Management of type 1 diabetes

More research is needed into exercise and blood glucose control

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Diabetes UK (or BDA, as it was then) holidays for children with diabetes were more or less mandatory for those of us who were fortunate enough to be one of Tattersall's boys ('trainees') in Nottingham in the late 80s and early 90s. Here you got to see diabetes for real. You lived with it for 2 weeks. Morning and evening, the children with diabetes lined up to see the camp doctor with their latest blood glucose reading. Their diary recorded your hapless attempts to do in a fortnight what their parents and paediatricians had failed to do since diagnosis.

All activities were treated similarly; whether it was swimming for half an hour (well, splashing), rounders for 45 seconds (the time it takes to run to the fourth base) or sports day, our management consisted of reducing insulin (a bit) and ordering the consumption of a mini mars bar.

I never did work out why some appeared at teatime, thirsty and ketotic while others keeled over as you pricked their finger and confirmed what they already knew: their blood sugar was unrecordable.

The papers summarised alongside and below don't give all the answers, but the message is that diabetes and exercise is a complex issue. While jogging may deserve a mini-mars bar, high intensity short bursts may actually put your sugar up. And then there are the delayed effects of sport to deal with!

More research into the area of physical activity and glycaemic control is welcome. Our task as clinicians is to turn the science into practical advice for people with type 1 diabetes.

JOURNAL OF CLINICAL ENDOCRINOLOGY & METABOLISM

Exercise may cause nocturnal hypoglycaemia

Readability	✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 This small study was conducted to see how the amount of glucose needed to stop a fall in blood sugar due to exercise changes over time in a group of adolescents with type 1 diabetes.

2 The authors recruited 9 adolescents with type 1 diabetes (5 males) aged 16 ± 1.8 years with a diabetes duration of 8.2 ± 4.1 years and a mean HbA_{1c} of 7.8 ± 0.8%.

3 The VO_2 peak and lactate threshold of each individual were determined and they were then required to return for an exercise session and a control study which were 4 weeks apart. The sessions could only be attended if there had been no episodes of hypoglycaemia in the previous 48 hours and no exercise had been done for the previous 24 hours. No intermediate or long-acting insulin was administered on the day of the study.

4 The exercise session involved stationary cycling for 45 minutes at 95% of the lactate threshold. The control session involved sitting on the bike without pedalling. During the study, blood samples were taken every 15 minutes for glucose assays to adjust infusion rates.

5 Glucose infusion rates to maintain stable levels were elevated during and shortly after exercise compared with the rest study, and again from 7–11 hours following exercise.

6 The authors conclude that afternoon exercise could be a risk factor for nocturnal hypoglycaemia.

McMahon SK, Ferreira LD, Ratnam N et al (2007) Glucose requirements to maintain euglycemia after moderate-intensity afternoon exercise in adolescents with type 1 diabetes are increased in a biphasic manner. *Journal of Clinical Endocrinology & Metabolism* **92**: 963–8

AMERICAN JOURNAL OF PHYSIOLOGY - ENDOCRINOLOGY AND METABOLISM

Glucose utilisation decreases following intense exercise

Readability	✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 This study was undertaken to look at glucose production and utilisation in people with type 1 diabetes following continuous moderate exercise (MOD) or intermittent high-intensity exercise (IHE).

2 Nine individuals with type 1 diabetes (5 males) and a mean age of 22.6±5.7 years were enrolled in the study. They were randomised to 30 minutes of either MOD or IHE. Both involved continuous cycling at 40% VO_2 peak, but those doing IHE performed a 4-second sprint every 2 minutes. Blood glucose levels were measured every 5 minutes during exercise.

3 The authors found that during IHE, glucose production increased earlier and to a greater extent compared with MOD. During early recovery from IHE, glucose utilisation declined rapidly, whereas it remained elevated after MOD.

4 The above findings were consistent with a lower glucose infusion rate during early recovery (5 minutes) after IHE compared with MOD ($P<0.049$).

5 The study results suggest that the lesser decline in glycaemia with IHE may be attributed to higher glucose production during exercise and reduced glucose utilisation during exercise and early recovery.

Guelfi KJ, Ratnam N, Smythe GA et al (2006) Effect of intermittent high-intensity compared with continuous moderate exercise on glucose production and utilization in individuals with type 1 diabetes. *American Journal of Physiology. Endocrinology and Metabolism* **292**: E865–70

'Age-dependent endocrine changes will affect the insulin needs of those using CSII.'

