How to Reverse Insulin Resistance: The Secret is Sensitive Cells

The relationship between your cells and your hormones determines, to a large extent, how healthy you are.

For example, when our cells are resistant to the effects of insulin (one of the main anabolic and energy-storage hormones in the body), we have a higher chance of developing metabolic diseases such as type 2 diabetes, obesity, and heart disease.

In contrast, insulin sensitive cells are able to efficiently and effectively respond to insulin in a way that allows us to carry out many of the vital mechanisms needed to maintain health and prevent disease.

Altogether, this biological phenomenon is known as insulin sensitivity, and it plays a significant role in fat loss, hormone balance, metabolic function, and disease prevention. When the majority of our cells aren't insulin sensitive, this can lead to a condition called insulin resistance, which significantly increases the risk of heart disease and type 2 diabetes.

Fortunately, you won't be stuck at a specific level of insulin resistance for the rest of your life. In fact, there are several strategies you can use to increase your receptivity to insulin and reverse insulin resistance – but before we implement them, let's take a closer look at insulin and insulin resistance.

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What is Insulin? The Lifesaving Effects of a Highly Misunderstood Hormone

Insulin is a protein-based hormone secreted by the pancreas in response to increases in blood sugar and certain amino acids. Insulin's primary role is to regulate the nutrients you absorb from food, primarily carbohydrates.

When you eat and digest carbs, it increases how much sugar is in your bloodstream. This is detected by the cells in your pancreas which will then secrete insulin into the blood. Once the insulin is traveling in your bloodstream, it will start binding to your cells and stimulate them to take in and utilize the sugar.

The purpose of this action is to reduce the amount of sugar in your blood and trigger the cells to use it and/or store it. This is essential for our health because abnormally high amounts of sugar in the blood can cause harm throughout the body. In some cases, having high blood sugar levels can even cause major health issues and become fatal if not managed properly.

With that being said, everything about insulin isn't "good." In fact, this (not so) superhero hormone hinders the one key metabolic process that allows us to lose fat: Fat burning.

Insulin, Carbs, Weight Gain, and Fat Loss: What is the Real Cause of the Obesity Epidemic?

With the increasing popularity of low-carb diets and the belief that carbs make you fat, insulin and carbs have been demonized as the reason why we gain fat. Although there is

some truth to this (because insulin tends to stimulate sugar use and shut down fat burning), the hypotheses that arose from this understanding are not supported by the evidence.

For example, one of the most popular explanations for the growing obesity epidemic in westernized countries is that our carb-heavy diets keep our insulin levels so high that it prevents us from burning stored fat. This is known as the "Carbohydrate-Insulin Hypothesis," and it's touted as the main reason for why low carb diets, like the ketogenic diet or the Atkin's diet, are so effective at boosting fat loss.

Makes sense, right? Just cut the carbs to decrease insulin levels, and you will trigger fat burning and lose fat. This hypothesis is accurate in some aspects, but it neglects the bigger picture.

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If we consider the totality of the biochemistry and physiology of digestion and energy metabolism – without exaggerating insulin's effects on fat cells – insulin is simply one piece of information that feeds into what the body decides to do.

Put in another way: insulin provides our cells with info regarding glucose availability and energy status, and our cells will integrate that information with all the other information they have about their own energy status, needs, and abilities to come up with the appropriate actions.

The ultimate result is that cells burn energy when they need fuel and stop burning energy when they don't – insulin is just one of the hormones involved in the decision-making process of the cells. This means that your energy intake (i.e., calorie consumption) is the ultimate determining factor of whether you gain or lose weight. Insulin is but one of the multitude of factors that determines what you do with the calories you consume.

The Relationship between Insulin, Insulin Resistance, and Insulin Sensitivity

With this deeper understanding of the relationship between insulin and our cells, a much more accurate model of insulin resistance arises as well. Although carbs are the main reason why insulin is released, what is going in the cell is the ultimate determinant of how it will respond to that insulin.

