

CARBOHYDRATE COUNTING FOR INSULIN ADMINISTRATION IN THE SCHOOL SETTING

Katelyn Yzquierdo, MS, RD, CSP, LD

CLINICAL NUTRITION



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OBJECTIVES

- Learn how to carb count for meals and snacks
- Understand label reading and other methods to calculate carb counts
- Apply carb counting to manage blood glucose levels
- Learn how to prepare the student for physical activity/sports



THE IMPORTANCE OF CARB COUNTING



- **Studies show that people with better carb counting skills have better BG control.**
- **Counting carbs is the best way of keeping blood sugars under control-** better than limiting sugars, counting calories or using an exchange system.
- **Inaccurate carb counting can lead to low blood sugars or hyperglycemia** by wrongly estimating insulin before meals.
- **Inaccurate carb counting is also associated with higher blood sugars after meals.** Adolescents with the most accurate carb counting skills (less than 10g off) had better BG control and a lower A1C.

WHY COUNT CARBOHYDRATES?

- Food is made up of many different nutrients:
 - Carbohydrate
 - Protein
 - Fat
 - Vitamins & Minerals
 - Water
 - Fiber

BLOOD GLUCOSE LEVELS



- Our bodies need a little bit of each of these nutrients but someone with diabetes needs to pay close attention to the amount of carbohydrate they consume.
- Carbohydrate is the nutrient that breaks down to sugar (glucose) in our bodies as we digest it

ARE CARBOHYDRATES BAD?

- **No!**
 - Individuals with diabetes must be mindful of how many carbs they eat, they don't need to avoid it altogether. Carbs are the body's main source of fuel and are necessary to maintain proper function.
 - The type of carb and portion size are what matter most.
- Think of your carb intake like **rain**:
 - We don't want a drought or a flood but a nice even sprinkling throughout the day!

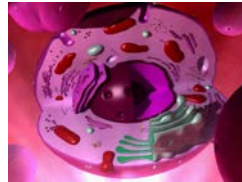


WHAT IS GLUCOSE?

- Our bodies use carbohydrate for energy by turning it into glucose.

Glucose = energy

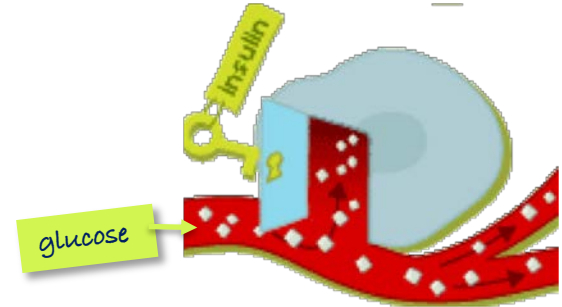
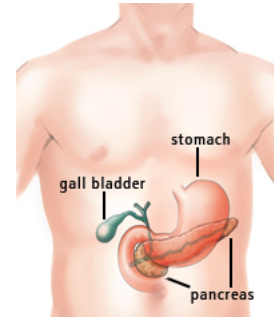
- **Glucose** provides **energy** for:
 - Cells
 - Brain
 - Every function in the body!



WHAT IS INSULIN?

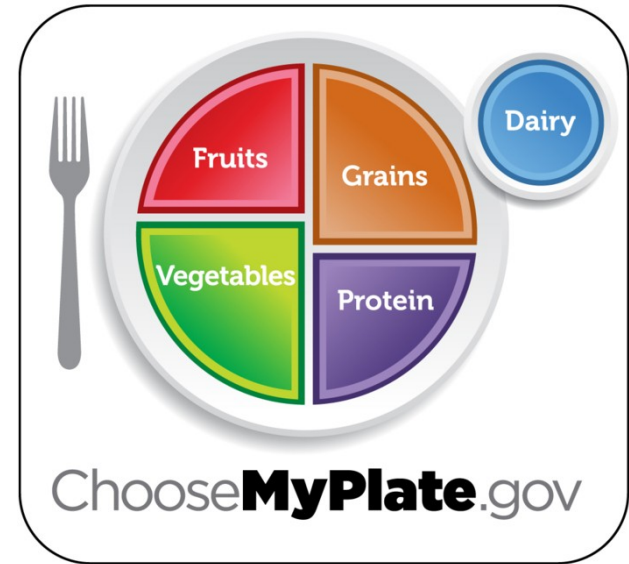
Insulin = Hormone made by the pancreas

- In order to use energy from glucose, insulin must be available to carry glucose into the cells.
- Because people with diabetes have impaired insulin production, sugar can build up in their blood causing hyperglycemia.
- Our goal: matching carbohydrate intake to insulin needs!



