

# Insulin Resistance

## Introduction

- Problems in one's diet are very common in today's society. Obesity has become a major issue. Fast food chains pop up on every corner. Grocery stores have brightly colored boxes of preserved foods lining every shelf. Due to this, I chose Insulin Resistance as the topic of my fact sheet. I decided to pick this topic because my paternal grandmother, my uncle, and my close friend all have diabetes. I also chose it because insulin resistance is something that can be inherited but in many cases it is developed from factors one has complete control over.

Among the three people I know with the disease, the two types of diabetes are covered. Throughout the past year and a half I have learned a lot about the different things affecting insulin resistance in the body as well as how to treat the side effects of the disease. Overall, I think that having a further understanding of this topic that is currently affecting people I care about as well as being something that is vital to today's society is something that can be very necessary. With this newfound knowledge, I can not only help myself but those in my life.

## Section 1: Background and Problem Statement

- **Web site #1 Name:**  
Healthy People 2010 "5"
- **Web address:**  
<http://www.healthypeople.gov/Document/HTML/Volume1/05Diabetes.htm>
- **Background Information:**

Healthy People 2010, or HP2010, is a Web site devoted to two goals. The first of these is to increase the quality and years of healthy life followed closely with the goal to

eliminate health disparities. In the case of insulin resistance, HP 2010: 5 goes into the disease of Diabetes. This section has a specific goal of “Through prevention programs, reduce the disease and economic burden of diabetes, and improve the quality of life for all persons who have or are at risk for diabetes” (1). Diabetes is simply put, when the body builds up a resistance to insulin. Demographics and trends are explained as well as disparities and related issues to this health problem. The definition that the terminology section of HP 2010: 5 gives is that diabetes is “a chronic disease due to either or both insulin deficiency and resistance to insulin action, and associated with hyperglycemia (elevated blood glucose levels). Over time, without proper treatment, organ complications related to diabetes develop, including heart, nerve, foot, eye, and kidney damage; problems with pregnancy also occur. Diabetes is classified into four major categories: type 1 diabetes, type 2 diabetes, gestational diabetes mellitus (GDM), and all other types. Along with all of this information, there is an outline of related objectives. These range from access to quality health care, chronic kidney disease, family planning, heart disease and stroke, immunization and infectious diseases, maternal, infant and child health, nutrition and overweight, and physical activity and fitness.

- **Web site #2 Name:** Center for Health and Healing
- **Web address:**  
[http://www.centerforhealthandhealing.org/Insulin\\_Resistance/index.htm](http://www.centerforhealthandhealing.org/Insulin_Resistance/index.htm)
- **Background Information:**

This source clearly gives insight into the causes and symptoms of insulin resistant individuals. The simple reason for a person to have insulin resistance has to do with the amount of insulin receptors in their cells. A normal cell can have somewhere around 20,000 receptors that allow insulin and glucose to enter the cell. An insulin resistant cell

has around 5,000 receptors. This drastically changes the intake of insulin, therefore leaving much more insulin and glucose in the blood stream. This leads to rapid weight gain in the insulin resistant person. These symptoms and closely related causes are very important to this disease.

- **Web site #3 Name:** Medline Plus
- **Web address:**  
<http://www.nlm.nih.gov/medlineplus/ency/article/001214.htm>
- **Background Information:**

This source gives a clear description of how to treat diabetes. It clearly states in the causes section that diabetes “can be caused by too little insulin, resistance to insulin, or both” (1). In the treatment section however, the three goals of prolonging life, reducing symptoms, and preventing complications are accomplished through skills. This site teaches how to recognize high and low blood sugar levels, what to eat, and how to test different aspects of life that affect diabetes. It even goes into details about what happens when treatment is neglected or fails. There are possible complications listed, as well as issues that warrant calling a medical professional.

## **Section 2: Research**

- **Web site #1 Name:** Cedars-Sinai Medical Center News
- **Web address:**  
<http://www.csmc.edu/pdf/MedicalGenetics-3-ADA2005.pdf>
- **Summary of the research:**

This research relates to statistics that will follow in this fact sheet. The title of the news article is “Researchers Find that Variations in Four Inflammatory Genes May Predispose Mexican Americans to Insulin Resistance, a Precursor of Diabetes.” The

research goes on to explain that certain pathway genes are direct links to insulin resistance. This scholarly research about the inflammation that triggers insulin resistance was done in 2005 but it is still very relevant today. The director of research, Dr. Jerome I. Rotter can be quoted as saying “Because insulin resistance and heart disease are so common in the Mexican American population and we know that chronic low-grade inflammation is associated with these diseases, our group wanted to investigate whether specific inflammatory genes might be involved” (2). The reason I find this to be particularly interesting in relation to my topic is simply because it gives specifics to a demographic. This research shows that certain things common in Mexican American people make them to be more prone to inflammation. Overall, the research by the Cedars-Sinai Medical Center is very different in its way of thought.