Thus, the key to reversing insulin resistance as a whole is increasing the insulin sensitivity of each individual cell. Sounds simple enough, but how can accomplish such a solely cellular feat? To answer this question, we must develop a better sense of insulin sensitivity.

What is Insulin Sensitivity Exactly?

Insulin sensitivity is the term that we use to describe how the cells in our body respond to insulin. The more insulin sensitive your cells are, the more responsive they will be to insulin, and vice versa.

To measure this phenomenon objectively, we need to figure out how much insulin your body needs to produce to deposit a certain amount of glucose (sugar). You are considered insulin sensitive if your body only needs to secrete a small amount of insulin to deposit glucose into the cells, and you are considered insulin resistant when you need a higher than normal dose of insulin for the cells to respond.

Insulin sensitivity has turned into a widespread phenomenon in the weight loss industry because of the strong correlation between insulin sensitivity and body fat percentage. The research literature suggests that increasing your insulin

sensitivity (which also means decreasing your insulin resistance) will reduce your risk of heart disease, type 2 diabetes, obesity, and Alzheimer's disease. In other words, if you want to lose fat and improve your overall health, it is probably best to optimize your insulin sensitivity.

Related: ***Sugar Leads to Depression – World's First Trial Proves Gut and Brain are Linked (Protocol Included)***

What Determines How Insulin Resistant You Are?

Both modifiable and non-modifiable factors determine the degree to which you are insulin sensitive or insulin resistant.

Non-modifiable factors are factors that cannot be changed. Some examples of **non-modifiable factors** that decrease insulin sensitivity are:

- **Increasing age.** Research has found increasing age to be associated with increased insulin resistance. However, it is possible to prevent this decline in insulin sensitivity with the lifestyle changes we will talk about later.
- **Genetics.** Your genes can determine how sensitive certain cells are to insulin. For one example of what I mean by this, check out our article on polycystic ovary syndrome – a condition that is intimately linked with cells that were left vulnerable to insulin resistance by specific genes.
- **A family history of type 2 diabetes.** The combination of genetic and environmental factors that come with your family history can leave you with a higher risk of developing insulin resistance.
- **Ethnic background.** If you are of African-American, Asian-American, Latino/Hispanic-American, Native

American, or Pacific Islander descent, you have a greater likelihood of developing insulin resistance.

In contrast, **the modifiable factors** (i.e., what you can actually do to increase your insulin sensitivity) are

- losing weight
- reducing stress levels
- maintaining a calorie deficit
- decreasing caffeine consumption
- eating less processed foods and sugar
- exercising
- getting adequate sleep
- taking specific supplements and/or drugs that decrease insulin resistance
- fasting/intermittent fasting
- and many more that we will take a closer look at later in this article

By neglecting to use these modifiable risk factors to your advantage, you will steadily reduce your insulin sensitivity and set the stage for insulin resistance and the conditions that come with it.

The Big Picture – Insulin Sensitivity and Insulin Resistance

The physiology of insulin resistance is so complex that we aren't even close to explaining it all. However, it is possible to distill our learnings into one simple concept that will help you understand what causes insulin resistance and increases insulin sensitivity for most people:

