

Type 1 Diabetes Mellitus and Sports Participation

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Athletes with type 1 diabetes mellitus (insulin dependent diabetes) have special needs that must be met for success and safety in their chosen sports. They are different from other athletes because they are unable to produce their own insulin and are dependent on an external source (self-injection) of insulin to maintain glucose utilization by muscles and other insulin sensitive tissues. *Insulin acts by increasing glucose uptake by muscle cells. This glucose can be converted into energy for immediate needs or stored as glycogen for later energy use.*

It is essential that athletes with type 1 diabetes match their insulin dose with the amount of carbohydrate food (starches, fruits and sugar snacks) consumed and with their energy requirement during exercise and competition. This is no simple task. If the athlete with type 1 diabetes doesn't take enough insulin, his or her muscle cells will be unable to obtain sufficient glucose for efficient energy use during exercise and the



glucose concentration in the blood may rise to a high level (> 200 mg/dl). If the athlete with type 1 diabetes mellitus completely omits insulin treatment, his or her blood glucose concentration may rise to a dangerous level (>400 mg/dl). In such cases the body uses fat for fuel, generating large amounts of ketones. In this condition, called ketoacidosis, the high blood glucose leads to dehydration and the large amount of keto-acids in the blood interferes with the normal function of muscles, including the heart, and also impairs brain function. In contrast, if the athlete with type 1 diabetes takes too much insulin relative to carbohydrate consumption during exercise, dropping the blood glucose concentration below normal (<70 mg/dl), his or her brain is deprived of the minimal concentration of blood glucose for maintaining normal function, including surveillance of the space around the athlete, judgment and consciousness.

The benefits of sports participation for any athlete, including a person with type 1 diabetes, must be balanced against the risks of that participation. Given the inherent complexity of managing diabetes well for safe sports participation, coaches and athletic trainers may logically question whether the benefits of sports participation outweigh the risks for the athlete with type 1 diabetes. There is plenty of experience with athletes with type 1 diabetes to know that the vast majority of them have enjoyed success and have been safe in sports participation, despite the challenge of managing their diabetes control. In addition the generic benefits of sports participation for the athlete with type 1 diabetes are identical to those of any other athlete: peer relationships developed and enhanced by shared experiences, enhanced self-esteem and confidence from mastery of a skill, and learning about teamwork, character and courage. To insure that athletes with type 1 diabetes mellitus can realize all the benefits of sports participation and enjoy success with

safety, coaches and athletic trainers must have an adequate knowledge of the diabetic athlete's needs as well as the resources and a plan in place to support those needs.

The key elements of a plan for coaches and athletic trainers to prepare an athlete with type 1 diabetes for sports participation are:

1. Identify which of their athletes have insulin dependent diabetes mellitus. There have been reported instances where coaches and trainers didn't know athletes had diabetes until emergencies occurred. The lack of this knowledge usually resulted in delayed responses to the diabetic emergencies. As type 2 diabetes is increasing in the population, the occurrence of this type of diabetes, in which insulin is still produced, is also presenting in adolescents in greater numbers. Whereas young persons with type 2 diabetes are rarely on insulin, it is still important to know if any athletes have type 2 diabetes because they too may have difficulty with their diabetes control limiting their athletic performance. They are less likely to experience diabetic emergencies.



2. Require that the athlete with diabetes mellitus undergo a thorough physical assessment before the season by a licensed and appropriate health care provider, preferably a professional involved in the care of the diabetes, and gain approval for participation in the chosen sport. For example a diabetic with proliferative retinopathy (severe diabetic eye disease) would be precluded from contact sports lest he or she suffer a hemorrhage within the eye, resulting in vision loss. Also health care providers can use the hgbA1c test – a measure of the average glucose level and the patient's self-monitoring records to determine if the athlete has satisfactory diabetes control for sports participation. Diabetics with fluctuating blood glucose levels may need to make changes in their treatment to optimize glucose levels before their health care providers will approve their participation.

3. In order for the athlete to take the appropriate measures to prevent hyperglycemia (high blood glucose) or hypoglycemia (low blood glucose), the coaches or athletic trainers need to inform the athlete beforehand of when practices or competitions will take place, how many hours the athlete will be engaged, and what kinds of activities will be endured.

4. Athletic trainers and /or coaches should confirm that there are provisions for administering extra carbohydrate to treat low blood glucose if the sources of carbohydrate planned and taken by the athlete before and during practice or competition are insufficient. The best treatment for low blood glucose is a liquid with real sugar such as juice or soda pop (not diet soda). Usually a 6 - 8 oz. serving is sufficient to correct a low blood sugar.

5. Some diabetic athletes will have delayed hypoglycemia, a severe low blood glucose occurring many hours later. Such episodes of hypoglycemia can be prevented by having the diabetic athlete take a carbohydrate snack immediately after the workout, such as 4 to 6 graham crackers and 8 oz. of milk or a peanut butter and jelly sandwich.

6. Ideally coaches and athletic trainers should have an adequate knowledge of how diabetic emergencies present during sports participation. Severe hyperglycemia will usually present with symptoms of thirst, urine frequency, weakness and signs of dehydration. Hypoglycemia commonly presents with tremors, confusion and loss of judgment. If the coach or athletic trainer observes that the athlete with diabetes isn't performing at an expected level and suspects either hyperglycemia or hypoglycemia as the cause, then the athlete should be withdrawn from participation immediately and be attended to by the trainer or designated medical attendant. Under no circumstances should the athlete with type 1 diabetes mellitus be directed to play through high or low blood glucose symptoms. The athlete's condition will only worsen, leading to further impairment of performance and in the worst case, loss of consciousness. If the athlete has repetitive occurrences of significant hyperglycemia or hypoglycemia interfering with his or her performance, then the parents or legal guardians should be informed and further medical consultation can be requested by the school health authorities as a requisite for continued sports participation by the athlete.



7. Coaches should designate who has the responsibility for assisting the athlete with severe hypoglycemia (when the glucose level is low enough to impair the athlete's ability to take a glucose drink on their own) and whether that person has the resources needed, such as a portable blood glucose kit for checking the blood glucose level, sugar beverages and a glucagon emergency kit (an injection to raise the blood glucose) and the appropriate training for treating such a diabetic emergency. The athlete with diabetes mellitus and his or her parents or legal guardian should provide the prescribed blood glucose monitor and glucagon kit to the athletic trainer with instructions for emergency use before the first practice of the season.

8. Request that diabetic athletes provide duplicate vials of their insulins and other diabetic supplies to the athletic trainer for all overnight trips in case their luggage should be misplaced or stolen. Parents or legal guardians could bring these duplicates if accompanying the athletes on overnight trips.

In addition to the implementation of these plans, coaches and athletic trainers should also be willing to accommodate the diabetic athlete's occasional need to do things differently from other athletes and simultaneously support the athlete's efforts to participate. With this flexibility and support the diabetic athlete will be less likely to hide his or her illness and symptoms from coaches, trainers and teammates and will have a better opportunity for success.