagel (with a little peanut butter)
- * Graham crackers
- * Animal crackers
- * Granola bar



What's best for energy *during* exercise?

- When exercising > 1 hour it's helpful to eat or drink/eat something with a small amount of carbohydrate to maintain glycogen levels and improve performance!
- Target 15-60 grams of carbohydrate every hour after the first hour of exercise.



Foods/drinks for exercise or between heats

- 4-8 oz fruit juice
- 4-8 oz sports drink
- Fruit
- Fruit Purees
- Yogurt
- *If you have < 1 hour to before exercise again, stick with liquids or purees for quick digestion*



What's best for fast recovery?

- After prolonged or intense exercise, glycogen levels are depleted and muscles are exhausted
- Start refueling within 60 minutes of exercise followed by another carb-based meal or snack 2 hours later.
- Choose foods that provide a 2:1 or 3:1 carbohydrate to protein ratio to feed and repair muscles quickly
- SLEEP! If you've got a finals swim in the evening try to get some rest in between to rest, refuel, and repair muscles

Recovery foods

Carbohydrate: Refuels muscles

Protein: Builds & repairs muscles

	Carb (g)	Pro (g)
Yogurt, 6 oz	26	8
Cheerios w/ milk	32	11
Whole grain Pasta + meat sauce	80	20
Fruit smoothie with Greek yogurt	45	15
Chocolate milk	24	8

Carbohydrate-loading for Meets



How to Carbo-Load



- **Maintain** familiar, carb-based training diet
 - *Choose carbs for foundation of each meal*
- **Exercise less- TAPER!!**
 - *With less exercise, the muscles can store extra calories of carbs to load the muscles.*
- **Listen to your body**
 - ↓ training intensity = ↓ calorie burn.
 - Many athletes continue to eat the same amount of food despite their training. (see athlete's plate handout for guidance)

What's best for fluids?

- Most of the time, water is best!
- Small amounts of sports drinks are easy ways to get in some necessary carbs during longer workouts (> 1 hr).
- Drink water throughout the day rather than all at once

Fluid goals

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

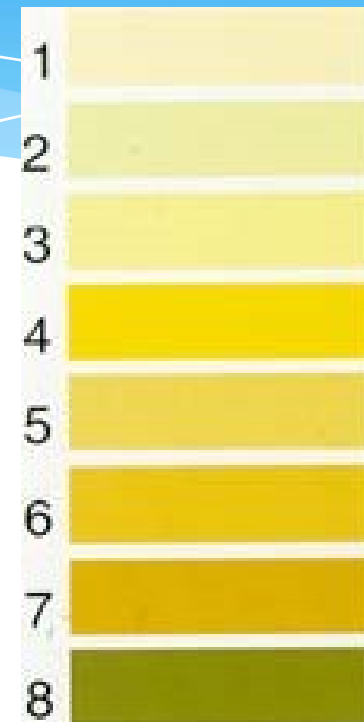


Dehydration hurts performance

Percent dehydration	Pounds lost 150-lb person	Physical effects
1	1.5	Increased body temperature
3	4.5	Impaired performance
5	7.5	GI distress, heat exhaustion
7	10.5	Hallucinations
10	15	Circulatory collapse

Symptoms of dehydration

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



Urine Color Chart*

1-3 = adequately hydrated

*Source: L. Armstrong PhD

Would Supplements Help?



Issues

- No FDA regulation for supplements
- Third party evaluation is optional for companies
- Can be laced with illegal substances not listed
- Review with sports RD before using



Protein: Supplements vs Food

Food	g Pro/serv	Cost / g Pro
Roast beef, 4 oz deli	32	\$0.09
Tuna, 5-oz can	25	\$0.08
Egg, 1 whole	6	\$0.04
Nesquik, 14-oz bottle	16	\$0.11
Clif Builder, 1 bar	20	\$0.12
Muscle Milk, 11-oz	20	\$0.15