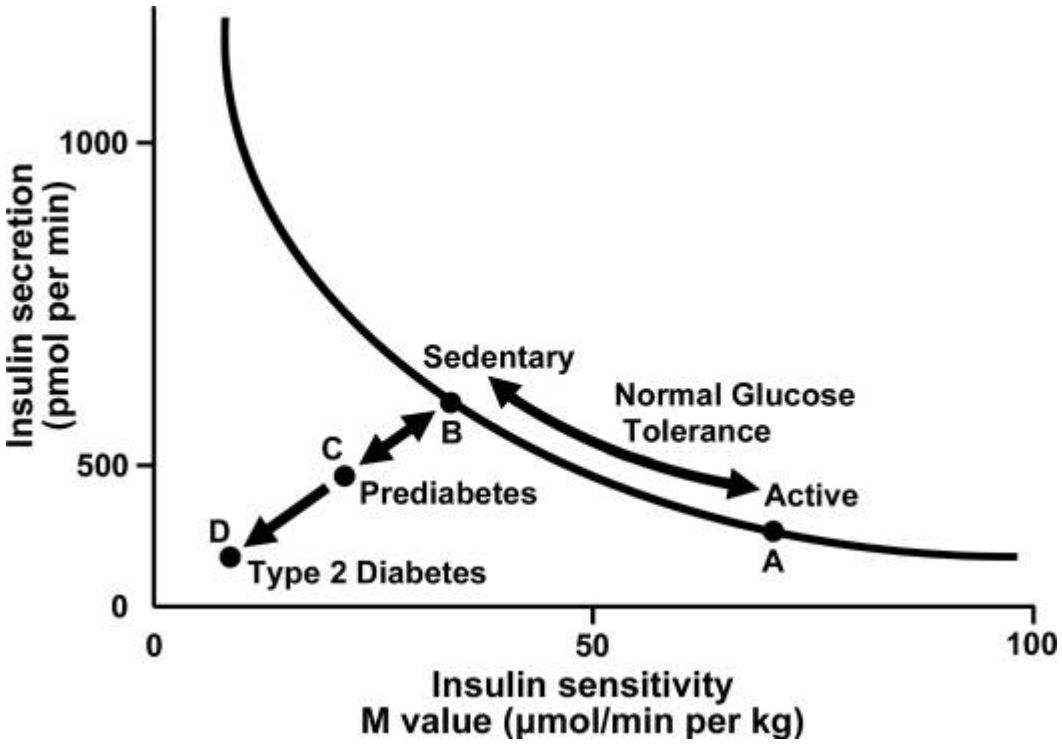
- Increased energy status will cause your cells to become more insulin resistant and less insulin sensitive over time.
- Decreased energy status will cause your cells to become less insulin resistant and more insulin sensitive over

time.

By energy status, I mean the current state of your cells. Are they being bathed in energy molecules without any demand to use it up? This is “high energy status”, and it occurs when we are inactive and overeat.

In contrast, if your cells are in need of more energy to keep up with your body’s demands, then this indicates that you are in “low energy status.” As a result, your cells will increase their sensitivity to insulin so that they don’t miss out on the opportunity to get more fuel.

To further illustrate the big picture of insulin resistance, here is a graph from an article published in Comprehensive Physiology:



This graph depicts the relationships between insulin secretion and insulin sensitivity. Insulin secretion rises as insulin sensitivity falls when an individual goes from a state of exercise training/being physically active (point A) to inactivity/sedentary (point B).

Conversely, insulin secretion decreases as insulin sensitivity

increases when a person goes from inactivity/sedentary (point B) to physically active (point A). This is what commonly occurs in healthy individuals.

However, when insulin secretion fails to compensate for a fall in insulin sensitivity, the person will progress to prediabetes (Point C). If no changes are made at this point, the disease will progress from point C to Point D (type 2 diabetes). The only way to prevent this from happening is by improving your insulin sensitivity.

Ten Ways to Reduce Insulin Resistance and Increase Insulin Sensitivity

Luckily, insulin resistance isn't a fixed mechanism in the body (even if you have all of the non-modifiable factors). It can be drastically improved (and potentially reversed) with simple lifestyle modifications.

Here are ten proven strategies you can use to help you optimize your insulin sensitivity:

1. Follow a Whole Food, Plant-Based Diet.

Simple sugar stimulates the most insulin release of all the macronutrients so, theoretically, removing carb-rich processed foods from your diet should decrease insulin levels and improve insulin sensitivity to some degree. This speculation is backed up by the research on how low carb diets affect patients with type 2 diabetes.

Also worth noting is the fact that whole foods are much more satiating and contain more fiber than processed foods. By increasing the satiety of our diet, we tend to eat fewer calories (decreasing the energy status of our cells), and the extra fiber helps slow carbohydrate and protein absorption,

decreasing our insulin requirements and reducing insulin resistance.