- **Web site #2 Name:** The Journal of Biological Chemistry
- **Web address:**  
<http://www.jbc.org/content/277/29/25863.full.pdf+html>
- **Summary of the research:**

This particular research is entitled “Disruption of Adiponectin Causes Insulin Resistance and Neointimal Formation.” This study used mice to test their theory. I find that interesting in itself simply because using mice to find out things on humans has always been fascinating in my opinion. The fact that an animal so far from humans in similarity is able to tell science so much is incredibly amazing. The results of this research were that adiponectin-deficient mice showed insulin resistance. The hypothesis was proved true by mutating the mice genes to be adiponectin-deficient.

- **Web site #3 Name:** The Endocrine Society

- **Web address:**  
<http://rphr.endojournals.org/cgi/content/56/1/265>
- **Summary of the research:**

This research is titled “Insulin Resistance and Its Treatment by Thiazolidinediones.” This 30-page pdf file of the experiment is lengthy and intricate. There are charts with words I don’t understand even after attempts to define them. But, a brief summary of the research is simply that “treatment of insulin resistance with the Thiazolidinediones improves insulin action, lowers plasma insulin levels, and ameliorates many of the components of the insulin resistance syndrome.”(290). I find this to be interesting because it is a biochemical pathway responsible for mediating this disease. Although the research is fairly old, being done in 2001, I still can see its relevance in treatment.

### **Section 3: Statistics**

- **Web site #1 Name:**  
Healthy People 2010 “5”
- **Web address:**  
<http://www.healthypeople.gov/Document/HTML/Volume1/05Diabetes.htm>
- **Summary of the statistics:**

In the trends section of this issue, there are many demographics and statistics of whom diabetes affects. The objectives covered with data tables that I find the most important are Diabetes Education, New Cases of Diabetes, Diagnosis of Diabetes and Overall Cases of Diagnoses Diabetes. In the category of Diabetes Education in specific, the goal was to have a 60% increase in the proportion of persons who receive formal diabetes education. “Diabetes patient education is viewed uniformly as effective and economical in the ultimate prevention of long-term complications from diabetes. An

individual with diabetes spends less than 1 percent of his or her time in contact with the health care system and on a daily basis must make a variety of critical decisions about diabetes” (13). In the category of people already having diabetes, 49% in females and 42% in males received diabetes education. In urban areas it was 49% while in rural areas it was only 37%. These discrepancies show where improvement must be made. The in depth trends listed in Healthy People 2010 are incredibly resourceful.

- **Web site #2 Name:** Center for Disease Control and Prevention
- **Web address:**  
<http://apps.nccd.cdc.gov/DDTSTRS/Index.aspx?stateId=9&state=Connecticut&cat=prevalence&Data=data&view=A&trend=prevalence&id=1>
- **Summary of the statistics:**

In Connecticut alone, Diabetes has been a major disease in the past ten years. From 2000 to 2008 alone the age group most affected is 65+ years old. The trends of this age group have consistently been climbing while the age groups of 18-44 and 45-64 seem to be at a plateau. During this time period the diagnosis percentage has gone way up. This does not say good things about the education and lifestyle choices of the American people.

- **Web site #3 Name:** Arteriosclerosis, Thrombosis, and Vascular Biology
- **Web address:**  
<http://atvb.ahajournals.org/cgi/content/full/25/12/2451>
- **Summary of the statistics:** These statistics are based around research entitled “Fast Food, Central Nervous System Insulin Resistance, and Obesity.” These statistics tie in directly with the causes of Insulin Resistance. The link between fast food to obesity is clear. There are now more than 24,000 fast food restaurants in the United States. Sugared beverage intake has increased dramatically in the past three decades. It has partly

replaced dairy beverage intake in those under 18. They are the second highest carbohydrate intake that this same age group consumes, following only bread. “Overall, sugared beverages currently account for 9% of total calorie intake” (para 9). The links then from obesity to CNS Insulin Resistance are complex and controversial. But, the increase in fast food consumption and the epidemic of Insulin Resistance are parallel in reference to the time period.

