

CARBOHYDRATE COUNTING BASICS IN THE REAL WORLD

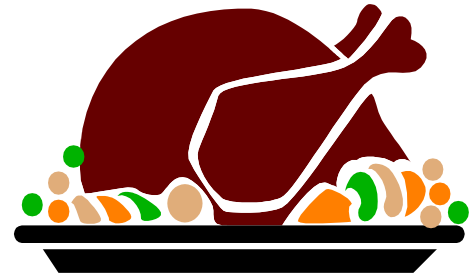
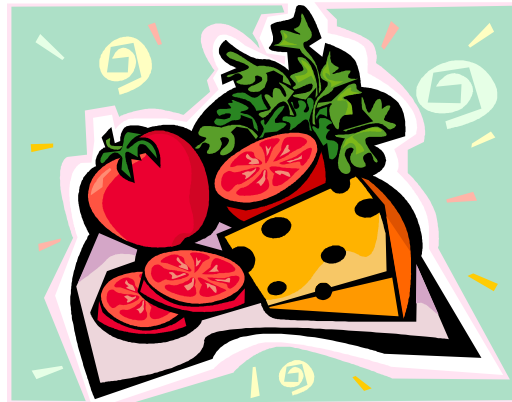
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CWD Friends for Life
Orlando Florida July 2010

OBJECTIVES: CARBOHYDRATE COUNTING IN THE REAL WORLD

- ◉ Present healthy eating strategies
- ◉ Review Basic Carbohydrate Counting
- ◉ Discuss Advanced Carbohydrate Counting
- ◉ Review ways to improve portion estimation and carbohydrate counting when eating out
- ◉ Review label reading techniques
- ◉ How to use these tools in the REAL WORLD!

HEALTHY EATING

- Children with diabetes have the same nutritional needs as children without diabetes



DIETARY INTAKES AMONG YOUTH WITH DIABETES: THE SEARCH FOR DIABETES IN YOUTH STUDY

- ◉ Less than 50% of participants met recommendations for fat, Vitamin E, fruit, vegetables and grains
- ◉ Authors felt that there was a critical need for improvement of dietary intake in youth with diabetes