HEALTHY EATING GUIDELINES

- Make $\frac{1}{2}$ your plate **fruits and vegetables**
- Choose **whole grains**
- Choose **low-fat** or **fat-free** dairy
- Vary your proteins (think **lean!**)
- Eat and drink less **sodium**, **saturated fat**, and **added sugars**



CARB, PROTEIN OR FAT?



- **Carbohydrates:**

- **Grains**
- **Beans, starchy vegetables**
- **Fruit**
- **Milk, yogurt**
- **Dessert foods**

- **Protein**

- **Beef, pork, poultry, fish**
- **Eggs**
- **Cheese**
- **Nuts, tofu**

- **Fat**

- **Butter, margarine**
- **Oils, lard, salad dressings**
- **Sour cream, mayonnaise**

TYPES OF CARBOHYDRATES

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STARCH

- Foods high in starch include:
 - Grains like wheat, oats, barley and rice
 - Crackers, tortillas, breads, pasta
 - Starchy vegetables:
 - corn, green peas, potatoes, beans
 - Dried beans, lentils and peas
 - pinto beans, kidney beans, black eyed peas and split peas



SUGAR

- Naturally occurring sugars - milk (lactose) or fruit (fructose)
- Added sugars (sucrose)
 - Common names: table sugar, brown sugar, molasses, honey, beet sugar, cane sugar, confectioner's sugar, powdered sugar, raw sugar, turbinado, maple syrup, high-fructose corn syrup, agave nectar and sugar cane syrup.



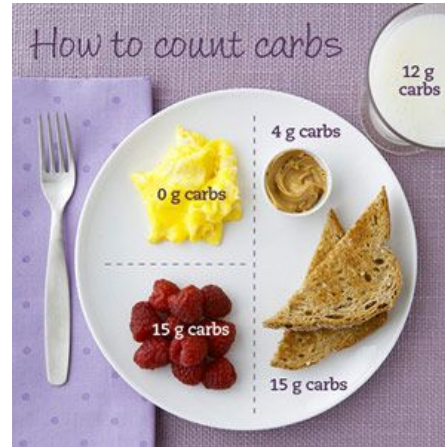
FIBER

- A complex carbohydrate
 - Fruits
 - Vegetables
 - Whole grains
 - Nuts
 - Legumes
- Beneficial for digestive health, management of cholesterol levels, and aids in satiety



CARB COUNTING BASICS

- The portion size and carb count of all carb containing foods in a meal or snack must be evaluated and added up to provide total carbohydrates.



CARB COUNTING BASICS

- The average 2000 calorie diet may eat ~45-60g carbs per meal
- Carb consistent diets are usually used at first diagnosis
- Pts may then transition to insulin-to-carb ratio (ICR) for insulin injections or use with an insulin pump (ex. 1:10)



CARB COUNTING APPLICATION

- Carb consistent diets are usually used at first diagnosis

	Breakfast	Morning Snack	Lunch	Afternoon Snack	Dinner	Bedtime Snack
Time of day	7:00am	10:00am	12:00pm	3:00pm	5:30pm	8:00pm
Grams of Total Carbohydrate	45 g	0-15 g	60 g	0-15 g	60 g	0-15 g

- Pts may then transition to insulin-to-carb ratio (ICR) for insulin injections or use with an insulin pump (ex. 1:10)

A dietitian can help determine a carb prescription that is appropriate for the age and activity level of the child

SAMPLE CARB CONSISTENT DIETS

Girls/Ages (years)	Grams of Carbs	Calories (approx).	Breakfast	Snack	Lunch	Snack	Dinner	Snack
1-3	129	1000	30	8	30	8	45	8
4-5	166	1300	45	8	45	15	45	8
6-8	150	1300	45	0/15	45	0/15	45	0/15
9-11	180	1700	45	0/15	60	0/15	60	0/15
12-13	180	1700	45	0/15	60	0/15	60	0/15
14-16	195	1900	45	0/15	60	0/15	75	0/15
17-18	180	1700	45	0/15	60	0/15	60	0/15

