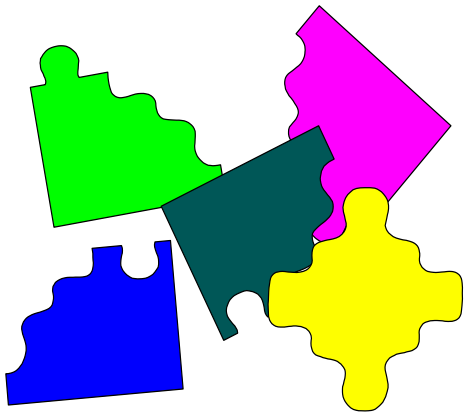

The 1, 2, 3's of Carbohydrate Counting

San Mateo County Employee Health & Fitness Program August 2003

What are Carbohydrates?

There are two types of Carbohydrates: "simple" and "complex". Simple Carbohydrates are sugars, while complex Carbohydrates are made up of starch and/or fiber. Because simple Carbohydrates are sugars, they taste sweet. Foods belonging to this group include fruits and sugar-laden foods such as candy, soda, cakes and cookies.

Starch and fiber are more "complex" because they are composed of a chain of several sugars (namely glucose). The difference between starch and fiber is that starch is digested and absorbed into the bloodstream as Blood Glucose. Fiber is not; it remains undigested and is a part of your waste.

Carbohydrate Fact vs. Fiction

Carbohydrates are a primary energy source for your body. Carbohydrates are absorbed into the bloodstream as Blood Glucose, which is used by your muscles, organs and brain as fuel for essential functions.

Four food groups contain a majority of the Carbohydrates we eat. The Grain and Fruit Groups contain approximately 15 grams of Carbohydrates per serving, the Milk Group has about 12 grams, and the Vegetable Group has 5 grams.

Do NOT be tricked by a food manufacturer's use of the term "Sugar free". "Sugar free" does not mean that a food is "Carbohydrate free" – remember all Carbohydrates (except fiber) break down into Blood Glucose! Often foods with "Sugar free" labels contain a chemically altered sugar called "sugar alcohols" (e.g. sorbitol, mannitol, xylitol). Diabetics beware: these convert into Blood Glucose just like regular sugar!

Do I Need to Count Carbohydrates?

The main thing that determines whether you should be counting Carbohydrates is your current Blood Glucose control. The higher your hemoglobin A1C level is above goal (<6.4%), the more likely you need to be counting Carbohydrates. Many diabetics who become more aware of their diet begin to eat fewer Carbohydrates, which results in lower overall Blood Glucose and an improved hemoglobin A1C.

How Many Carbohydrates Can I Eat?

Approximately 40 – 60% of your diet should be Carbohydrates, with the rest coming from protein and fat. How much or how little depends on your food preferences and your current Blood Glucose control. As an example, if your diet is 50% Carbohydrates, look at the chart below to see how many Carbohydrate grams you should eat, based on your daily caloric intake.

-- A Woman trying to lose weight:
1500 calories = 188 grams Carbohydrates
-- A Woman maintaining her weight OR a Man trying to lose weight:
2000 calories = 250 grams Carbohydrates
-- An Inactive Man maintaining current weight:

2500 calories = 313 grams of Carbohydrates
-- An Active Man maintaining current weight:
3000 calories = 375 grams Carbohydrates

Carbohydrate intake should be spread throughout the day so that your Blood Glucose rises slightly after each meal and snack. If you eat a big meal containing more Carbohydrates, your Blood Glucose will reflect that and your reading be higher.

What are My Blood Glucose Goals?

Use the table below to interpret whether your usual Blood Glucose readings are within the goals set by the American Diabetes Association. The best time to check whether a meal you've just eaten is "diabetes savvy" is to check your Blood Glucose two hours after the start of that meal. If your Blood Glucose reading is under 150mg/dl, then that meal is indeed "diabetes savvy" and moderate enough in Carbohydrates to fit into your diabetes plan. If not, the next time you eat that meal, make adjustments in your meal's total Carbohydrate grams to see if your post-meal Blood Glucose reading has improved.

Fasting	< 120 mg/dl
Pre-Meal	< 130 mg/dl
1 Hour Post-Meal	< 180 mg/dl
2 Hours Post-Meal	< 150 mg/dl

What affects my Blood Glucose?

