Fat and protein units: A parent's perspective

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Article points

1. Providing the right insulin dose and pattern of delivery for different meal types can be emotionally challenging for the parent of a child with type 1 diabetes.
2. For certain types of meal, calculating its fat and protein content and adjusting insulin delivery accordingly can be beneficial in the control of blood glucose levels.
3. Parents adopting this system for their child need to be taught it in a simple and practical terms.

Key words

- Children
- Fat and protein
- Parenting
- Type 1 diabetes

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Managing the diabetes control of a child or young person can be confusing and stressful for a parent. While matching mealtime insulin doses to the carbohydrate contained in a meal is well established, there is increasing evidence that fat and protein content should also be considered. This article outlines the experiences of the mother of a girl diagnosed with type 1 diabetes, including the challenges of learning carbohydrate counting and the realisation that the system may not fit all meal types. The benefits of fat and protein unit calculation for "awkward" meals are outlined, along with suggestions about the type of support needed to learn it.

When my daughter was diagnosed with type 1 diabetes, I did not realise what was happening. I thought there would be a few days in hospital and then she would be "better". That was not the case. I also thought that I would never do another exam in my life. However, the most difficult exam was yet to come – "carbohydrate counting".

Learning carbohydrate counting is a complex journey and it took around 6 months for me to be able to understand the technique of weighing and calculating carbohydrates. Once on the journey, you realise that insulin and food do not always match, and your maths skills need to be extremely good! I started to talk to other families to see how they dealt with food and I also began to question why my daughter's blood sugars reacted differently to different foods, such as pizza. I read the pump instruction manual and I started to experiment with dual and square boluses, building up a matrix of meals and insulin deliveries to match.

There were still "awkward meals", for example macaroni cheese and fish and chips. These were meals that I could never find the right pattern of insulin delivery to fit. I could not find anyone who could give me the right answer and I started to ponder the question, "if my daughter's plate was only 50% carbohydrate, what effect would the rest of the plate have on her processing of carbohydrate?" I also started to question the impact of fats and proteins in her diet and discussed it with my daughter's dietitian. I was given an example of "fat and protein units" (FPUs) and how to count them, which is estimated by counting kilocalories (see *Box 1*).

The calculations looked complex and scary and I thought counting FPUs would never work. I was not sure how to use it in practical terms, so I wrote the calculation for every meal down and found they became quicker each time. After the first meal I monitored my daughter's blood sugars and they were perfect all evening and on waking the next morning. This was highly unusual for the "awkward" meal she had. Using the same calculations I tried counting FPUs over most evening meals and, once I had established a routine, I found it was no more difficult than just counting carbohydrates.

The calculation did not always work (e.g. when eating low-fat meals) so, in these cases, we reverted to using a different method of insulin delivery. I have found benefit in using the FPU approach for higher-fat and -protein meals, and will continue to use it. It has given

me the opportunity to add another tool into the bag that will help my daughter manage and improve her life with diabetes. My daughter's HbA_{1c} usually ranges from 52 mmol/mol (6.9%) to 60 mmol/mol (7.6%) and understanding food more has helped maintain these levels, without extra hypoglycaemia.

Conclusions

If I went on this journey again, I would ask for clear teaching in simple, practical terms. An incremental learning approach would ensure that I developed my understanding of foods, starting with basic carbohydrate counting, weighing and measuring, and understanding the maths, followed by understanding the impact of glycaemic index (that is, how different foods affect blood glucose levels) and fat and protein counting. I am sure there is more to add to this list. I would say these are essential tools that families need to understand in order to improve their children's lives and maintain good control of their type 1 diabetes. ■

Box 1. The author's family's hot dog and mustard dish.

Carbohydrate value of meal

30 g carbohydrate
10 g carbohydrate = 1 carbohydrate unit (CU)
Therefore, meal contains 30 ÷ 10 = 3 CU
Insulin:carbohydrate ratio = 0.66 unit per CU
Therefore, 3 CU × 0.66 = 1.98 units of insulin are delivered immediately

Fat and protein value of meal

28 g fat (1 g fat contains 9 kcal)
15 g protein (1 g protein contains 4 kcal)
Therefore, meal contains (28 × 9 [fat]) + (15 × 4 [protein]) = 252 + 60 = 312 kcal
312 kcal from fat and protein = 3 FPU (as 100 kcal = 1 FPU)
Therefore, 3 FPU × 0.66 = 1.98 units of insulin delivered over 5 hours (5 hours for 3 FPU)

Notes

Meal-time boluses are delivered as dual waves; the first part is the dose required for carbohydrate and the second part is the additional units based on the protein and fat in the meal. The time extended is based on how much fat and protein is in the meal. Carb ratios are expressed in units per 10 g to make the equation work.

For the author's daughter and her ratios that means: 1 unit per 15 g is 0.66 units per 10 g.

Carbs are expressed as CUs where 1 CU is 10 g of carbs and fat and protein are combined into FPUs, where 1 FPU is 100 kcal from fat and protein. Use the carbs, kcals, protein and fat to work out the amount of protein and fat in a meal…

1 g protein = 4 kcal
1 g fat = 9 kcal

1 FPU = 3 hours' extended bolus // 2 FPU= 4 hours' extended bolus
3 FPU = 5 hours' extended bolus // >3 FPU= 8 hours' extended bolus