UTILIZING THE CARB COUNT

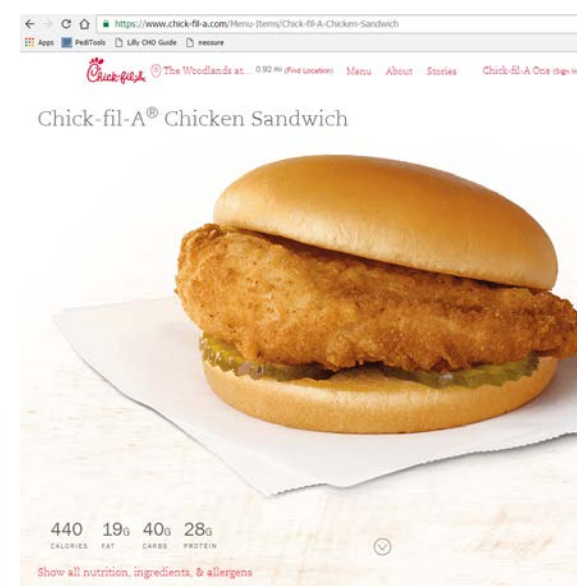
1. Pt is prescribed a carb consistent diet or ICR
2. Pt calculates the amount of carbohydrate in their meal
3. Carb count is used to ensure compliance with carb consistent diet
OR to determine amount of insulin needed with ICR
OR is entered into an insulin pump which calculates insulin dose automatically.

CARB COUNTING METHODS

1. Measuring portion sizes
2. Reading food labels
3. Utilizing websites and/or smart phone apps
4. “Guesstimating”

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

* Footnote on Daily Values (DV) and calories reference to be inserted here.



CARB FOODS LIST

- Use as general guide to learn food groups and portion sizes
- Not always as accurate as food label
- Encourage students to refer to list when struggling to carb count
- Take a picture of the list and keep it in your phone for quick reference

CARBOHYDRATE FOODS

These must be counted to maintain a consistent carbohydrate diet. All portions on this page have 15g carbohydrates. Check nutrition facts labels when possible.

BREADS

- 1 individual
 - slice of regular bread
 - biscuit (2 ½ inch)
 - cornbread (1¼ inch)
 - pancake or waffle 4" across, ¼" thick
 - plain roll
 - 6" flour tortilla
 - 2 corn tortillas
- ½ individual
 - English muffin
 - bun
 - pita
- Others
 - ¼ large bagel
 - 2 taco shells
 - 1/3 cup stuffing
- 2 slices low calorie bread

CEREALS & GRAINS

- 1/3 cup cooked (1 cup = 45g)
 - pasta
 - rice
 - couscous
 - quinoa
- ¼ cup (1 cup = 60g)
 - granola
- ½ cup (1 cup = 30g)
 - cooked grits
 - cooked wild rice
 - cooked oatmeal
- 3/4 cup (1 ½ cups = 30g)
 - cold breakfast cereal

CRACKERS & SNACKS

- Crackers
 - 8 animal crackers
 - 6 Ritz® (round butter)
 - 6 saltines
 - 2-5 whole wheat
 - 3 graham squares
 - 20 oyster crackers
 - 55 Goldfish®
- Snacks
 - 3 cups popcorn
 - ¼ oz pretzels
 - 2 rice cake

STARCHY VEGETABLES

- ½ cup cooked (1 cup = 30g)
 - corn
 - mashed potatoes
 - boiled potatoes
 - beans
 - lentils
 - peas
 - yams/sweet potatoes
- 1/3 cup (1 cup = 45g)
 - baked beans
 - hummus
- ¼ cup (1 cup = 60g)
 - mixed vegetables (corn, peas, lima beans)
 - edamame (shelled)
 - french fries
- Whole foods
 - ½ corn cob
 - ¼ large potato