2. Lose Fat.

Studies have shown that having high amounts of fat, especially around your midsection, can produce harmful chemicals and hormones responsible for increasing insulin resistance and inflammation.

Simply by losing excess fat, insulin sensitivity and metabolic function will improve significantly. More specifically, one study found that a weight loss of 5 percent is all obese patients need to experience some of the positive effects of fat loss on insulin sensitivity.

One of the most effective ways to lose fat is by replacing all the processed foods with high-quality whole foods.

3. Add Fasting and/or Intermittent Fasting to Your Lifestyle.

We learned earlier that low energy status increases insulin sensitivity. Although following a healthy diet is one of the best ways to achieve a lower energy status, sprinkling in some fasting and/or intermittent fasting throughout your diet plan can help as well.

A pilot study found that intermittent fasting for 2 weeks (with a 18-20 hour fasting window) helped to improve blood sugar levels with a trend toward improved insulin sensitivity in type 2 diabetics.

The research on dietary interventions for type 2 diabetes also suggests that calorie restriction is one of the major factors that can help manage and potentially reverse the disease. One way to achieve this, which was confirmed by the pilot study on intermittent fasting, is by restricting your feeding window,

so you eat fewer calories throughout the day.

By eating fewer calories, you decrease your energy status, which improves overall insulin sensitivity.

However, there is one caveat to fasting and intermittent fasting for people who have diabetes. Since both forms of fasting can cause significant changes in blood sugar levels, it is best to consult your doctor before adding them to your treatment plan.

4. Add Aerobic and Anaerobic Exercise to Your Weekly Schedule.

Want to improve your insulin sensitivity as rapidly as possible? Start working out, right now.

Exercise draws upon our energy stores so much that many of the cells throughout our body have to make themselves sensitive to insulin to ensure that they will get the energy they need.

Fortunately, both aerobic and anaerobic exercise will reduce your insulin resistance in a variety of ways, so the type of exercise you do is entirely up to you.

Aerobic exercise involves any form of physical activity that requires you to exercise for a prolonged period of time without rest breaks. This includes jogging, swimming, or anything where you're moving your body at a steady state for 30 minutes or longer.

Anaerobic exercise, such as lifting weights, sprinting, and intense rowing/cycling, can also drastically improve your insulin sensitivity.

In general, it is best to aim for five hours of exercise per week. Research suggests that this is the sweet spot for significantly improving your insulin sensitivity.
To get the best results, I recommend doing a combination of

aerobic and anaerobic exercise throughout the week. Anaerobic exercise will help you build more muscle and burn through glycogen stores, which keeps your insulin sensitivity high, while aerobic exercise will ensure that your cells never have a chance to increase their insulin resistance to unhealthy levels.

5. Reduce Your Stress Levels.

Stress, physical or emotional, causes us to secrete cortisol.

When cortisol is circulating through the blood, it stimulates various mechanisms in your body that increase your blood sugar levels, providing you with the energy you need to handle the stressful situation. One way that cortisol does this is by increasing insulin resistance.

Once the body has taken care of the stress-inducing situation, cortisol will be broken down as insulin sensitivity is restored. This response to stress is healthy and normal – in the short term.
However, most people in modern society are typically stressed for the majority of the day. With every stressor comes more cortisol, decreased insulin sensitivity, and more stress. The only way to stop this cycle is by giving your body a chance to relax and recover from your daily stressors.

Here are some helpful strategies you can use reduce your stress levels and decrease insulin resistance:

- Meditate
- Take a short nap
- Do yoga, tai chi, and/or qi gong
- Quit smoking
- Exercise regularly
- Maintain a good sleep schedule
- Use adaptogenic herbs like Rhodiola and Ashwagandha
- Supplement with vitamins and minerals that you may be

deficient in (magnesium and vitamins C, E, B, and D, in particular, can help with stress)

6. Get Adequate Sleep Every Night.

When you don’t get enough sleep, your body’s hunger hormone, ghrelin, begins to fluctuate, and your cortisol levels elevate. Simply put, losing sleep will cause you to feel hungrier than usual while simultaneously increasing your stress levels and insulin resistance (thanks to cortisol).