** Journal of the American Dietetic Association (May 2006)

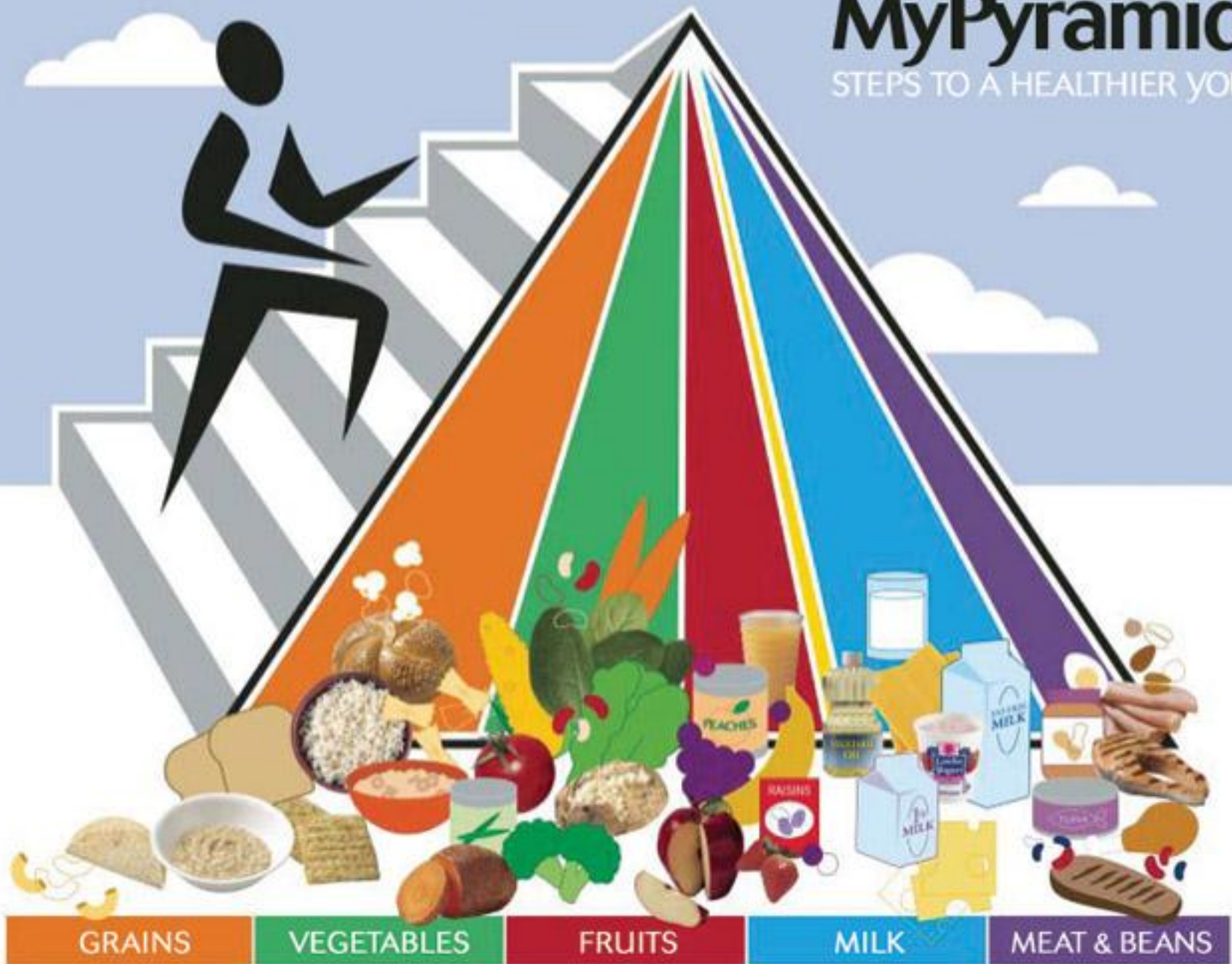
SIGNIFICANT VITAMIN D DEFICIENCY IN YOUTH WITH TYPE 1 DIABETES

- Most of the 128 participants had inadequate levels of vitamin D
 - 24% sufficient
 - 61% insufficient
 - 15% deficiency

- ***The Journal of Pediatrics Jan 2009

MyPyramid

STEPS TO A HEALTHIER YOU



FOOD GUIDE MESSAGE

- ◉ Enjoy a variety of foods from each group every day
- ◉ Choose lower fat foods more often
- ◉ Choose whole grains and enriched products more often
- ◉ Choose dark green or orange vegetables and orange fruit more often
- ◉ Choose lower fat milk products more often
- ◉ Choose leaner meats, poultry and fish, as well as dried peas, beans and lentils more often

FOOD GROUPS CONTAINING CARBOHYDRATE

- ◉ Grains, Beans and Starchy Vegetables



- ◉ Fruit



- ◉ Milk and Yogurt Products



- ◉ Sweets



- ◉ Non Starch Vegetables



HOW TO GET KIDS TO EAT HEALTHY?

- ◉ Kids learn from their parents
- ◉ Offer healthy and convenient snacks
- ◉ Create colorful meals and snacks



**“How come God put all the vitamins in
cabbage and nothing in candy?”**

DIABETES MEAL PLANNING

- ◉ More liberalized Meal Planning (Carb Counting), analog insulin, insulin pump therapy can allow for an INCREASE IN FOOD CHOICES, BUT...demands attention to
 - ◉ PORTION SIZES
 - ◉ ACCURATE CARB COUNTING



WHY COUNT CARBS?

- ◉ Carbohydrates raise blood glucose levels quicker and higher than Fat or Protein
- ◉ Within 1 to 2 hours most of the carbohydrate we eat has been converted into glucose
- ◉ Balancing Carbohydrate intake with insulin and exercise helps to keep blood glucose levels in your target range

WHY COUNT CARBS?

- In a recent Italian study published in May of this year it was shown that Counting Carbohydrate as part of your Diabetes Management Program can actually improve Quality of Life along with knowledge of Diabetes Management
- *Trento, Marina et al. Journal Endocrinol Invest May 3, 2010

BASIC CARBOHYDRATE COUNTING

- Uses “Carb Choices”
- Carb Choices are based on exchanges
- 1 exchange/choice = 15 grams of carb
 - 1 fruit = 1 starch = 1 milk = 1 other
- Vegetables are free when only 1 or 2 servings are eaten at a time
- This system is based on averages and not precise

ADVANCED CARBOHYDRATE COUNTING

- ⦿ Count exact carb grams in the food rather than exchanges or choices
- ⦿ More precise than using exchanges
- ⦿ Best way to match insulin doses to food
- ⦿ Accuracy of insulin dose is influenced by the accuracy of your carbohydrate counting

