

Hypoglycemia from the Laboratory to the Clinic

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A recent article¹ in Diabetes Care examined the etiology and prevention of frequent or severe hypoglycemia in insulin using diabetics. Although a number of current and potential preventative strategies were mentioned, an important and increasingly popular approach was ignored ---- a very low carbohydrate (CHO) diet.

We have, since prior to 1973, been using such a diet to bring insulin requirements down to the physiologic levels produced by non-diabetics.² The low insulin doses are used with basal/bolus dosing and blood glucose (BG) self-monitoring to eliminate severe hypoglycemia. Elevated BG's are corrected with very small doses of rapid acting insulin (sometimes less than or equal to ¼ unit) and BG's below target are corrected with glucose tablets or oral liquid glucose (not foods).

Why is a low CHO diet essential? We herein ignore the fact that dietary protein (3) also affects BG and must be covered by much smaller amounts of insulin than the same weight of CHO. Consider first the usual attempts to precisely cover ingested CHO with insulin. Let's assume that one unit of crystalline insulin will cover exactly 8 gm of oral CHO for a particular patient. She would inject 12 ½ units to cover a 100 gm CHO meal. The food labeling requirements in the USA permit an error of plus or minus 20% for any ingredient including CHO. Thus if the product (say pasta) were underestimated on the label by 20% and if one gm CHO would raise her BG by 5 mg/dl, her anticipated BG would be overestimated by 20 gm x 5 mg/dl or 100 mg/dl --- ergo hypoglycemia would

occur if her target was less than 150 mg/dl. When eating one tenth of this amount of CHO, the uncertainty in BG would only be 10 mg/dl and hypoglycemia would be prevented. . Unlabeled foods such as potatoes, fruit, etc. would require CHO estimates from food tables that can have even greater errors and foster even more severe BG declines.

A similar argument can be made when one considers the uncertainty in absorption of insulin when injected in large doses (4).

For most adult patients we limit CHO to 6 gm for breakfast, 12 gm for lunch and 12 gm for dinner. We further limit the nature of the CHO foods to slow acting vegetables such as greens, zucchini, cauliflower, pumpkin, eggplant, etc. This permits us to approximate timing of the food's increase of BG with the insulin's reduction of BG.

In conclusion, very low CHO diets combined with small physiologic doses of insulin have been in use for many years and certainly should be advocated in the ADA guidelines for the prevention of severe hypoglycemia in insulin using patients. The usual objections to low CHO diets are addressed in reference 5 which reviews 64 studies, many of which compare low CHO to low fat diets

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