DAIRY

- 1 cup ANY milk
- ½ cup ice cream
- ½ cup pudding
- 2/3 cup yogurt

DRINKS

- 4 oz (1/2 cup)
 - regular juice
 - regular soda/pop
- 8 oz (1 cup)
 - Gatorade® "G series"
 - Powerade®
 - VitaminWater™ (formula50)
- 24 oz Gatorade® "G2"

FRUIT

- Whole fruit (Tennis ball size)
 - 1 small apple
 - 1 medium orange
 - 1 kiwi
 - 1 small nectarine
 - 1 medium peach
 - ½ medium banana
 - 1 cup melon cubes
 - 1¼ cup whole strawberries
 - ¼ cup berries
 - 12 fresh cherries
 - 17 small grapes
 - ½ small or ¼ cup mango
 - ½ fruit or 1 cup cubes papaya
 - ½ medium pear
 - ¼ cup fresh pineapple
 - 2 small plums
 - 2 small tangerines/clementines
- Canned fruit (No sugar added):
 - ½ cup any canned fruit
 - ½ cup applesauce
 - ¼ cup canned mandarins
- 2 Tbsp dried fruit

CONDIMENTS

- 1 Tablespoon (3 teaspoons)
 - honey or agave
 - sugar
 - jelly/ jam
 - syrup
 - BBQ sauce
 - ketchup
 - sweet salad dressing



NON-CARB FOODS LIST

- AKA “free foods”
- Fill up on non-starchy vegetables and lean proteins
- Choose healthy unsaturated fats

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NON-CARBOHYDRATE FOODS

These foods do not raise blood glucose levels significantly.

NON-STARCHY VEGETABLES

1 cup raw or ½ cup cooked =
~ 5 grams of carbohydrate

- artichoke
- asparagus
- bamboo shoots
- beans (green, Italian)
- beets
- broccoli
- brussels sprouts
- cabbage
- carrots
- cauliflower
- celery
- coleslaw, no dressing
- cucumber
- eggplant
- greens (collard, kale, turnip)
- leeks
- mushrooms
- okra
- onions
- pea pods or pea snaps
- peppers
- radishes
- salad greens
- sauerkraut
- soybean sprouts
- spinach
- squash (summer, zucchini)
- tomatoes
- turnips
- water chestnuts

OTHER

- Non-nutritive sweeteners
 - Splenda® (sucralose)
 - Equal® (aspartame)
 - Truvia® (stevia)
 - Sweet N' Low® (saccharin)
- Sugar free:
 - Jello/ gelatin
 - Popsicle
 - Cool Whip®

PROTEINS

(Meat & Meat Substitutes)

Prepare meats without
batter/breading*

Meats

- beef
- chicken
- fish
- pork
- shellfish
- wild game
- processed sandwich meats

Meat Substitutes

- beef jerky
- cheese
- cottage cheese
- egg substitutes
- egg whites
- whole egg
- hot dog

Plant- Based Proteins

- Nut spreads
(almond, peanut butter,
or soy)

*Batter/breading contains
carbohydrates

FATS

Fats will help slow the rise of blood
glucose after meals. These should be
used sparingly.

- ✓ choose low-fat versions of all fats
when possible.
- ✓ fat should represent 30% or less of
daily intake.

Unsaturated Fats Monounsaturated

- avocado
- nuts
- olive, canola or peanut oil
- black olives
- green olives

Unsaturated Fats Polyunsaturated

- low fat margarine,
reduced fat mayo or salad
dressing
- stick or tub margarine,
regular mayo or salad dressing,
- oil: corn, cottonseed, flaxseed,
grapeseed, safflower, sunflower, enova
soybean
- walnuts halves

Saturated Fats

- stick butter, lard,
Shortening
- coconut, palm
- reduced fat butter,
heavy cream, regular cream
cheese
- light cream,
reduced fat cream cheese
- regular sour cream
and coconut
- bacon
- light sour cream



READING FOOD LABELS

Servings per Container

It is important to know how many servings are in the package as a whole. If you eat all 8 servings in this container, you will need to multiply all nutrition values by 8.

Serving Size

Start with the serving size. All of the nutrition values listed on the label are for that one serving size.

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 14%

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 240mg 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.

* Serving Size grams

This is the product weight in grams and not grams of carbohydrates. This is helpful if you have a food scale.

