

Introduction

Diabetes is a complex disease to manage and treat, however exercise has been proven to contribute to improved outcomes for this population. Prediabetes is a risk factor to heart disease, and according to the American College of Sports Medicine (ACSM), individuals with prediabetes are at an increased risk to develop diabetes. The fundamental goal for individuals with diabetes is glycemic control. Exercise acts like insulin and therefore can be a positive contributor to the management and control of diabetes, along with diet and in many cases, medication.

Please refer to the Diabetes Energy Pathways algorithm for information about the energy pathways for non-diabetes, Type I, and Type II diabetes.

Recommendations

Once the diagnosis has been made as to type of diabetes, and medical clearance has been established, an exercise program can be safely implemented. A medically supervised exercise test may be prudent.

Normal Blood Glucose	Fasting plasma glucose < 100 mg/dL	HbA1C < 5.7%
Prediabetes	Fasting plasma glucose 100 mg/dL to 125 mg/dL	HbA1C 5.7% - 6.4%
Diabetes Mellitus	Fasting plasma glucose ≥ 126 mg/dL	HbA1C > 6.5%

Glycosylated hemoglobin (HbA1C) is a valuable tool to use to monitor blood glucose control over time and may help with identifying the effectiveness of exercise programming.

- Vigorous intensity exercise is not recommended and increases risks for other diabetic related complications. Light to moderate intensity exercise that can be sustained is recommended.
- Heart rate and blood pressure response to exercise may be blunted in individuals with diabetes and therefore the Rate of Perceived Exertion Scale is recommended for monitoring exercise intensity.
- Silent ischemia may often go undetected in individuals with diabetes and therefore, an annual cardiovascular risk assessment should be conducted by a health care provider.

MyFitScript™

Exercise prescription for persons with diabetes should include components of aerobic conditioning, strength exercises, flexibility, and neuromuscular conditioning. It is recommended that inactivity should not exceed 2 days per week, due to the beneficial effect of exercise on blood glucose control. Adjusting carbohydrate intake and/or medications before and after exercise is recommended based on the intensity of exercise and blood glucose levels.

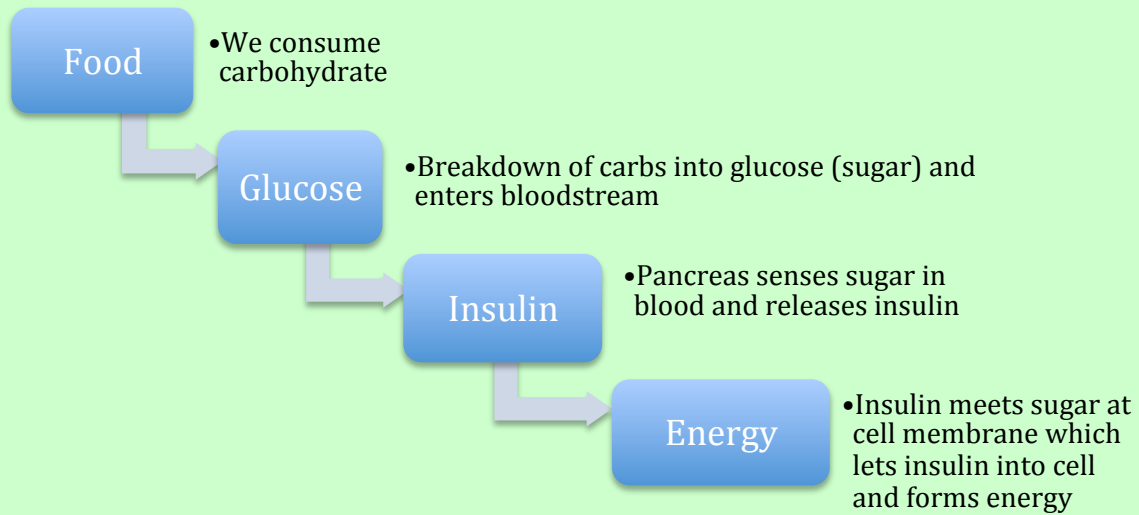
The MyFitScript™ F.I.T.E. acronym is the guideline-based prescription and stands for frequency of exercise, intensity of exercise, time or duration of exercise, and type or mode of exercise as it pertains to aerobic and strength components of the exercise program. For more information about exercise intensity and Rate of Perceived Exertion Scale visit MyFitScript website and Library tab.