Caffeine and exercise



- Not recommended under age 16
- *Pro:* May make exercise seem easier and enhance performance.
- *Con:* May cause nervousness, upset stomach, and “coffee jitters.”
- Dose that may aid performance: about 1.5 caffeine/lb body wt
 - *About 225 mg caffeine for 150 lb person (1-2 cups of coffee)*

ATHLETE'S PLATE

HARD TRAINING / RACE DAY:

FATS

2 Tablespoons



Avocado
Oils
Nuts
Seeds
Cheese
Butter



Grains

Pasta
Rice
Potatoes
Cereals
Breads



Fresh Fruit
Stewed Fruit
Dried Fruit



Water
Dairy/Nondairy
Beverages
Diluted Juice
Flavored
Beverages

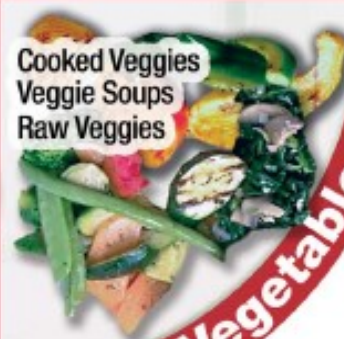


Coffee
Tea

Poultry
Beef/Game/Lamb
Fish
Eggs
Low-Fat Dairy
Soy (e.g., Tofu,
Tempeh)
Legumes/Nuts