Total Carbohydrates

To count carbohydrates, look at the grams of total carbohydrates. Dietary fiber and total sugars are included in total carbohydrate amount.

LETS PRACTICE

- How many servings in this product?
8 servings
- What is the serving size of this product?
2/3 cup
- How many grams of carbohydrates in this product?
37g
- How many grams would be in 2 servings of this product?
74g

Nutrition Facts	
8 servings per container	
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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.

USEFUL TOOLS

- Apps

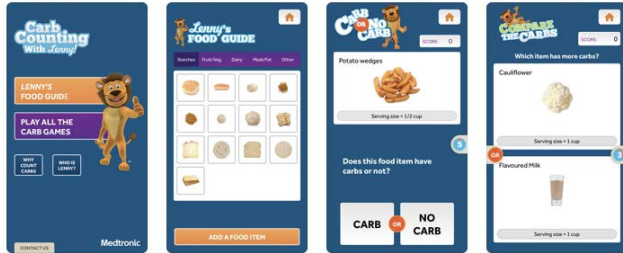
- My Fitness Pal



- Calorie King



- Carb Counting with Lenny



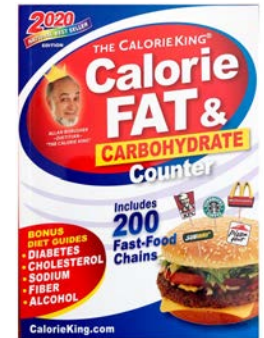
- Websites

- <https://www.myfitnesspal.com>

- <http://www.lillydiabetes.com>

- Book

- Calorie King 2020!



SWEETS & SNACKS

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CARB COUNTING FOR TREATS AND SWEETS

- Mini cupcake (15g CHO) vs regular (35-40g)


























- Lofthouse cookie (~25g) vs mini Lofthouse cookie (~10)

- Small slice of birthday cake (~40g)



15g CARBOHYDRATE SNACKS

 <p>1 small apple</p>	 <p>Half of a banana</p>	 <p>½ mango</p>	 <p>1 cup watermelon</p>	 <p>1 medium orange</p>	 <p>12 fresh cherries</p>
 <p>15 medium Strawberries or 1 ¼ cup</p>	 <p>2 small plums, clementines, apricots</p>	 <p>1 small bunch (~17 grapes)</p>	 <p>¼ cup raisins or small matchbox size</p>	 <p>¼ cup unsweetened applesauce</p>	 <p>¼ cup canned fruit in juice (not syrup)</p>
 <p>1 slice toast</p>	 <p>100 Calorie Snack Pack - Cookie</p>	 <p>¼ cup ice cream (not including cone)</p>	 <p>8 oz white milk</p>	 <p>¼ cup sugar free pudding</p>	 <p>4 oz yogurt (Check Label)</p>
 <p>100 Calorie Snack Pack - Cracker</p>	 <p>8 animal crackers</p>	 <p>1 oz bag chips</p>	 <p>15-20 pretzels</p>	 <p>15-20 Cheez-Itz®</p>	 <p>1 granola bar (Check Label)</p>

HEALTHY COMBINATION SNACK IDEAS

Great snacks include 15g carbohydrate + protein



8 animal crackers &
2 tablespoons peanut butter



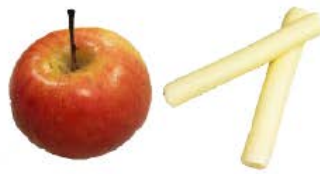
1 slice toast & 2 tablespoons peanut butter



3 cups plain popcorn &
1 oz nuts



15-20 Cheese-Itz® crackers &
1 oz cheese



1 small fruit &
1 oz cheese



1 ounce mini muffin &
¼ cup cottage cheese



½ sandwich (meat, cheese, vegetables or
peanut butter with no jelly)



6 saltine crackers &
¼ cup tuna salad



15-20 baked tortilla chips &
2 tablespoons hummus

LOW OR NO CARBOHYDRATE SNACKS

					
carrots	celery	cherry tomatos	lettuce	spinach	cauliflower
					
bell pepper	pickles	cucumber	zucchini	avocado	broccoli
					
string cheese	cheese cubes	cottage cheese	eggs	sliced turkey, chicken, ham, roast beef	tuna
					
nuts	peanut butter	pepperoni slices	beef jerky	sugar-free jello	sugar-free popsicles