References:

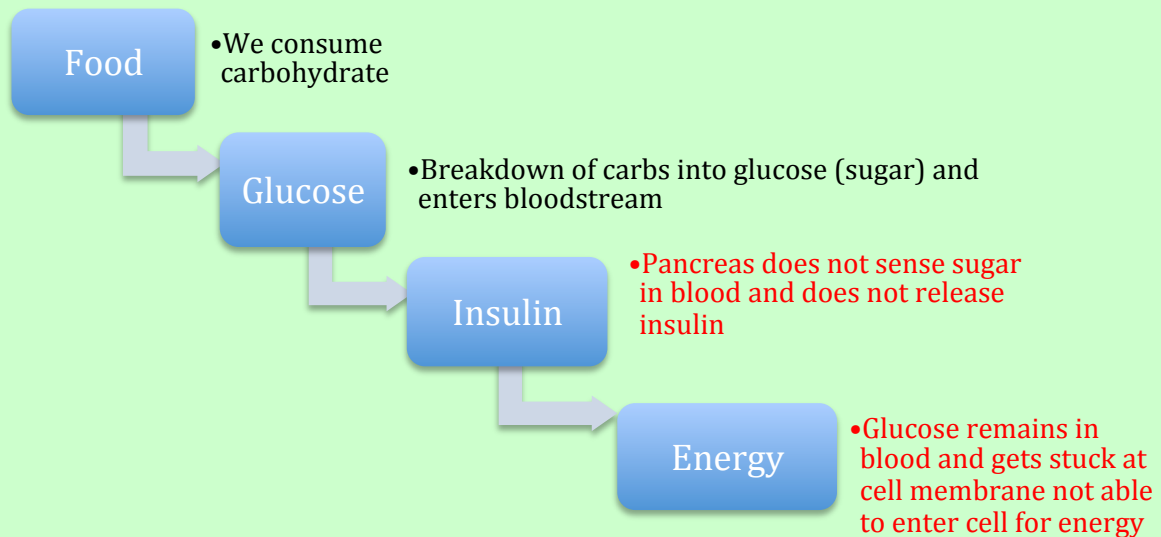
ACSM's Exercise Management for Persons with Chronic Disease and Disabilities – Third Edition, 2009