INSULIN TO CARBOHYDRATE RATIO

- ⦿ This is the amount of insulin to cover the carbohydrate eaten at a meal or snack
- ⦿ When set correctly the BG should not rise more than 2.2 - 4.4 mmol at the 2hr pc mark
- ⦿ When adjusting do so by 1 to 2 grams at a time

DETERMINING INSULIN:CARB

- ◉ Detailed food, BG and insulin dose records are helpful
- ◉ Accurate carbohydrate counting is essential
- ◉ BG testing ac and 2 hr and 4 hr pc meals
- ◉ There are three methods that can be used

METHOD ONE: FOOD RECORDS

- ◉ Keep detailed BG, insulin & food records
- ◉ divide grams of carb consumed by insulin dose taken
- ◉ This helps to identify the differences in I:C ratios at different meals
- ◉ DISADVANTAGE: the I:C ratios on MDI will be different than on a pump

METHOD TWO: 500 RULE

⦿ Insulin to Carb ratio is the amount of carbohydrate 1 unit of insulin will cover

⦿ It is a precise way to calculate your insulin needs based on your carbohydrate intake

$$\text{I:C} = \frac{500 \text{ (480)*}}{\text{TDD}}$$

*TDD is the Total Daily Insulin Dose

$$\text{E.g. I:C} = \frac{500}{20}$$

1 unit for every 25 grams of carb

METHOD THREE: TDD

- ⦿ Take the TDD - basal insulin = bolus insulin
- ⦿ Divide the daily average carbohydrate intake by the bolus insulin to = I:C ratio
 - E.g.. Becky's TDD is 20 units - 10 units basal = 10 units bolus
- ⦿ Average CHO intake of 220 g per day = 22 g
10 units

CARB GRAMS VS. CHOICES

FOOD	GRAM	VS CHOICE
1 cup mashed potatoes	36	2
8 spears of asparagus	8	0
1 small dinner roll (1 oz.)	19	1
3 oz of chicken	0	0
1 small 8 oz pear	21	1
2 tsp margarine	0	0
<hr/>		
	81 gm	60 gm
Insulin dose using 1:15 (1:C ratio)	5.4 u	4.0 u

SO..THIS IS WHY WE CARB COUNT!



"...Doctor, I have Billy Roberts on line two who wants to know how much insulin he needs to take to cover 6 malt balls...3 chocolate bunnies...11 marshmallow eggs... oh... and a whole handful of gummi worms..."

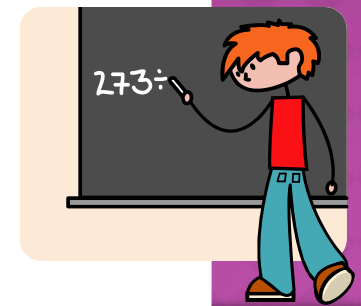
HOW ACCURATE ARE WE?

- 2009 study found that only 23% of adolescents (ages 12-18yrs) estimated daily carbohydrates within 10 grams of the true amount

*** Diabetes Spectrum Jan,1 2009 Vol 22,#1

HOW TO CARB COUNT ACCURATELY

- ◉ Read and use labels
- ◉ Software on pumps for carb information
- ◉ Ask for nutrition information at restaurants
- ◉ Look up information on-line before going
 - (www.calorieking.com)
- ◉ Divide and Conquer: Order rice or pasta on side rather than mixed with other foods in casseroles



LABEL READING



- Use the Nutrition Facts Labels to help you make informed choices.
- Not all foods have labels. Exceptions: fresh fruit and vegetables, raw meat and poultry, foods prepared or processed at the store, foods that contain very few nutrients.
- Canada introduced a new system for providing nutrition information on food labels in 2003
- As of Dec 2005, most companies are required to provide accurate food labels to consumers.

Nutrition Facts

Per 1/2 cup (125 mL)

Amount	% Daily Value
Calories 70	
Fat 0.5 g	1 %
Saturated Fat 0 g + Trans Fat 0 g	0 %
Cholesterol 0 mg	
Sodium 250 mg	10 %
Carbohydrate 13 g	4 %
Fibre 2 g	8 %
Sugars 6 g	
Protein 2 g	
Vitamin A 1 %	Vitamin C 2 %
Calcium 0 %	Iron 4 %

PORTIONS VS. SERVINGS

WHAT'S THE DIFFERENCE ?