DIABETES CARE

Age-dependent endocrine changes affect distribution of insulin need in CSII

Readability	✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 The authors of this study attempt to classify basal insulin infusion-rate regimens and compare these with underlying clinical characteristics of the individuals involved.

2 The primary data source for this analysis was the German/Austrian diabetes data acquisition system for prospective surveillance database (DPV) for quality control and scientific surveys in paediatric diabetology, which identified 1248 individuals with type 1 diabetes using pump therapy (CSII).

3 The most recent basal insulin infusion rates (September 2004) were analysed. These were expressed relative to mean basal insulin infusion rates in 24 hours.

4 The authors found that seven different basal insulin infusion rate patterns occurred.

5 A dawn-dusk pattern was used in 708 people, with the peak basal insulin infusion rate at 5 am. Additional patterns showed only one basal insulin infusion rate oscillation per 24 hours, with a backshift of peak basal insulin infusion rates in younger children ($P<0.000001$).

6 The authors conclude that age-dependent endocrine changes will affect the insulin needs of those using CSII. They feel that this should be thought about when considering insulin infusion rate strategies in children and adolescents with type 1 diabetes.

Holterhus PM, Odendahl R, Oesingmann S et al (2007) Classification of distinct baseline insulin infusion patterns in children and adolescents with type 1 diabetes on continuous subcutaneous insulin infusion therapy. *Diabetes Care* **30**: 568–73

'Inhaled insulin may increase the acceptance of insulin therapy in adults with type 1 diabetes.'

XENOTRANSPLANTATION

Porcine islets have potential for humans

Readability	✓✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓✓

1 This case study looks at the long-term viability and function of transplanted encapsulated neonatal porcine islets.

2 A Caucasian male with type 1 diabetes of 18 years' duration was given an intraperitoneal transplant of alginate-encapsulated porcine islets at the dose of 15000 islet equivalents (IEQs)/kg bodyweight (total dose 1305000 IEQs) via laparoscopy.

3 Twelve weeks following the transplant, his insulin dose had been reduced by 30% ($P=0.0001$).

4 His insulin dose returned to pre-transplant levels after 43 weeks. However, glycaemic control continued to improve and no sign of porcine viral or retroviral infection was seen.

5 The authors conclude that this form of transplant could have sustained benefits for humans with type 1 diabetes.

Elliott RB, Escobar L, Tan PL et al (2007) Live encapsulated porcine islets from a type 1 diabetic patient 9.5 yr after xenotransplantation. *Xenotransplantation* **14**: 157–61

DIABETES CARE

BFST-D intervention helps reduce HbA_{1c}

Readability	✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓

1 The authors of this study evaluate a revised intervention of the Behavioural Family Systems Therapy for diabetes (BFST-D) for improving parent–adolescent relationships, thus reducing family conflict and helping concordance.

2 The study involved 104 families who had an adolescent with poorly controlled type 1 diabetes. They were randomised to standard care (SC) or 12 sessions of either family educational support (ES) or BFST-D over 6 months. There were follow-up sessions at 12 and 18 months from baseline.

3 The authors found that BFST-D was significantly better than both SC and ES in effects on HbA_{1C}, while the effects on treatment adherence and family conflict were similar.

4 The authors conclude that the results support the usefulness of BFST-D in improving HbA_{1c} in adolescents with inadequately controlled type 1 diabetes.

Wysocki T, Harris MA, Buckloh LM et al (2007) Randomized trial of behavioral family systems therapy for diabetes: maintenance of effects on diabetes outcomes in adolescents. *Diabetes Care* **30**: 555–60

DIABETES CARE

Inhaled insulin is safe in the long term

Readability	✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓

1 This study was undertaken to look at the safety and efficacy of inhaled insulin in the long term (2 years).

2 There were 580 participants who were randomised to either inhaled insulin or subcutaneous insulin (SC; 290 people per group) plus basal insulin.

3 The primary end point was the annual rate of decline in pulmonary function (forced expiratory volume in 1 second [FEV_1]).

4 The authors found that there was a significant difference in FEV_1 between the treatment groups in favour of SC, which developed within the first 3 months and did not progress thereafter. There was also a higher incidence of cough in the inhaled insulin group.

5 Glycaemic control was sustained in both groups with a significantly higher incidence of severe hypoglycaemia in the SC group. Weight gain was significantly less in the inhaled insulin group.

6 The authors conclude that inhaled insulin may increase the acceptance of insulin therapy in adults with type 1 diabetes.

Skyler JS, Jovanovic L, Klioze S et al (2007) Two-year safety and efficacy of inhaled human insulin (Exubera) in adult patients with type 1 diabetes. *Diabetes Care* **30**: 579–85