Altogether, these hormonal changes will typically cause you to eat more and struggle to regulate glucose effectively when you do have those extra calories. The best way to counteract this is by going to sleep at the same time every night and waking up at around the same time every day after getting at least 7 hours of sleep.

7. Consume More Soluble Fiber.

Of the two types of fiber, insoluble and soluble, soluble fiber is most notable when it comes to reducing insulin resistance. This is because soluble fibers slow down the movement of food through the small intestines, which helps reduce the amount of sugar that enters your blood, decrease appetite, and lower cholesterol levels.

Not sure how to get more soluble fiber? Here are some of the healthiest sources (as long as your digestive system can tolerate them):

- Cruciferous vegetables
- Leafy greens
- Pumpkin seeds
- Sunflower seeds
- Legumes
- Oats

8. Add More Fruits, Vegetables, Herbs, and Spices to Your Diet.

Many studies have found that a diet rich in plant compounds from fruits and vegetables is linked to reduced insulin resistance. The healthiest plants tend to be low-carb fruits and vegetables like wild berries, leafy greens, and cruciferous vegetables.

Herbs and spices have also shown promising results for boosting insulin sensitivity. Some of the most effective are:

- **Turmeric:** This powerful herb contains a compound called curcumin, which has potent antioxidant and anti-inflammatory properties. It can indirectly increase insulin sensitivity by reducing free fatty acids and sugar in the blood.
- **Ginger:** This popular spice is linked to increased insulin sensitivity as well. Studies have found that its active component, gingerol, makes muscle cells more receptive to sugar.
- **Garlic:** Garlic has antioxidant properties that may directly increase insulin sensitivity, according to animal studies.
- **Cinnamon:** This popular spice is well-known for its ability to reduce blood sugar and increase insulin sensitivity. One meta-analysis found that consuming 1/2–3 teaspoons (1–6 grams) of cinnamon daily can significantly reduce short- and long-term blood sugar levels.

9. Drink Green Tea

Green tea an excellent choice for people who are struggling to manage their blood sugar levels. Several studies have found that drinking green tea can increase insulin sensitivity and reduce blood sugar levels.

The beneficial effects of green tea could be due to its powerful antioxidant epigallocatechin gallate (EGCG), which many studies have found to increase insulin sensitivity on its own.

Supplementing with decaffeinated green tea extract may be the best option since caffeine has been found to increase insulin resistance.

10. Experiment with Supplements that Help Reduce Insulin Resistance.

There are many supplements that can help with insulin resistance, but let’s stick with the ones that are backed by research:

- **Resveratrol:** This is a polyphenolic compound that can be found in red wine and is known for its antioxidant benefits. High-quality evidence indicates that resveratrol can boost glucose uptake significantly without increasing insulin needs.
- **Alpha Lipoic Acid:** Alpha Lipoic Acid (ALA) is an organosulfur compound that is essential for aerobic energy metabolism. Many studies have reported that supplementation with this compound can help reduce insulin resistance in subjects with type 2 diabetes.
- **Berberine.** This is a plant alkaloid that has been shown to lower blood glucose in many cases. Some researchers have even found berberine to be as effective as the popular diabetes drug, metformin.
- **Chromium:** Some evidence indicates that this essential trace element has the ability to indirectly increase insulin sensitivity.
- **Magnesium:** This essential mineral is so crucial for proper insulin signaling that magnesium deficiency can worsen insulin sensitivity.
- **Gymnema Sylvestre:** It lowers blood sugar and is also

called gurmar, which means “destroyer of sugar” in Hindi.