- ◉ A SERVING is the amount of food you see listed on the Nutrition Facts Label or what is recommended for the different food groups on the Food Guide
- ◉ A PORTION is the amount of food you choose to put on your plate
- ◉ PORTIONS may actually contain several SERVINGS.

WHY IS PORTION CONTROL AND ACCURATE CARB COUNTING IMPORTANT?

- ◉ Optimal postprandial blood sugar control
- ◉ Weight management



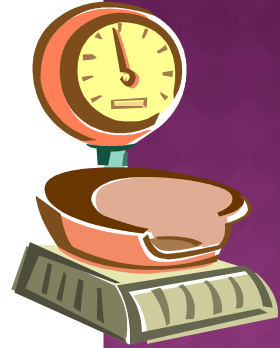
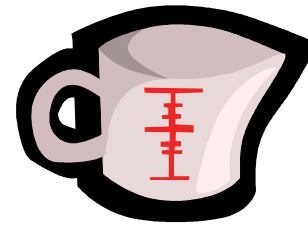
HOW TO PORTION ACCURATELY

- Measuring Tools

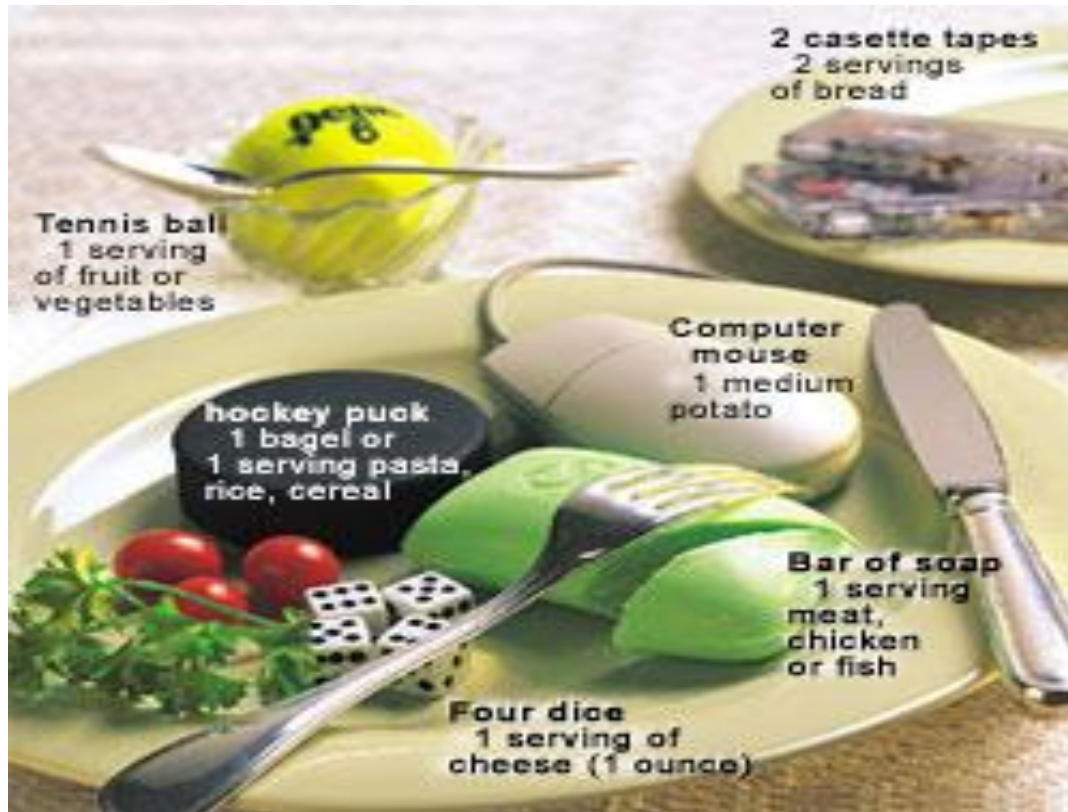
- Measuring cups
- Measuring spoons
- Gram scales, Salter Scale

- Food Labels

- Exchange Lists, Internet, Books: Calorie King



WHAT IS A SERVING???