HEALTHY COMBINATION LOW OR NO CARBOHYDRATE SNACK IDEAS



turkey and cheese roll ups



side salad with egg or avocado



carrots and ranch dressing



celery and peanut butter



cucumber slices and tuna



pepperoni slices and cream cheese



tomato and mozzarella



lettuce wrap with chicken or tuna salad



bell pepper and hummus

PREPARING FOR ACTIVITY

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PREPARING FOR ACTIVITY



- Regular physical activity is important for overall health and wellness
- Its important to balance insulin doses with carb intake (meals/snacks) and activity level
- If blood glucose is less than 100 mg/dL or greater than 300 mg/dL, no strenuous exercise until blood glucose levels are within range.

CHALLENGES & CONSIDERATIONS OF BG MANAGEMENT WITH EXERCISE

- Every athlete has a unique BG response before, during, after exercise
 - Type and amount of CHO in diet, intensity, duration, temperature/altitude, performance anxiety/excitement
- Daytime and nocturnal hypoglycemia are common during and after exercise
- Adjusting basal and/or long acting insulin may be necessary before exercise



PREVENTING HYPOGLYCEMIA

Prior to Exercise

- A BG value of 120-180 mg/dL is a good starting point for activity
- Check BG before exercise; if BG >250 mg/dL, check for ketones (ketones, **NO** exercise)
- ***BEFORE** Boluses/basal rate may need to be reduced before exercise (especially long lasting exercise) to prevent hypoglycemia.

During Exercise

- Measure BG every 30 minutes during exercise
- ***DURING** A CHO snack 30 min into exercising may be necessary

After Exercise

- Measure BG immediately after and 2-4 hours post exercise.
- ***AFTER exercise, the greatest concern is** late-onset hypoglycemia, which may occur due to low glycogen levels. Prevention strategies include consuming additional CHO (via bedtime snack) and/or reducing basal rate or long-acting insulin after HIIT or an extended practice.
- **Emphasize proper recovery.** Replenish muscle glycogen right after exercise (within 30-60 minutes) by taking in adequate carbohydrate, you'll be less likely to get as low later on.

MANAGING EXERCISE

Intensity	Examples	If blood glucose is...	Then eat...	Suggestions
Light	Walking a half mile or leisurely biking for less than 30 minutes.	Less than 100 mg/dL	15g carbohydrate per 60 minutes	1 fruit or bread serving (1/2 cup orange juice or ¼ bagel)
		100 mg/dL or above	No food needed	
Moderate	Tennis, jogging, swimming, baseball, leisurely biking, gardening, golfing, vacuuming for 30 minutes to 1 hour.	Less than 100 mg/dL	15-30 g carbohydrate before exercise, then 10-15 g per 30-60 minutes of exercise	1 milk and 1 fruit serving; or 1 milk and 1 bread (1 cup plain yogurt and ½ banana; or cereal and 1 cup milk)
		100mg/dL or above	15-30 g carbohydrate per 30-60 minutes of exercise	1 fruit or 1 bread serving (1/2 banana or 8 saltine crackers)
Strenuous	Football, hockey, racquetball, basketball, strenuous biking, swimming, soccer, lacrosse, raking leaves.	Less than 100 mg/dL	Give 15 g fast acting carbs, recheck in 15 min., if BG > 100 mg/dL, okay to exercise, follow instructions below.	Fast acting carbs: 4 oz. juice, 4 glucose tablets, etc.
		100 mg/dL or above	30-45 g carbohydrate per 30-60 minutes. Check blood glucose often	2 bread servings with either 1 milk or 1 fruit (2 slices toast, with 1 cup fat-free [skim] milk or 1 small orange)

AFFILIATION STATEMENT



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Texas Children's Hospital is affiliated with Baylor College of Medicine in the areas of pediatrics, pediatric surgery, and obstetrics and gynecology. Currently and throughout the 60-year partnership, Texas Children's serves as Baylor's primary pediatric training site, and more than 1,500 Baylor faculty are the division chiefs and staff physicians of Texas Children's patient care centers.



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COMMENTS/QUESTIONS?