



## Insulin Resistance

### What Is Insulin?

- Insulin is an important hormone produced by the beta cells in your pancreas.
- Has many actions within the body involved in the metabolism of carbohydrates, lipids, fats, and proteins.

### What Is Insulin Resistance?

- Prevents the tissues in your body, particularly muscles and fat tissues, to respond appropriately to insulin requiring more insulin to elicit the same response. This results in higher levels of insulin needed to continue to exert its physiological effects.

### Signs & Symptoms

- Abdominal Obesity
- Elevated Cholesterol Levels
- High Blood Pressure
- Fatigue
- Frequent Infections
- Tingling Sensation in Hands/Feet
- Sweet Cravings
- Increased Hunger
- Acanthosis Nigricans (Darkening of skin in the folds and creases of the body) or skin tags

### Causes

Insulin resistance has a strong association with genetics, but also can be a result of lifestyle and is often associated with the following:

- Infection or Severe Illness
- Metabolic Syndrome
- Obesity
- Pregnancy
- Steroid Use/Other Medications
- Stress

There are other medical conditions associated with insulin resistance, including:

- **Type 2 Diabetes**-Insulin resistance can occur long before diabetes develops and if left untreated, insulin resistance can present as type 2 diabetes.
- **Fatty Liver**-Caused by the accumulation of fat in the liver resulting in uncontrolled lipids due to insulin resistance damaging the liver and can possibly lead to cirrhosis and possibly liver cancer.
- **Arteriosclerosis/Atherosclerosis**-Process of thickening and hardening of the walls of medium-sized and larger arteries. Responsible for the following:
  - Coronary Artery Disease-Angina/Heart Attack
  - Peripheral Vascular Disease
  - Strokes
- **Skin Lesions**-Increased number of acanthosis nigricans (skin tags) as well as darkening and thickening of the skin especially in fold areas of the neckline and axilla (where the arm connects to your shoulder).

- **Reproductive Abnormalities in Women**-Difficulties with ovulation, conception, regularity, and cessation of menses and can result in Polycystic Ovary Syndrome (PCOS).
- **Hypergonadism**-Causes a woman's ovaries to produce high levels of male hormones such as testosterone and other hormones creating symptoms like excess body hair and weight gain.
- **Growth Abnormalities**-Creates high levels of circulating insulin affecting some mechanisms as the result of glucose metabolism impairment. Insulin's effects on growth through a mediator called insulin-like growth factor-1 (IGF-1) creating linear growth in height and coarsening of features.

#### Risk Factors for Insulin Resistance

- Obesity-Body Mass Index (BMI) more than 25
  - Waist Measurements
    - Men-More Than 40 Inches
    - Women-More Than 35 Inches
- Over the age of 40
- Ethnicity-Latino, African American, Native American, or Asian American
- History of gestational diabetes
- Close blood-related family members with type 2 diabetes, high blood pressure, or arteriosclerosis
- High blood pressure, high triglycerides, low HDL cholesterol or arteriosclerosis
- Polycystic Ovary Syndrome (PCOS)
- Acanthosis Nigrans (skin tags)

#### Diagnosing Insulin Resistance

- Provider will look at detailed patient history, physical examination, and request laboratory testing
- Test fasting glucose levels in conjunction with fasting insulin levels, Hemoglobin A1C

#### Treatment of Insulin Resistance

##### Lifestyle Changes-

Reduce sugar intake, artificial sugars, and sugar alcohols.

Reduce carbohydrate intake to decrease insulin released by your pancreas.

- Carbohydrates are absorbed into your body after they are broken down into sugar components.
- Foods high in glycemic index are absorbed faster than others increasing blood glucose more rapidly causing the secretion of more insulin to control the level of glucose in the blood.

Intermittent Fasting/Time Restricted Eating

- Allows the pancreas to rest and not release insulin.
- Start with 12 hours of fasting and a 12-hour eating window.  
Then may increase to 16 hours of fasting and 8 hour eating window.

Medications-These medications and supplements help increase the body's sensitivity to insulin.

- Semaglutide or Liraglutide - (glucagon-like peptide-1 or GLP-1)
- Metformin - (prescription medication)
- Berberine - (supplement)