TIPS AND TRICKS



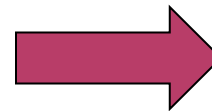
- ◉ Thumb tip= 1 tsp (mayo or margarine)
- ◉ Thumb= 1 Tbsp (salad dressing, cream cheese)
- ◉ Two fingers lengthwise= 1 ounce (cheese or meat)
- ◉ Palm of hand/deck of cards= 3 ounces (meat)
- ◉ Tight fist= ½ cup (noodles or rice)
- ◉ Cupped hand= 1 cup (vegetables or rice)
 - Woman's hand sizes

LABEL READING: SERVING VS. PORTION

Look at the specific amount of food listed

Compare this to the amount you plan on eating

If the amounts are different, do the math to calculate the correct nutrition information



Nutrition Facts			
Per 2 slices (64 g)			
Amount	% Daily Value		
Calories 140			
Fat 1.5 g	2 %		
Saturated 0.3 g + Trans 0.5 g	4 %		
Cholesterol 0 mg			
Sodium 290 mg	12 %		
Carbohydrate 26 g	9 %		
Fibre 3 g	12 %		
Sugars 2 g			
Protein 5 g			
Vitamin A	0 %	Vitamin C	0 %
Calcium	4 %	Iron	10 %

KNOW YOUR SERVING SIZE

Nutrition Facts			
Per 2 cookies (30 g)			
Amount		% Daily Value	
Calories 150			
Fat 7 g		11 %	
Saturated Fat 3 g + Trans Fat 1 g		20 %	
Cholesterol 0 mg			
Sodium 80 mg		3 %	
Carbohydrate 21 g		7 %	
Fibre 1 g		4 %	
Sugars 8 g			
Protein 1 g			
Vitamin A	0 %	Vitamin C	0 %
Calcium	0 %	Iron	8 %

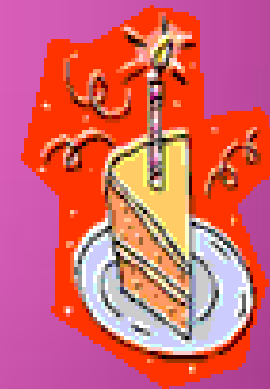
Nutrition Facts			
Per 4 cookies (30 g)			
Amount		% Daily Value	
Calories 130			
Fat 4 g		6 %	
Saturated Fat 1 g + Trans Fat 1 g		10 %	
Cholesterol 0 mg			
Sodium 80 mg		3 %	
Carbohydrate 23 g		7 %	
Fibre 0 g		0 %	
Sugars 6 g			
Protein 2 g			
Vitamin A	0 %	Vitamin C	0 %
Calcium	0 %	Iron	8 %

Although the gram weight is the same in both, the serving size is different.

Per 1/12 package (83 g)
(about 1/12 cake)

Amount	Dry Mix	Original Recipe	Lower Fat Recipe
Calories	170	270	190
	% Daily Value		
Fat 4.5 g*	7 %	23 %	9 %
Saturated 2 g + Trans 0.5 g	13 %	18 %	13 %
Cholesterol 0 mg			
Sodium 370 mg	15 %	15 %	15 %
Carbohydrate 33 g	11 %	11 %	11 %
Fibre 2 g	8 %	8 %	8 %
Sugars 20 g			
Protein 2 g			
Vitamin A	6 %	6 %	6 %
Vitamin C	0 %	0 %	0 %
Calcium	6 %	6 %	6 %
Iron	15 %	15 %	15 %

**LABEL READING:
DIFFERENT
PREPARATION
METHODS CAN
CHANGE NUTRIENT
CONTENT**



LABEL READING: FAT CONTENT

- Look at the fat content.
- Compare the listed fats (saturated and trans fats) with the remaining unlisted fats (polyunsaturated and monounsaturated fats)
- A good goal is to have more than 50% of total fat coming from polyunsaturated and monounsaturated fats



Nutrition Facts			
Per 2 slices (64 g)			
Amount	% Daily Value		
Calories 140			
Fat 1.5 g	2 %		
Saturated 0.3 g + Trans 0.5 g	4 %		
Cholesterol 0 mg			
Sodium 290 mg	12 %		
Carbohydrate 26 g	9 %		
Fibre 3 g	12 %		
Sugars 2 g			
Protein 5 g			
Vitamin A	0 %	Vitamin C	0 %
Calcium	4 %	Iron	10 %

LABEL READING: % DAILY VALUES

- is a benchmark for evaluating the nutrient content of foods quickly and easily
- is based on recommendations for a healthy diet
- is used to determine whether there is a lot or a little of a nutrient in a specific amount of food

Nutrition Facts			
Per 2 slices (64 g)			
Amount			% Daily Value
Calories 140			
Fat 1.5 g			2 %
Saturated 0.3 g + Trans 0.5 g			4 %
Cholesterol 0 mg			
Sodium 290 mg			12 %
Carbohydrate 26 g			9 %
Fibre 3 g			12 %
Sugars 2 g			
Protein 5 g			
Vitamin A	0 %	Vitamin C	0 %
Calcium	4 %	Iron	10 %

LABEL READING: WHAT TO DO WITH FIBER?