There are various factors that affect your day-to-day Blood Glucose readings.

Fiber. Fiber can slow down the rise in Blood Glucose that normally occurs after eating a Carbohydrate-containing meal.

Because of this, there is an important rule in Carbohydrate Counting that states "if you eat a food with more than 5 grams of fiber, you subtract the number of fiber grams from the meal's Carbohydrate total". In essence, more fiber in a meal means you have a lower "net" Carbohydrate intake.

Fat and Protein. Fat and protein delay how quickly Carbohydrates get absorbed into the bloodstream. If you test your Blood Glucose two hours after a high-fat meal containing 45 grams of Carbohydrates and then compare that Blood Glucose reading to a reading taken after eating a low-fat meal where you also had 45 grams of Carbohydrates, you will find that your Blood Glucose reading after the high-fat meal will be *lower*. It's not because you ate fewer Carbohydrates (you didn't!), but because the fat slowed down the absorption of Carbohydrates into your bloodstream.

Meal Size. The size of a meal can affect your post-meal Blood Glucose readings too. The larger the meal, the slower the absorption, so big meals often have lower "peak" Blood Glucose readings.

Glycemic Index. The "Glycemic Index" (or GI) of a food indicates how quickly a particular food is absorbed in the bloodstream. As a general rule, simple Carbohydrates get absorbed into the bloodstream faster than complex Carbohydrates, and therefore have a higher GI reading. The GI scale runs from 1-100 with the higher numbers indicating a faster Carbohydrate digestion and a faster rise in Blood Glucose.

For example refined corn flakes have a GI of 83 while an orange has a GI of 43. Fiber rich lentil beans clock in at 27.

Exercise. Exercise is often a forgotten variable when it comes to understanding Blood Glucose. Many people know that exercise uses glycogen stores (sugar reserves) in the body, thereby lowering Blood Glucose. What they may not know is that the metabolic benefits of exercise extend well beyond the exercise period. This means that you will have a decreased need for insulin for up to 24-28 hours *after* exercise. Many exercisers will see a noticeable *decrease* in their Blood Glucose readings, as a result.

Illness. An illness MAY increase the amount of Blood Glucose in your bloodstream but there is often little you can do about this. For

women, the same thing can occur during menstruation although the increase is usually more subtle.

How Do I Count Carbohydrates?

Carbohydrate Counting -- like anything else that's new -- takes a little bit of time in the beginning. If you can count and add, then you can Count Carbohydrates! The easiest way to determine the number of Carbohydrates in prepared or processed foods is to look at the "Nutrition Facts" on the food labels. All packaged foods have a "Total Carbohydrate" listing. Make sure you refer to the "Portion Size" information too, so you can adjust the number of Carbohydrates accordingly, based upon the amount you're eating.

The next best way to master Carbohydrate Counting is to buy a book. Most Carbohydrate Counting books list foods by brand name or as a whole food (fruits, vegetables, nuts, meat). If you want to really master this technique, you can search Diabetes websites and even purchase software to download onto your computer or palm pilot!

When preparing foods, you should initially measure your ingredients and learn portion sizes -- otherwise you'll be guessing at the number of Carbohydrate grams. To stay organized, keep a Food Record and total your Carbohydrates after each meal and snack. If you test your Blood Glucose two hours after your meals, you'll be able to make sense of your numbers.

What Are the Benefits of Counting?

Carbohydrate Counting and Blood Glucose monitoring are two important pieces of the diabetes control puzzle. The general benefits of Counting Carbohydrates include improving your Blood Glucose control (which will reduce your risk of future diabetes complications) and helping you to better interpret your Blood Glucose readings. The latter enables you to make adjustments in when and what you eat.

Benefit to pre-diabetics or newly diagnosed diabetics. The same general benefits exist for both the newly diagnosed diabetic or the person trying to prevent the disease: Carbohydrate Counting can lower Blood Glucose values and make meter readings easier to interpret.

Benefit to people on oral medications. Unlike a Type 1 diabetic who can make on the spot adjustments in the insulin amount, a type 2 diabetic on oral medications takes the medications at approximately the same time of the day. If both the Carbohydrate intake and timing isn't consistent from day to day, then Blood Glucose readings appear more erratic, and that can be frustrating. The only thing a person with type 2 diabetes is left to do is to eat a consistent amount of Carbohydrates at each meal and snack.