Energy Pathways for Individuals With and Without Diabetes

Individual without Diabetes



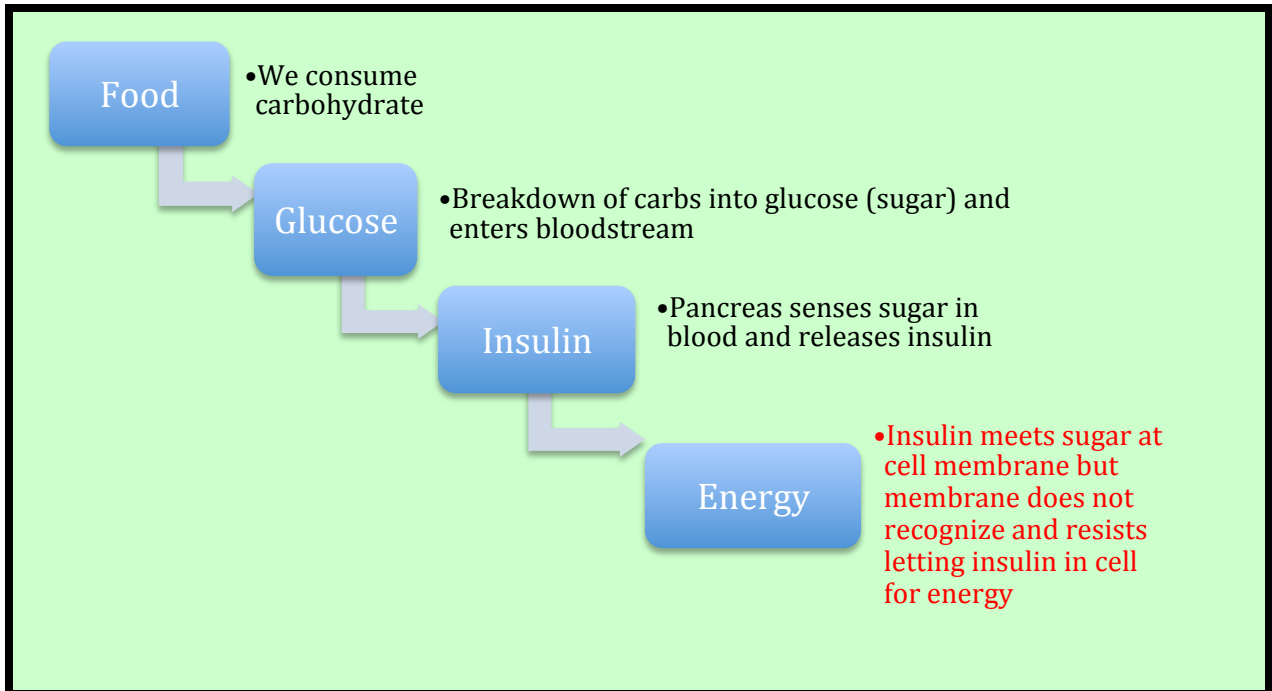
Individual With Type I Diabetes (Insulin Deficient)



In an individual without diabetes, consumption of complex carbohydrates provides the body with the needed energy for everyday living. Carbohydrate is the primary energy source for the brain.

In Type I diabetes, sugar is released into the blood however the pancreas does not recognize it and therefore does not release insulin increasing the risk for ketoacidosis. Without enough insulin, the body begins to break down fat as fuel producing a buildup of acids in the bloodstream called ketones. High levels of ketones poison the blood and can lead to serious complications. Type I diabetics will need to take insulin or medications to help move the sugar from the blood into the cells for use.

**Individual
with
Type II
Diabetes
(Insulin
Resistant)**



In Type II diabetes, sugar is released into the blood and the pancreas recognizes it and releases insulin. At the cell membrane (skeletal muscle, liver, adipose tissue) however, the insulin receptor does not recognize the insulin and therefore the insulin cannot enter the cell to produce energy. Sometimes the pancreas does not make enough insulin.

A Word About Exercise and Diabetes

Being overweight or obese can cause insulin resistance, especially if the extra weight is around the abdominal area, referred to as central obesity. The fundamental goal for individuals with diabetes is glucose control using exercise, diet, and in many instances, medication.

For those individuals with Type II diabetes and using insulin, regular exercise may reduce insulin requirements by enhanced sensitivity to insulin increasing cellular uptake of glucose from the blood. Therefore, exercise acts like insulin. In Type I diabetes, enhanced insulin sensitivity has little impact on pancreatic function however exercise may lower requirements for exogenous insulin.

A Word About Precautions

Hypoglycemia (<70 mg/dL) can be a serious problem for individuals with diabetes who take insulin and exercise. A rapid drop in blood glucose may occur with exercise, and may be delayed for up to 12 hours post-exercise. Therefore, exercise close to bedtime is not advised, and regular monitoring of blood glucose before, during, and after exercise is recommended.

Sugar remaining in the blood can cause serious damage to blood vessels and organs and may ultimately lead to cardiovascular disease, stroke, or eventually death.