- According to the Canadian Diabetes Association, fiber does NOT raise blood glucose and therefore should be subtracted from the total carbohydrate.
- According to the American Diabetes Association only half of the fiber grams should be subtracted once you get over 5 grams

Nutrition Facts			
Per 2 slices (64 g)			
Amount		% Daily Value	
Calories 140			
Fat 1.5 g		2 %	
Saturated 0.3 g		4 %	
+ Trans 0.5 g			
Cholesterol 0 mg			
Sodium 290 mg		12 %	
Carbohydrate 26 g		9 %	
Fibre 3 g		12 %	
Sugars 2 g			
Protein 5 g			
Vitamin A	0 %	Vitamin C	0 %
Calcium	4 %	Iron	10 %



SUGAR ALCOHOLS

- ◉ SORBITOL, XYLITOL, MANNITOL, ISOMALT
- ◉ Often have an “ol” ending
- ◉ These sugars have less of an affect on the blood glucose results as they are not completely absorbed in the body
- ◉ Large amounts can create a laxative affect
- ◉ IF A FOOD ITEM CONTAINS 5GM OF SUGAR ALCOHOL THEN SUBTRACT HAVE OF THOSE GRAMS FROM THE TOTAL CARBOHYDRATE AND ONLY COUNT THE DIFFERENCE

ALCOHOL

- ◉ ALCOHOL ITSELF DOES NOT CONTAIN CARBOHYDRATE
- ◉ HOWEVER SOME ALCOHOLIC BEVERAGES LIKE BEER AND COOLERS DO CONTAIN CARBOHYDRATE
- ◉ ALCOHOL CAN LOWER THE BLOOD SUGARS
- ◉ IT IS A GOOD IDEA TO ALWAYS EAT WHEN CONSUMING ALCOHOL
- ◉ ADA RECOMMENDS:
 - NO MORE THAN 2 DRINKS PER DAY FOR MEN
 - NO MORE THAN 1 DRINK PER DAY FOR WOMEN

GLYCEMIC INDEX

- IS A SYSTEM THAT RANKS CARBOHYDRATE CONTAINING FOODS BASED ON THEIR POTENTIAL TO IMPACT BLOOD GLUCOSE RESULTS
- Foods are given a rating between 1-100
- Every food is compared to glucose with a rank of 100
- The higher the rating the higher the potential rise in blood glucose

PRACTICE MAKES PERFECT

- Once portion sizes and carbohydrate counts are known for food and beverages at home, then eating out is easier.
- Careful postprandial blood glucose monitoring will tell you if you estimated portions accurately, correct with additional insulin if needed.

ADVANCED PUMP FEATURES

- ⦿ Can help deliver the insulin to match the carbohydrate absorption more closely

AND

- ⦿ Help to improve glycemic control

NORMAL BOLUS



EXTENDED BOLUS

- CAN BE USED WHEN A DETERMINED AMOUNT OF CARBOHYDRATE IS GOING TO BE CONSUMED OVER A CERTAIN AMOUNT OF TIME
 - COCKTAIL PARTIES
 - BUFFETS
 - LOW GLYCEMIC INDEX FOODS
- YOU CAN CALCULATE THE TOTAL AMOUNT OF INSULIN AND DELIVER IT OVER A 3HOUR PERIOD FOR EXAMPLE

EXTENDED BOLUS



COMBO BOLUS

- Can be used to deal with the affect that Protein and Fat can have on blood glucose results

FAT

- Effects on BG
 - Delayed stomach emptying
 - Decreased insulin sensitivity
 - Increased insulin resistance
 - May last for hours after eating
- Minimal fat actually converted to glucose (<10%)
- Individual's response needs to be evaluated

USAGE OF COMBO BOLUS BASED UPON FAT IMPACT

- May need to increase insulin for a high fat meal
 - 1-2 units for a meal with 10-20 g fat
 - Up to 4 units for a meal with greater than 20 g fat
 - Varies based on patient's total daily dose of insulin
- May need to use the extended bolus for a high fat meal to accommodate delayed absorption of CHO
 - Start with a 50/50 bolus
 - 50% given as a normal bolus
 - 50% extended for 2 hours
 - Adjust based on individual's response

Ryan-Turek T. *Variable Bolus Features on Insulin Pumps and Practical Applications for Use.* On The Cutting Edge. 2005; 26:4:16-18.

