



## What Are the Safety Considerations for Insulin Control for Athletes?

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### Abstract

Athletes diagnosed with diabetes may have difficulty with fluctuating blood sugar levels during intense exercise. Considerations for athletes with insulin concerns may range from exercise rehabilitation to the use of an automatic insulin pump. The automatic insulin pump is a small battery-operated device the size of a pager. The pump continuously delivers small doses of insulin to the body. It can be conveniently clipped to a belt, waistband, or carried in a pocket. Many athletes have used this machine to assist with insulin control. Medical people believe that those who use the insulin pump will experience improved insulin control. Insulin pumps should be padded during rough physical activity, such as football, because a needle is inserted in the side of their abdomen. The insulin pump regulates blood sugar before and after practice to ensure appropriate insulin levels. Checking insulin levels, while participating in physical activities, is a requirement to prevent further insulin related injuries.

**Keywords:** Athletes, Athletic trainers, Automatic insulin pump, Coaches, Diabetes, Sports

### 1. Automatic Insulin Pump

The automatic insulin pump has many features and positive aspects that may benefit diabetics (*Figure 1*). Some of the conditions where insulin pumps should be used:

Recurrent severe hypoglycemia.

Suboptimal diabetes control (i.e., A1C exceeds target range for age).

Micro-vascular complications and/or risk factors for macrovascular complications.

Good metabolic control, but insulin regimen that compromises lifestyle.

Who would benefit from insulin pump use?

Young children and especially infants and neonates.

Adolescents with eating disorders.

Children and adolescents with a pronounced dawn phenomenon. A condition some people with insulin-dependent diabetes experience resulting in a significant rise in their early morning blood glucose values (around 5:00 am), possibly requiring additional insulin to control.

Children with needle phobia.

Pregnant adolescents, ideally before conception.

Ketosis-prone individuals.

Competitive athletes.

Szypowska conducted a study that analyzed the changes in basal insulin requirement in preschoolers treated with the insulin pump during the start of their Type 1 Diabetes. All participants were put on the pump within two months of Diabetes onset. All were treated for at least one year and continued to be analyzed during a post-screening. During this study, the data of 58 children were analyzed. "Data was collected every six months with total daily insulin dosage and basal insulin" (Szypowska, 2009). The data produced in this study was beneficial. Daily records were kept and numbers indicated increases or decreases in insulin dosage and basal insulin, as related to insulin needs. Statistics demonstrated the subjects' range of insulin fluctuations. For those with insulin problems, it is important to track daily physical activity along with insulin uptake. According to Szypowska, "exercise has been reported as key to lowering insulin needs" (Szypowska, 2009). The results of Szypowska's study found that basal insulin rose 10% in the third month and did not exceed 30% after twelve months. In the third month, 46% of the older children ( $3.7 \pm 1.4$  vs.  $2.8 \pm 1.4$  years;  $p = 0.01$ ) were without basal insulin. Szypowska's study provided critical information that was beneficial to students with diabetes. Using an insulin pump at an early age is a major advantage for the athlete or student. Becoming familiar with insulin dosages and exercising with the pump is crucial to students who participate in sports. By the time student athletes participate in junior high athletic teams, such as football, basketball, baseball, and softball, taking care of insulin levels will be easier to manage.

Currently, the diabetic insulin pump is not only used by non-athletes, but also by professional athletes in a variety of sports. In the New York Times article written by Bill Finley, Finley discussed how a belt pump helped a professional baseball pitcher with diabetes. "When Detroit Tigers pitcher Jason Johnson starts tonight against the Yankees, he will have to worry about a potent lineup and a game plan to beat the team with the best record in baseball. But Johnson, a tall and slender right-hander, will no doubt have less on his mind than in past appearances at Yankee Stadium. A diabetic, he will no longer have to prick his finger several times a game to check his blood sugar or worry that a lack of insulin is causing him to tire" (Finley, 2004). Dealing with the stress of the game, the last thing Johnson wanted to do was worry about his diabetes. While using the insulin pump, there is a monitor who controls glucose and insulin in one's body. "Many athletes today find benefits in the use of the insulin pump" (Finley, 2004).

According to the article Sports and Diabetes, "Whether you are starting a new sport or you are new to insulin injections or the pump, always discuss sports participation with your health care team first. The excitement of a big competitive event can stimulate the release of stress hormones, which in turn will raise your blood glucose levels" (Zielke, 2007, pages 37-38). Talking with an Athletic Trainer or health care professional before going on the pump is important because the pump may not be for everyone. Some frequently asked questions about the pump include:

Should I take it off for games?

Will I have more low blood sugars?

Do I have to adjust my basal rate?