Cooked Veggies
Veggie Soups
Raw Veggies



Lean Protein

Vegetables

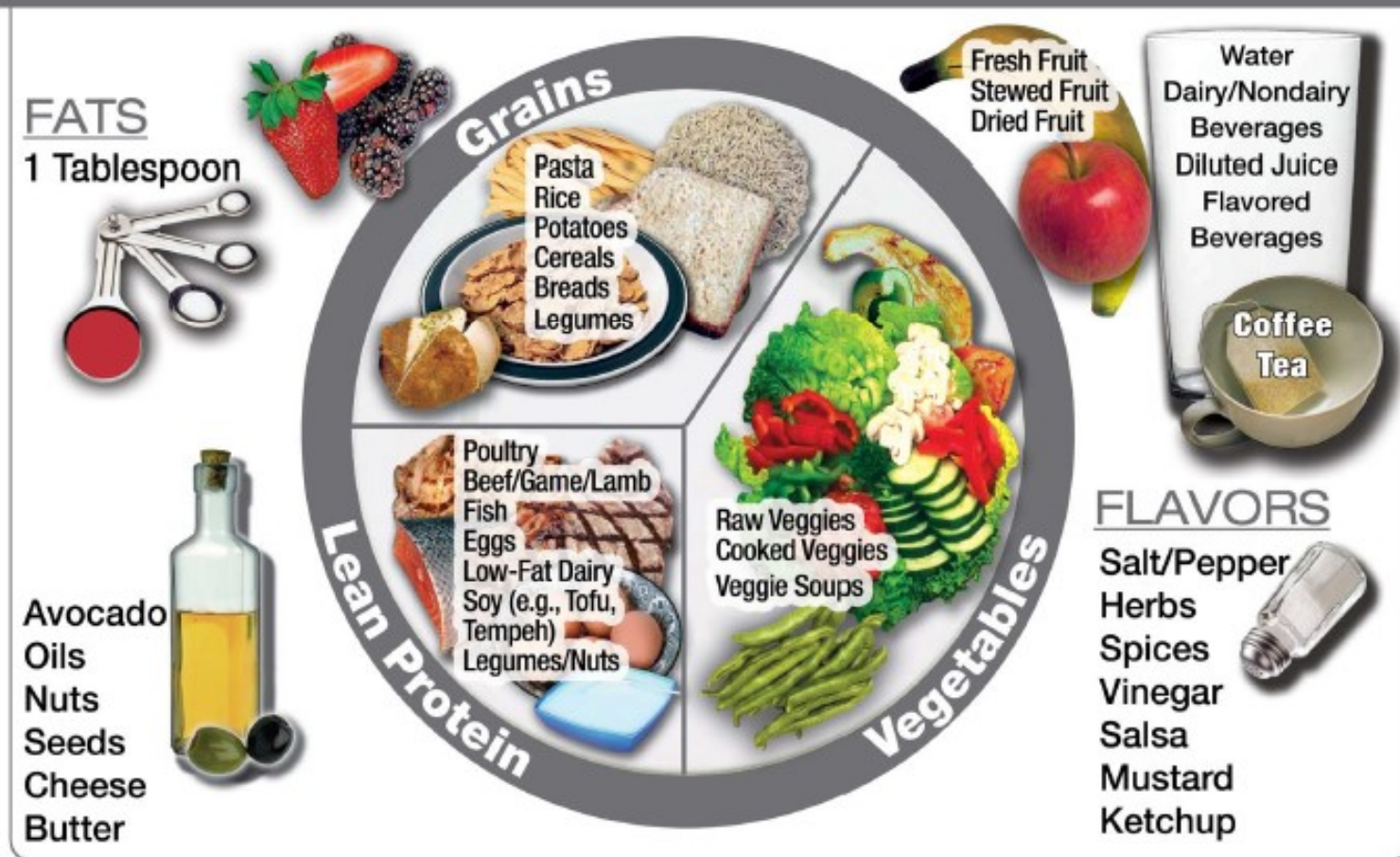
FLAVORS

Salt/Pepper
Herbs
Spices
Vinegar
Salsa
Mustard
Ketchup



ATHLETE'S PLATE

MODERATE TRAINING:



The Athlete's Plates are a collaboration between the United States Olympic Committee Sport Dietitians and the University of Colorado (UCCS) Sport Nutrition Graduate Program.

For educational use only. Print and use front and back as 1 handout.

ATHLETE'S PLATE

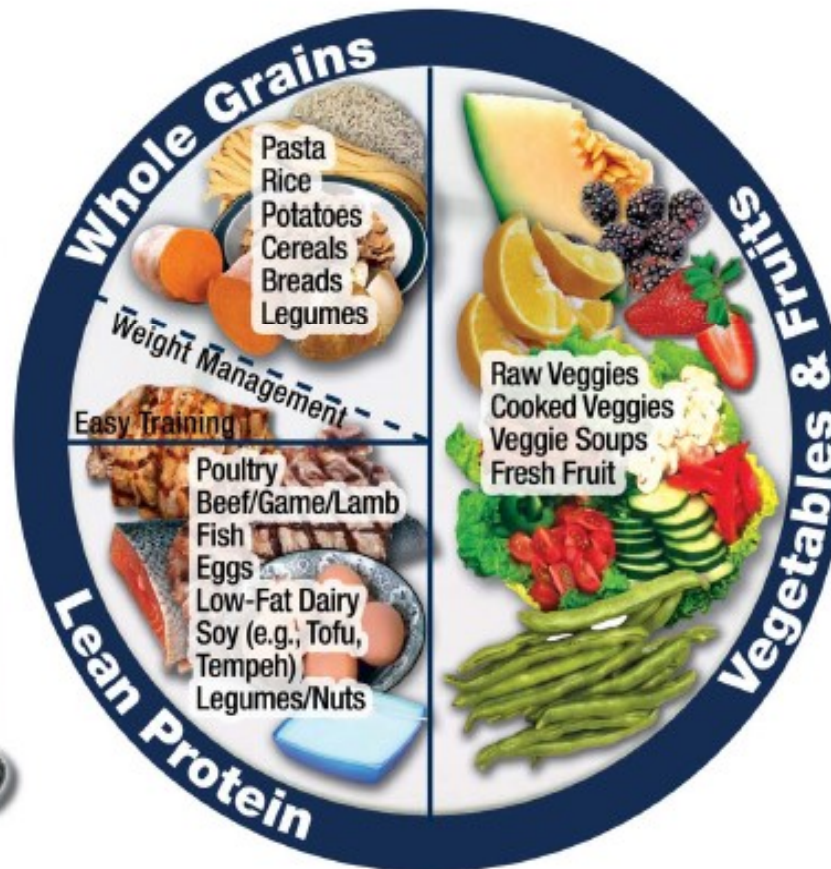
EASY TRAINING / WEIGHT MANAGEMENT:

FATS

1 Teaspoon



Avocado
Oils
Nuts
Seeds
Cheese
Butter



Water
Dairy/Nondairy
Beverages
Diluted Juice
Flavored
Beverages

Coffee
Tea

FLAVORS

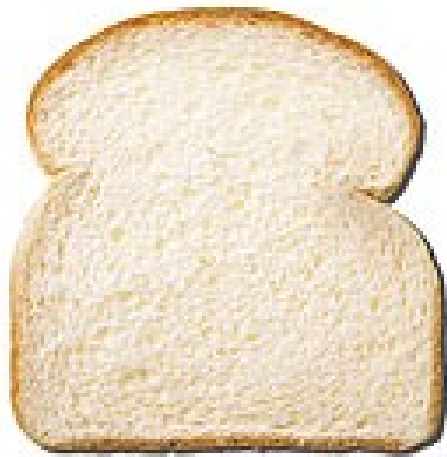
Salt/Pepper
Herbs
Spices
Vinegar
Salsa
Mustard
Ketchup



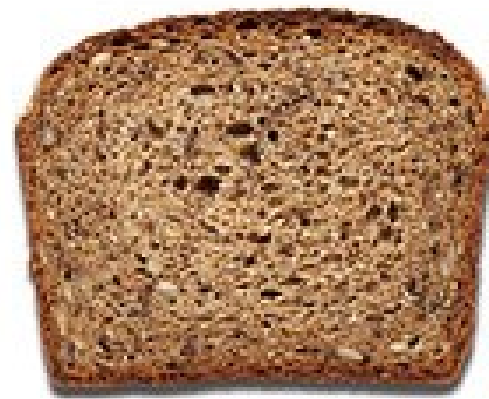
The Athlete's Plates are a collaboration between the United States Olympic Committee Sport Dietitians and the University of Colorado (UCCS) Sport Nutrition Graduate Program.

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Bread Demonstration



White bread



Whole grain bread



Nutrition Facts

Serving Size

1 container (150g)

Calories 100

Calories from Fat 0

* Percent Daily Values are based on a 2,000 calorie diet.

Amount/Serving	% Daily Value*	Amount/Serving	% Daily Value*
Total Fat 0g	0%	Sodium 55mg	2%
Sat. Fat 0g	0%	Total Carb. 11g	4%
Trans Fat 0g		Sugars 7g	
Cholest. < 5mg	1%	Protein 14g	28%
Vitamin A 6% • Calcium 15% • Vitamin D 10%			

Not a significant source of dietary fiber, vitamin C and iron.

Ingredients: Pasteurized Grade A Nonfat Milk, Fruit Blend (peaches, water, fructose, sugar, modified corn starch, pectin, guar gum, potassium sorbate added to preserve freshness, vitamin A acetate, annatto color, citric acid, vitamin D₃, malic acid, sodium citrate). **Contains 0.5% or less of:** Natural Flavor, Yogurt Cultures (*L. bulgaricus*, *S. thermophilus*), Acesulfame Potassium, Sucralose.

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Nutrition Facts

Serving Size

1 container (150g)

Calories 140

Calories from Fat 0

* Percent Daily Values are based on a 2,000 calorie diet.

Amount/Serving	% Daily Value*	Amount/Serving	% Daily Value*
Total Fat 0g	0%	Sodium 50mg	2%
Saturated Fat 0g	0%	Total Carb. 22g	7%
Trans Fat 0g		Sugars 18g	
Cholest. < 5mg	1%	Protein 11g	22%
Vitamin A 4% • Calcium 10% • Vitamin D 20%			

Not a significant source of dietary fiber, vitamin C and iron.

Ingredients: Cultured Pasteurized Grade A Nonfat Milk, Fruit Blend (blueberries, sugar, water, modified corn starch, malic acid, vitamin A acetate, vitamin D₃). **Contains 0.5% or less of:** Potassium Sorbate Added to Maintain Freshness, Yogurt Cultures (*L. bulgaricus*, *S. thermophilus*), Natural Flavor.