Wolpert H. *Smart Pumping: A Practical Approach to Mastering the Insulin Pump.* Virginia: ADA; 2002: 134.

PROTEIN

- Many Canadians eat double the recommended amounts for protein
- Rate of digestion and conversion to glucose depends on state of insulinization and glycemic control
- BG effect difficult to predict
 - Up to 50-60% can be converted to glucose
- Evidence suggests more glycemic impact in poorly controlled diabetes, less impact when patient is adequately insulinized and controlled

PROTEIN

- In individuals without diabetes:
 - Protein ingestion stimulates the endogenous production of both insulin and glucagon
- In individuals with type 1 diabetes:
 - No endogenous insulin production
 - Production of endogenous glucagon
 - Protein causes a slow rise in BG; 3-5 hours after eating
 - Occurs after the peak of rapid-acting insulin analogs
 - Cannot be included in meal bolus

COMBO USAGE BASED UPON PROTEIN IMPACT

- Small to moderate protein intake has little effect on BG
 - Combo bolus is not needed
- Large protein intake (greater than 8 oz)
 - BG may increase 4-12 hours later
 - Combo bolus may be beneficial
 - Duration and dosage based on individual's response
 - Consider temporary basal increase starting 3-4 hours after the meal

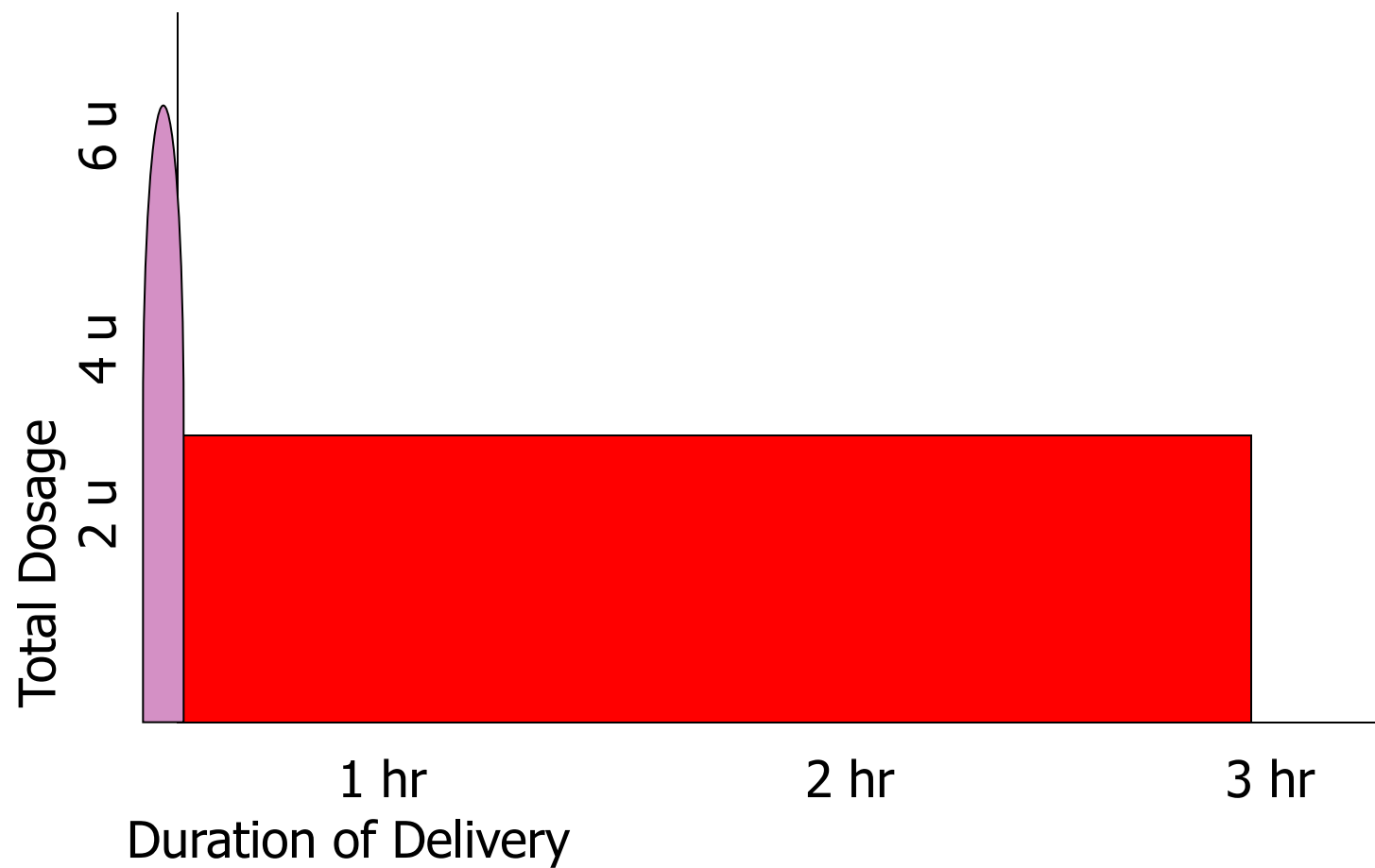
COMBO BOLUS

- How can we adjust the bolus to deal with these affects?
 - COMBO BOLUS OPTION

AN EXAMPLE:

- CAN DELIVER 50% OF THE TOTAL AMOUNT OF INSULIN AS A NORMAL BOLUS AND THE OTHER 50% OVER AN EXTENDED AMOUNT OF TIME

COMBO BOLUS



COMBINATION BOLUS

○ THE PIZZA BOLUS

- *A 2005 STUDY INDICATES THAT THE BEST WAY TO KEEP BG'S IN TARGET RANGE AFTER PIZZA IS TO DELIVER THE INSULIN IN A 50/50 SPLIT SPREAD OUT OVER 8 HOURS!!!!!!!!!!!!



*Jones M.S., et al. Optimal Insulin Pump Dosing and Postprandial Glycemia following a Pizza Meal using Continuous Blood Glucose Monitoring System. Diabetes Technology and Therapeutics. 2005; 7(2): 233-240.

PERFECT WORLD

Bolus given at least 20 minutes before the meal