When participating in contact sports, such as football, basketball, or hockey, it is vital to protect the pump with an extra pad or sport pack (*Figure, 2*). A direct blow to a pump that is not padded produces a high chance that the pump may break. By padding the pump, the pump and athlete may be at a lower risk of further injuries. "If the pump is damaged, most companies will ship another pump to you overnight if still under warranty" (Zielke, 2007, pages 37-38). When pumps are utilized in contact sports many recommend that the athlete has a backup pump. "If you choose to disconnect your pump just before your activity, remember the insulin that's still active in your system is rapid acting and won't last long. Some athletes reconnect between periods and give themselves a supplemental bonus. For example, an athlete keeping his or her pump off for 1 hour who uses 0.8 units of basal insulin an hour may need to replace 0.4 units or 50 percent after the activity. Why replace only half of the dose? Exercise can lower your blood glucose levels, so you might need only half as much" (Zielke, 2007, pages 37-38). Most athletes produce lower blood glucose when exercising, but there are some athletes who produce higher levels of blood glucose. The automatic pump is an excellent decision for those involved in athletics and daily exercise. "It helps manage your glucose levels during your entire workout and provides a sense of security which will enhance your workout" (Zielke, 2007).

## **2. Athletic Trainers Perspective**

Before an athlete participates in a sport, a physical is required for overall health assessment and physician's approval. If the athlete has diabetes, the physician will review symptoms of low blood sugar and facts with the patient. The student's Athletic Trainer will be notified about the situation and will be ready for any emergency. According to Jimenez (2007), a member of the National Athletic Trainers Association, "Athletic Trainers deal with Type One Diabetes constantly" (Jimenez, 2007). "In managing diabetes, the most important goal is to keep blood glucose levels at or as close to normal levels as possible without causing hypoglycemia" (Jimenez, 2007). If insulin levels fluctuate it is important to normalize insulin levels immediately. The athlete should check levels before and after meals. "This goal requires the maintenance of a delicate balance among hypoglycemia, euglycemia, and hyperglycemia, which is often more challenging in the athlete due to the demands of physical activity and competition" (Jimenez, 2007). Maintaining blood

sugar levels before and after physical activity would be beneficial. Athletes must constantly test and regulate their blood sugar levels on a daily basis. If insulin levels do not return to normal, a physician must be seen as soon as possible. Some of the items kept on hand during practices and games to treat low blood sugar levels are glucose tablets and PowerAde. Athletic Trainers need to be aware of the symptoms of insulin fluctuation, to prevent further damage to their body. For example: if an athlete passes out while running on a basketball court, they could injure themselves and miss participation for part of the season. Athletic Trainers will be present during games and practices in a college or professional setting and will be aware of diabetic symptoms and blood sugar fluctuations (Jimenez, 2007).

### 3. Coaches' Perspective

In a high school setting, Athletic Trainers may not always be at practices. When this happens coaches are responsible to be prepared and have a plan of action. Sometimes all the diabetic athlete needs is a rest. It is important for the coach and Athletic Trainer to know how much rest time the diabetic student athletes requires before reentering participation. Allowing student athletes with medical conditions to participate in game or practice too soon may cause further damage and make it difficult to bring insulin levels back to normal. Student athletes should assess levels of blood sugar during timeouts or breaks. This process will facilitate the regulation of glucose. Coaches are required to pass a Prevention & Care of Athletic Injuries course which provides diabetic information. After participation in the above course the coach will be better prepared to assist the diabetic athlete (Mannie, 2007).

### 4. Summary

Athletes with diabetes are capable of competing in sports if given the proper medical assistance and supervision. The athlete who consistently manages their insulin levels will increase participation time and reduce needed rest time during games and practices. Personal management of one's insulin takes time. Investing in an automatic insulin pump would be recommended for most diabetics and athletes with diabetes. The insulin pump when used by athletes or non-athletes is a time saver. Student athletes who study and research diabetes will contribute to their knowledge of diabetes and may increase their quality of life.

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Figure 1. Insulin Pump

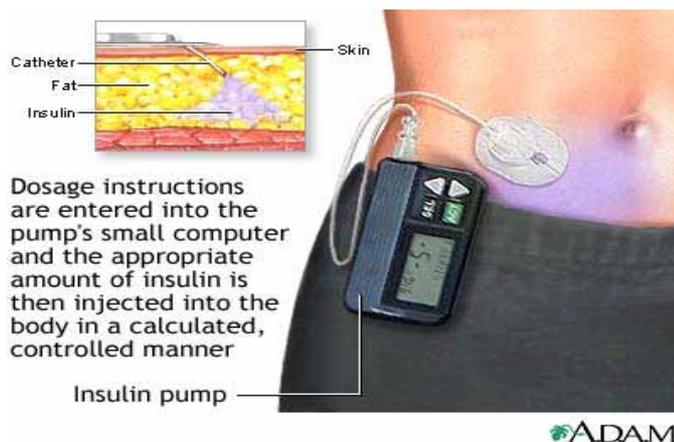


Figure 2. how the pump is worn/attached