Outline

• Purpose of session
• Understanding current practice nationally
• Practical experience
• Review current evidence
• Practical tips
Purpose of session

- An opportunity to gain an insight into current HCP knowledge into fat and protein counting
- An opportunity to share national experience and current practice
- To gain some understanding in DAFNE educator requirements
- To signpost you to relevant recent evidence/further reading
- To share guiding principles
- To understand where fat and protein sits in the wider DAFNE curriculum
- To become aware of new, supportive DAFNE resources for HCPs and patients
Confidence

How confident do you feel:

• Being familiar with the existing evidence?
• Being able to count fat and protein yourself?
• Being able to educate others in fat and protein counting?

_________________________
Not confident         Very confident
Case study

A patient is asking for advice on how to manage their insulin for a pub meal of BBQ ribs and dessert. The last couple of times they had this same meal they found they had high BGs the following morning, despite what they felt was an accurate estimation of carbohydrate.

Questions:

1. What factors could be causing this?
2. How much protein and fat do you think this meal contains?
3. What amounts of protein and fat would you recommend to start counting?
4. What is the BG response to fat and protein?
5. How would you manage this with insulin?
Insulin Therapy
There are excellent reviews to guide the initiation and management of insulin therapy to achieve desired glycemic goals (1,2,3). Although most studies of MDI versus pump therapy have been small and of short duration, a systematic review and meta-analysis concluded that there were no systematic differences in A1C or severe hypoglycemia rates in children and adults between the two forms of intensive insulin therapy (4). A large randomized trial in type 1 diabetic patients with nocturnal hypoglycemia reported that sensor-augmented insulin pump therapy with the threshold suspend feature reduced nocturnal hypoglycemia, without increasing glycated hemoglobin values (5). Overall, intensive management through pump therapy/continuous glucose monitoring and active patient/family participation should be strongly encouraged (6–8). For selected individuals who have mastered carbohydrate counting, education on the impact of protein and fat on glycemic excursions can be incorporated into diabetes management (9).
Research questions

- What effect does dietary fat and protein have on acute postprandial BGs in T1DM?
- What prandial insulin dosing strategies work best for fat and protein in T1DM?
- What are the clinical implications for this?
The evidence

Clinical Care/Education/Nutrition/Psychosocial Research

Dietary Fat Acutely Increases Glucose Concentrations and Insulin Requirements in Patients With Type 1 Diabetes

Implications for carbohydrate-based bolus dose calculation and intensive diabetes management

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patients with type 1 and type 2 diabetes have shown that dietary fat delays gastric emptying, leading to a bolus of glucose.

Test the hypothesis that high fat meals would require more insulin coverage than low fat meals with identical carbohydrate content regulated the macronutrient intake of adults with Type 1 Diabetes undergoing closed loop glucose control.
Wolpert et al (2014)

Closed Loop Control

Glucose (mg/dL)

**** p < 0.0001
Both Dietary Protein and Fat Increase Postprandial Glucose Excursions in Children With Type 1 Diabetes, and the Effect Is Additive

Four test breakfasts with identical carbohydrate content but varying fat and protein quantities.

- High fat/high protein
- High fat/low protein
- Low fat/low protein
Pizza meal in children with T1D

- **Dose:** Carb-based
- **Bolus:** Normal

- **Dose:** n CU (10g Carb) X ICR + n fat-protein X ICR
- **Bolus:** Dual, extended to 6 hr

**Hypoglycemia (< 50 mg/dL):**
2 of 12 subjects who received fat-protein bolus
Why does this happen?

- Delayed digestion and absorption of carbohydrates
- Fat amplifies BG response by:
  - Increased acute insulin resistance post-meal
  - Increased liver glucose production
- Protein effect, proposed mechanisms:
  - Protein conversion to glucose
  - Stimulated glucagon secretion by different amino acids
Impact of Fat, Protein, and Glycemic Index on Postprandial Glucose Control in Type 1 Diabetes: Implications for Intensive Diabetes Management in the Continuous Glucose Monitoring Era

Diabetes Care 2015;38:1008–1015 | DOI: 10.2337/dc15-0100
Dose adjustment considerations for high fat meals > 40g fat:

**Pumps:**
- increase total insulin dose (start 30-35%)
- combination bolus, 50:50% split over 2-2.5 hours

Review late postprandial glucoses: adjust total insulin as indicated

Review early postprandial glucoses: adjust split as indicated

**MDI:**
- 30-35% pre-prandial dose as additional insulin 1 hour post-meal
- OR
- Pre-prandial injection of regular +/- analogue insulin
Dose adjustment considerations for high protein meals:

< 75g protein alone: don’t need an adjustment
> 75g protein consumed alone

OR

at least 40g protein with at least 30g carbohydrate: increase total insulin dose by 15-20%
Insulin dosing (based on CSII)

- Threshold dose responses at: 25g protein and 20g fat
- Use split dose/dual wave (60:40 split)
- Increase insulin dose by 10%
- Continue increasing insulin in 5-10% increments. Up to 40%
- Extend the dual wave over 3 hours
What does this mean for DAFNE?
Carb free meals
Take home messages

- Optimise carbohydrate counting first
- Then optimise insulin to carbohydrate ratio
- Consider other factors i.e. alcohol, exercise, antecedent hypoglycaemia
- Consider fat and protein counting for BGs raised 3 to 5 hours postprandially
- Start with the largest meal/evening meal
- Start counting at levels of 25g protein or 20g fat
- Recommend individuals keep a list of these high protein/high fat foods and meals
- Approximately 5g protein alone = 1g carbohydrate alone
- Strategies: addition of protein to meals/snacks to dampen early postprandial phase BG peak or prevent overnight hypoglycaemia
- Carb free versus skipping a meal for basal insulin checks