Why: after eating carbs blood sugar starts to rise within 5-10 minutes. Fast acting insulin starts to work to lower the blood sugar 15-20 minutes after it is given and only $\frac{1}{2}$ of its glucose lowering action is seen 2 hrs later.

Post meal blood sugars are better controlled when boluses are given 20 minutes prior to the meal.

REAL WORLD

Bolus after meals:

- ⦿ unsure of how much is going to be eaten
 - Young children, restaurant
- ⦿ Habit

Solution:

- ⦿ Give $\frac{1}{2}$ of what you expect to be eaten before the meal, finish the bolus/injection after the meal is finished
- ⦿ Give before
- ⦿ If you are using a pump give the bolus for each course of the meal

IN SUMMARY

- ◉ Various tools for diabetes meal planning can be helpful and effective when used as part of daily diabetes care:
 - Canada's Food Guide
 - Labels, Portions sizes, serving sizes
 - Books and resources
 - Bolus recommendations
 - Advanced pump features

PUTTING IT ALL TOGETHER

- Carbohydrate Counting is a flexible system of meal planning that allows you to accurately determine insulin doses and help predict the impact of carbohydrate on your blood glucose results
- It is still important however to make health food choices as much as possible (DIABETES OR NOT!)

CARBOHYDRATE COUNTING IS A JOURNEY....NOT A DESTINATION!

- ⦿ YOU NEVER ACTUALLY GET THERE
- ⦿ EDUCATED “GUESSTIMATES” ARE A REALITY
- ⦿ BUT IT DOES IMPROVE CONSISTENCY IN INTAKE AND OVERALL GLYCEMIC CONTROL
- ⦿ IT IS NOT WHAT YOU DO SOME OF THE TIME...BUT WHAT YOU DO MOST OF THE TIME THAT MAKES THE DIFFERENCE!!

RECOMMENDED CARB COUNTING RESOURCES

- ◉ 2009 Calorie King, Calorie, Fat and Carbohydrate Counter; Calorie King Wellness Solutions
- ◉ The Ultimate Guide to Accurate Carb Counting, Gary Scheiner, MS, CDE
- ◉ The Diabetes Carbohydrate and Fat Gram Guide; Lea Ann Holzmeister
- ◉ Complete Guide to Carb Counting, Hope Warshaw, MMSc, RD, CDE, BC-ADM and Karmeen Kulkarni, MS, RD, CDE, BC-ADM

- ① Questions?
- ① Comments?
- ① Suggestions?

THANK YOU!!!!!!!

Thank you from the
bottom of my pancreas...