How to Know If These Changes are Reversing Your Insulin Resistance

The quickest and safest way to find out if you are insulin resistant is to get a test done by your doctor. The most reliable test is called HOMA-IR, which makes an accurate guess regarding your body’s insulin resistance by tracking your blood sugar and insulin levels over time.

You can also measure your blood sugar fluctuations directly with an oral glucose tolerance test. This test consists of multiple blood tests and the ingestion of a glucose solution as a way to see how your body handles an increase in blood sugar levels.

Despite how helpful both of these tests are, they are inconvenient and unnecessary for most people. A more accessible way to track your level of insulin resistance is by seeing how your blood work and other key health indicators change as you make the appropriate dietary and lifestyle adjustments.

For example, if your blood sugar levels, blood lipids, and blood pressure reach healthier levels, then you are most likely improving your insulin sensitivity, reducing your insulin resistance, and optimizing your health. Furthermore, if you are losing inches off your waist, then you are almost certainly making your cells more sensitive and less resistant to insulin.

Sources:

- *The role of adipose tissue dysfunction in the pathogenesis of obesity-related insulin resistance.* – NCBI

- *Metabolic Syndrome and Insulin Resistance: Underlying Causes and Modification by Exercise Training* – NCBI
- *Insulin sensitivity in the intact organism.* – NCBI
- *14 Natural Ways to Improve Your Insulin Sensitivity* – Healthline
- *How do I increase insulin sensitivity?* – Examine
- *Changes in beta cell function occur in prediabetes and early disease in the Leprdb mouse model of diabetes* – NCBI
  Understand Your Risk for Diabetes – American Heart Association
- *The top 10 causes of death* – World Health Organization
- *Understanding Insulin Sensitivity and Diabetes* – National Institutes of Health
- *Insulin Resistance and Hyperinsulinemia* – American Diabetes Association
- *Insulin resistance and associated compensatory responses in african-american and Hispanic children.* – NCBI
- *Racial/Ethnic Differences in Insulin Resistance and Beta Cell Function: Relationship to Racial Disparities in Type 2 Diabetes among African Americans versus Caucasians.* – NCBI
- *Effects of long-term calorie restriction and endurance exercise on glucose tolerance, insulin action, and adipokine production.* – NCBI
- *Ethnic Differences in the Relationship Between Insulin Sensitivity and Insulin Response* – American Diabetes Association
- *Effect of alpha-lipoic acid on blood glucose, insulin resistance and glutathione peroxidase of type 2 diabetic patients.* – NCBI
- *Oral magnesium supplementation improves insulin sensitivity and metabolic control in type 2 diabetic subjects: a randomized double-blind controlled trial.* – NCBI
- *Chromium* – WebMD
- *Effects of resveratrol on glucose control and insulin*

sensitivity in subjects with type 2 diabetes: systematic review and meta-analysis – NCBI
- *The impact of soluble dietary fibre on gastric emptying, postprandial blood glucose and insulin in patients with type 2 diabetes.* – NCBI
- *Mechanisms of Glucocorticoid-Induced Insulin Resistance* – NCBI
- *Effects of intensity and volume on insulin sensitivity during acute bouts of resistance training.* – NCBI
- *Aerobic training improves insulin sensitivity 72-120 h after the last exercise session in younger but not in older women.* – NCBI
- *Effects of short-term, medium-term and long-term resistance exercise training on cardiometabolic health outcomes in adults: systematic review with meta-analysis.* – NCBI
- *Exercise and insulin sensitivity: a review.* – NCBI
- *In obese patients, 5 percent weight loss has significant health benefits* – ScienceDaily
- *Effect of a low-carbohydrate diet on appetite, blood glucose levels, and insulin resistance in obese patients with type 2 diabetes.* – NCBI
- *Effects of intermittent fasting on health markers in those with type 2 diabetes: A pilot study* – NCBI
- *Insulin Resistance Isn't All About Carbs and Insulin* – Chris Masterjohn, PhD
- *The Biochemistry of Why Insulin Doesn't Make You Fat* – Chris Masterjohn, PhD