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Nutrition Facts

Serving Size 1 bar (68g)
Servings Per Container 6

Amount Per Serving		
Calories 280	Calories from Fat 90	
		% Daily Value*
Total Fat 10g		15%
Saturated Fat 4.5g		23%
Trans Fat 0g		
Cholesterol 0mg		0%
Sodium 250mg		10%
Potassium 210mg		6%
Total Carbohydrate 29g		10%
Dietary Fiber 2g		8%
Sugars 20g		
Protein 20g		39%
Vitamin A 10%	• Vitamin C 35%	
Calcium 15%	• Iron 20%	
Vitamin D 4%	• Vitamin E 45%	

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Nutrition Facts

Serving Size 1 bar (48g)
Servings Per Container 5

Amount Per Serving		
Calories 210	Calories from Fat 100	
		% Daily Value*
Total Fat 11g		17%
Saturated Fat 2g		10%
Trans Fat 0g		
Polyunsaturated Fat 3g		
Monounsaturated Fat 6g		
Cholesterol 0mg		0%
Sodium 70mg		3%
Potassium 340mg		10%
Total Carbohydrate 23g		8%
Dietary Fiber 5g		20%
Sugars 17g		
Protein 7g		
Vitamin A 0%	• Vitamin C 0%	
Calcium 2%	• Iron 8%	

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Nutrition Facts

Serving Size 1 bar (37g)
Servings Per Container 8

Amount Per Serving		
Calories 130	Calories from Fat 25	
		% Daily Value*
Total Fat 3g		5%
Saturated Fat 1g		5%
Trans Fat 0g		
Polyunsaturated Fat 0.5g		
Monounsaturated Fat 1g		
Cholesterol 0mg		0%
Sodium 90mg		4%
Potassium 105mg		3%
Total Carbohydrate 24g		8%
Dietary Fiber 2g		8%
Sugars 12g		
Protein 1g		
Vitamin A 0%	• Vitamin C 0%	
Calcium 20%	• Iron 15%	
Thiamin 25%	• Riboflavin 25%	
Niacin 25%	• Vitamin B6 25%	
Folic Acid 25%	• Vitamin B12 25%	
Zinc 10%		

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Nutrition Facts

Serving Size 1 Cup (240mL)
Servings Per Container 6.5

Amount Per Serving

Calories 80 **Calories from Fat** 0

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 125mg **5%**

Total Carbohydrate 6g **2%**

Dietary Fiber 0g **0%**

Sugars 6g

Protein 13g **26%**

Vitamin A 10% • Vitamin C 0%

Calcium 40% • Iron 0%

Vitamin D 25%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Nutrition Facts

Serving Size 1 cup (249g)
Servings Per Container 8

Amount Per Serving

Calories 210 **Calories from Fat** 80

% Daily Value*

Total Fat 8g **13%**

Saturated Fat 5g **26%**

Trans Fat 0g

Cholesterol 30mg **10%**

Sodium 200mg **9%**

Total Carbohydrate 27g **9%**

Dietary Fiber 1g **5%**

Sugars 25g

Protein 9g

Vitamin A 6% • Vitamin C 0%

Calcium 30% • Iron 6%

Vitamin D 30%

*Percent Daily Values are based on a 2,000 calorie diet.

Nutrition Facts

Serving Size 1 cup (236 mL)

Amount Per Serving

Calories 130 **Calories from Fat** 45
% Daily Values*

Total Fat 5g **8%**

Saturated Fat 3g **15%**

Trans Fat 0g

Cholesterol 20mg **7%**

Sodium 125mg **5%**

Total Carbohydrate 12g **4%**

Dietary Fiber 0g **0%**

Sugars 12g

Protein 8g

Vitamin A 10% • Vitamin C 4%

Calcium 30% • Iron 0% • Vitamin D 25%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Resources

- The presentation was adapted using material written by Nancy Clark, MS, RD