Research Summary: Insulin #2

As featured in Dr. Kenny Mittelstadt's video:
"Insulin Resistance Explained: The Root Cause & 4 Tactics to Reverse It"
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Research Context:

This week's topic explores how insulin resistance is not simply about eating too much sugar or lacking willpower. It reflects a shift in how the body manages fuel over time. Insulin is part of your body's communication system, signaling cells when to store and use energy. When that signal has to work harder to maintain balance, something underneath has changed.

Many people are told their labs are "normal," yet they feel unstable energy, stubborn weight changes, or afternoon crashes. Glucose may still fall within range while insulin is already elevated behind the scenes, compensating to keep things steady. On paper, it looks stable. Beneath the surface, the system may be under strain.

Insulin resistance develops gradually. It reflects repeated patterns of fuel coming in without equal capacity to use it efficiently. Over time, tissues adapt to that load, and that adaptation is what we call resistance. The research below explains why these shifts can begin years before glucose reaches a diagnostic threshold and how daily intake patterns and muscle demand shape insulin responsiveness long before diabetes is diagnosed.

Key Findings from the Research:

Study 1 (PMID 37200851):
This large screening study found that many individuals had high insulin levels even when fasting glucose and A1C were within normal range. Nearly one third of young adults showed elevated insulin without detectable glucose abnormalities. In practical terms, their bodies were producing more insulin to keep blood sugar steady. Insulin moves glucose from the bloodstream into tissues. When tissues become less responsive, the pancreas compensates by releasing more insulin. This can keep glucose looking normal on labs for years, even as metabolic strain builds beneath the surface.
Why this matters: Insulin resistance often begins quietly. Elevated insulin can be one of the earliest signs that the metabolic system is under increasing load, before glucose markers clearly shift.

Study 2 (PMID 34468401):
This systematic review and meta analysis evaluated 27 studies on resistance training in adults living with overweight or obesity without diabetes. Across studies, resistance training improved fasting insulin and markers of insulin responsiveness, even when significant weight loss did not occur. Muscle is one of the primary tissues that stores and uses glucose. When muscle mass increases or is regularly challenged, the body becomes more efficient at clearing glucose from the bloodstream. Why this matters: Improving insulin resistance is not only about reducing intake. Expanding metabolic capacity through muscle demand directly improves how the body handles glucose.

Study 3 (PMID 37331899)
This human clinical research examined how reducing carbohydrate intake affects insulin demand and post-meal glucose control. Participants who lowered carbohydrates showed reduced insulin requirements and more stable glucose levels, even when baseline glucose was not elevated. Carbohydrates are the main dietary source of glucose. When intake is frequent, insulin rises repeatedly. Reducing carbohydrate load lowers the intensity of that signal. Why this matters: Lowering repeated glucose exposure reduces insulin workload and supports improved tissue responsiveness over time.

Functional Medicine Connections:

When we zoom out, a systems pattern becomes clear.

First, insulin can rise years before glucose does. That reflects compensation. The body increases the insulin signal because tissues are less responsive. Over time, that repeated signaling creates strain.

Second, frequent glucose exposure increases metabolic load. When carbohydrate intake is high and consistent, insulin must rise repeatedly to manage incoming fuel. That pattern reinforces compensation.

Third, muscle represents metabolic capacity. Muscle is a primary site for glucose storage and use. When it is strong and regularly challenged, the body handles glucose more efficiently and reduces pressure on insulin signaling.

Viewed together, insulin resistance reflects a mismatch between incoming energy signals and the body's capacity to manage them. Reducing glucose load lowers demand. Building muscle increases capacity. Regulation improves when both sides are addressed.

Practical Reflections & Takeaways:

Have you experienced energy swings, afternoon crashes, brain fog after meals, or stubborn weight changes even when your labs were described as normal? That mismatch may reflect rising insulin demand beneath the surface. Sometimes the body is compensating long before standard numbers clearly shift.

How often is your body being asked to manage incoming glucose each day? Think not only about portion size, but frequency. Repeated snacking, liquid carbohydrates, or large swings between restriction and high intake can all increase signaling demand.
Are you focusing only on reducing intake, or are you also building metabolic capacity through regular muscle demand? Both sides of the equation matter. Regulation improves when incoming load and storage capacity are balanced.

These patterns are not random. They are signals about how your system is adapting to energy load over time. Noticing them is the first step toward understanding what your metabolism may be trying to communicate.

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