#### **Section 4: Consumer Information**

- **Web site #1 Name:** National Diabetes Education Program
- **Web address:**  
[http://ndep.nih.gov/media/getreal\\_tips.pdf](http://ndep.nih.gov/media/getreal_tips.pdf)
- **Summary of the information:**

This site is a pdf of an article titled “Get Real! You Don’t Have to Knock Yourself Out to Prevent Diabetes.” It shows three simple steps that can help one avoid insulin resistance, or type 2 diabetes. The three solutions are to move more, make healthy food choices, and start your game plan to prevent diabetes. Anyone can use these simple steps and they break down the major cause of the disease, obesity. These very easy to understand guidelines are common knowledge and they are easily accessible for the common person to gain awareness.

- **Web site #2 Name:** American Diabetes Association
- **Web address:**  
<http://www.diabetes.org/diabetes-basics/prevention/diabetes-risk-test/>
- **Summary of the information:**

This site provides a short test to see what risk factors one has for diabetes. I scored in risk of pre-diabetes. My BMI or body mass index and my level of physical

activity led the test to these results. These risk factors are very interesting because I was unaware that race or ethnic background was a major risk factor. Although, if you refer back to Section 2: Research, Web site #1, one can easily see that it is a factor that affects this disease dramatically.

- **Web site #3 Name:** Diabetes Prevention: 5 Tips for Taking Control
- **Web address:**  
<http://www.mayoclinic.com/health/diabetes-prevention/DA00127/NSECTIONGROUP=2>
- **Summary of the information:**

In this site, five major lifestyle “tweaks” are given that make a huge difference. They are listed as follows; 1) Get More Physical Activity, 2) Get Plenty of Fiber, 3) Go For Whole Grains, 4) Lose Extra Weight, and 5) Skip Fad Diets and Make Healthier Choices. Many interesting facts support their five tips. For example, in tip 4 the fact that “In one study, overweight adults who lost a modest amount of weight – 5 percent to 10 percent of initial body weight – and exercised regularly reduced the risk of developing diabetes by 58 percent over three years” (2).

### **Section 5: Solutions to the Problem (or Issue)**

- **Web site #1 Name:** Diabetes Genome Anatomy Project
- **Web address:**  
<http://www.diabetesgenome.org>
- **Summary of the information:**

This site is about a group of researchers. They currently are involved with eight projects that are all related to insulin resistance issues. They are addressing this problem by “unraveling the interface between insulin action, insulin resistance and the genetics of type 2 diabetes” (para 1). This is important because if this is not reached then there will

not be a valid issue to make policy change. Considering we do not know exactly the reasons for insulin resistance, although we know contributing factors or causes, laws and economic policy actions cannot be made until we have completed research about this disease. This organization is working towards a solution.

**Web site #2 Name:** HIIT Training: The Cure for Insulin Resistance, Type 2 Diabetes, Metabolic Disease and Obesity?

**Web address:**

<http://www.healthhabits.ca/2009/01/28/hiit-training-the-cure-for-insulin-resistance-type-2-diabetes-metabolic-disease-and-obesity/>

**Summary of the information:**

This site describes a certain training that can solve this disease's ailments. Although it is simply a specific training, and almost any training will help to curb this disease in many cases, this one claims a cure. They are not trying to sell anything. They simply are informing the public "The efficacy of a high intensity exercise protocol, involving only 250 kcal of work each week, to substantially improve insulin action in young sedentary subjects is remarkable" (para 1). Overall, the Web site shows that this specific type of exercise affects the insulin resistance in the body, specifically.

- **Web site #3 Name:** Financial Help for Diabetes Care
- **Web address:**  
<http://diabetes.niddk.nih.gov/dm/pubs/financialhelp/>
- **Summary of the information:**

This site tells about government funding for diabetes care. It details facts like "According to the American Diabetes Association, people with diabetes spend an average of \$11,744 a year on health care expenses—more than twice the amount spent by people without diabetes" (para 1). It gives descriptions of Medicare and Medicaid. These two programs that are under government rule help with these costs for the average American.

The site also explains Health Care in different situations. Educational options are provided like classroom services, technological assistance, and local resources. Overall, this site aims not to give a solution, per se, but to provide the tools needed for one to make better decisions to have their insulin resistance not be a crippling aspect of everyday life.

### **Conclusions**

This project helped me to learn many things I was unaware of concerning diabetes and insulin resistance. I hope that the knowledge I have gained, such as causes, treatments, prevention methods, diagnoses, demographics more commonly acquiring the disease, and how to cope with it will not only help me from developing the disease, but may help me to help those around me to also prevent this disease. Diabetes and insulin resistance in many cases can be avoided. I also hope that the new information I have will help me to understand those in my life suffering from this illness. I would like to say that after reading this fact sheet my audience would gain the same type of knowledge I've acquired about this disease.

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