Benefit to people on insulin. The benefit of Carbohydrate Counting to a diabetic on insulin is that it allows tighter control of Blood Glucose. Appropriate adjustments can be made in the number of insulin units based on the type and size of the meal eaten.

There are two main things a person on insulin wants to learn from Carbohydrate Counting. First is their Carbohydrate-to-Insulin ratio (CHO:Insulin), which is the number of Carbohydrate grams that 1 unit of insulin will cover. For example, if someone has a ratio of 12:1, it means that for every 12 grams of Carbohydrates they eat, they must inject 1 unit of insulin -- so that their Blood Glucose readings are within normal range two hours later.

The second goal of Carbohydrate Counting for insulin users is to learn their "Recovery Number". When your Blood Glucose reading is too high before a meal but you still need to eat, the Recovery Number is the number of Blood Glucose "points" you'll drop by taking 1 extra unit of insulin. This extra unit (or two or three) is added to the amount you'll need to take to cover your meal, which is determined from your CHO:Insulin ratio. For example, if someone has a recovery of 35 points for every extra unit and their Blood Glucose is 150 point too high before their meal, they'd take 4 extra units (150/35 = 4.2) to recover.

Note – for some diabetics, the Carbohydrate: Insulin ratio is lower at breakfast than at dinner (Breakfast has 10g:1 unit and Dinner has 15g:1 unit), meaning that more insulin is needed in the morning to cover your Carbohydrate intake. This is called the "Dawn Phenomenon". Be sure to discuss this with your doctor.

Final Thoughts on "Carb Counting"

YES, Carbohydrate Counting requires more work initially because both food intake and multiple Blood Glucose readings need to be recorded AND monitored daily. Those who do it say that their improved hemoglobin A1Cs (AND their better health as a result) are well worth the effort!

Happy Counting!

Where to Find More Information

The following books are written for consumers and are available at bookstores and online book retailers.

- "ADA's Complete Guide to Carbohydrate Counting" by Hope Warshaw, RD, CDE and Karmeen Kulkurni, RD, CDE.
- "The Diabetes Carbohydrate and Fat Gram Counter" by Lea Ann Holzmeister, RD, CDE.
- "Pumping Insulin: Everything you need to know for success with an insulin pump" by John Walsh, PA, CDE and Ruth Roberts, MA.
- "Diabetes Type 2 Complete Food Management Program" by Sherri Chafer, RD, CDE.
- "My Other Check Book" and "The Pocket Pancreas" by John Walsh, PA, CDE and Ruth Roberts, MA.

Websites

- Carb Counting: www.weightbydate.com
  www.carbcards.com
  www.accu-chek.com
  www.diabetespilot.com
- General Diabetes: www.diabetes.com
  www.diabetes.org

Local Resources

Take advantage of the many local resources available to you at work, in your community, through your health plan or on the Internet! If you don't know where to start, visit the Health & Fitness website for some ideas -- **www.co.sanmateo.ca.us/eps/heart.** Click "Heart 2 Health".

HEAR^{2}T Program

There is a strong link between heart disease and diabetes. Employees with diabetes may be eligible to receive confidential health and nutrition counseling services FREE of charge. Complete your on-line HEAR^{2}T questionnaire at **www.stanfordheart.net/online/smc.** If your results are "high" or "very high", the Nurse Counselor will contact you directly to determine your interest in participating in this program.

Living and Working with Diabetes

Three information-packed sessions, each three hours long. The third session is devoted entirely to Meal Planning and Carbohydrate Counting.

Redwood City:
November 4, 12, & 19 (mornings)

South San Francisco:
November 6, 13 & 20 (mornings)

Pre-registration is required. Call (408) 808-1333 to register or e-mail toni@tonibloom.com. Conducted on County time with your supervisor's approval.

Individual Nutrition Counseling

E-mail our Employee Health & Fitness Program registered dietitian at toni@tonibloom.com for more information about individual nutrition counseling services at County discounted rates. Whether you need help Carbohydrate Counting or setting up a plan for weight loss, she's a great nutrition "coach"!

For more information:

The San Mateo County
Employee Health & Fitness Program
www.co.sanmateo.ca.us/eps/hf