

**TOM ELLIOTT MBBS**  
**ENDOCRINOLOGY & INTERNAL MEDICINE**

Dr. T.G. Elliott Inc.  
4102 – 2775 Laurel St.  
Vancouver, BC V5Z 1C6, CANADA

ph  
fax

604 - 875-5900  
604 - 875-5931  
[www.drtomelliott.com](http://www.drtomelliott.com)

### Carbohydrate Counting

Carbohydrate (“carb”) counting is the process of making an intelligent guess as to how much starch or carbohydrate any individual foodstuff, or complete meal, contains. Carbs are usually estimated in units of grams (1 oz = 28 grams, 1 lb = 454 grams). The reason for counting carbs is that the dose of meal time ultra-short-acting insulin (Humalog or NovoRapid) you require is directly proportional to the carbs you are about to eat.

First you have to learn the carb values for common starchy foods – these can be obtained from a number of resources. A good place to start is [www.bcchildrens.ca/Services/SpecializedPediatrics/EndocrinologyDiabetesUnit/ForFamilies/DiabetesHandouts.htm#nutrition](http://www.bcchildrens.ca/Services/SpecializedPediatrics/EndocrinologyDiabetesUnit/ForFamilies/DiabetesHandouts.htm#nutrition).

The next thing you need to figure out is how many grams of carbs it takes to neutralize the effect of one unit of ultra-short-acting insulin. This value is often called the “carb ratio”. People with Type 1 diabetes who are very sensitive to insulin may require as many as 15 grams of starch to neutralize one unit of ultra-short-acting insulin (ie their “carb ratio” is 15 to 1 or 15:1). The “average” Type 1 diabetic has a lower carb ratio, often close to 10 to 1. (note people with Type 2 diabetes often have much lower carb ratios, as low as 5 to 1 or even 2 to 1).

When you are starting out with carb counting, it is safe practice to assume your carb ratio is 15 to 1 – we choose a high starting carb ratio because we don’t want you to have a low sugar after your first dose! To find out your own carb ratio you will have to do a series of simple experiments with your favourite starchy foods.

A small bagel has 30 grams of starch. If your carb ratio is 15 to 1 and you plan to eat a bagel, you will need  $30/15 = 2$  U of ultra-short-acting insulin to neutralize the carbs in a single bagel. The ultimate test of whether you got the dose of insulin right (based on carb counting and your carb ratio) is whether the sugar two hours after a meal is in the 6-10 range (or 8-12 one hour after a meal). This also assumes that your blood sugar before the meal started out in the right range (say 5-8). So if you ate the bagel and your sugar was  $> 10$  two hours after the meal it means you didn’t take enough insulin and that your carb ratio is less than 15 to 1. Next time you eat the bagel you might want to try a carb ratio of 10 to 1 which would mean you would take  $30/10 = 3$  units of ultra-short acting insulin. On the other hand if your blood sugar after the bagel was  $< 6$  that implies you took too much insulin and your carb ratio is actually higher than you guessed. Note for American readers: to convert blood sugar values discussed in this article to American units multiply by 18.

Providing you are doing your carb counting correctly and your sugars after meals are good, your sugar values when you wake and before meals have much more to do with your dose of basal (baseline) insulin. Common once-daily basal insulins include insulin glargine (Lantus) and insulin detemir (Levemir). NPH is a basal insulin that is best taken twice daily (12 hours apart) in roughly equal doses. The dose of basal insulin is correct when your sugar when you wake and before meals is in the 5-8 range. If your pre-breakfast readings are consistently above 8 you probably need to increase your basal insulin dose. To be on the safe side you should check your sugar at 2:00 or 3:00 AM to make absolutely sure you are not low – some people have morning highs because they have asymptomatic 2:00 or 3:00 AM lows. If your pre-breakfast readings are consistently less than 5 you need to decrease your basal insulin dose.

If your sugar before a meal is  $> 8$ , you may consider correcting for the high sugar by taking extra ultra-short-acting insulin. This is called a “correction” dose – this extra/correction ultra-short-acting insulin is given above and beyond the dose determined by carb counting and carb ratio. A safe starting correction dose would be to take an extra unit of ultra-short-acting insulin for every 4 your sugar is above target. So if your sugar before a meal is 12 and your pre-meal target is 5-8, it is 4 above target and you might take an extra unit of ultra-short-acting insulin. If your pre-meal sugar is 16 that is 8 above your target and you might take an extra 2 units of ultra-short-acting insulin.