

— YOUTUBE RESEARCH SUMMARY

Research Summary: Blood Work Context and Pre-Analytical Variables

As featured in Dr. Kenny Mittelstadt's video: [The Hidden Context Behind Your Blood Work Results](#)

— Research Context

This week's topic explores how a blood result can be technically accurate and still miss the bigger picture. It comes down to how the conditions around a blood draw, from fasting length to hydration status to how long the sample sat before processing, shape the numbers that print on a report, often without anyone examining those conditions at all. Below are the key studies that help connect these dots.

— Key Findings from the Research

STUDY 1 • PMID 38559530

A 2024 review published in *Cureus* mapped every stage where errors enter a laboratory result, from preparation before the draw to how the sample was handled before reaching the analyzer. The analytical phase, the actual machine reading your blood, is the most tightly controlled part of the process. The variables that introduce the most uncertainty happen earlier: fasting status, hydration level, body posture during the draw, and the order in which collection tubes were filled. This pre-analytical phase is responsible for the majority of errors in laboratory medicine. The number on your report can be a perfectly accurate reading of a moment that did not represent your typical physiology at all.

STUDY 2 • PMID 38443327

A 2024 study published in *Clinical Chemistry and Laboratory Medicine* collected blood from 30 healthy volunteers and tracked how 65 routine markers changed based on how long the sample sat before processing and the storage temperature. Glucose and potassium shifted meaningfully within hours at room temperature, with no change in the person's actual health status. The variable was the draw conditions after the blood left the body. A sample that sat at room temperature longer than recommended could show glucose or potassium readings outside the expected range solely because of what happened to the sample on the way to the lab. This also explains why repeat testing sometimes produces a different result when handling conditions change.

STUDY 3 • PMID 38965833

A 2024 paper in *Clinical Chemistry and Laboratory Medicine* examined what happens to common markers across a typical morning draw window, even when preparation is done correctly. Markers like TSH, glucose, and liver enzymes follow natural patterns throughout the day, rising and falling based on time rather than changes in health. For some markers, the expected shift across just a few hours in the morning is large enough to influence how a result is interpreted. TSH is typically higher in the early morning and lower by midday, so two draws from the same person on the same day could produce readings that look meaningfully different. A single result is a snapshot of one point on a moving curve.

— Functional Medicine Connections

Your blood is a living fluid. It shifts with your stress levels, your sleep, your hydration, the time of day, and the length of your fast. The moment a sample leaves your body, it begins to change further based on temperature and time. By the time a number prints on a report, it has passed through all of those layers.

Standard lab interpretation treats the number as a fixed data point. Functional medicine interpretation asks what was happening around that number. Were the conditions representative? What does this marker look like across time? What other markers were moving in the same direction at the same draw? A creatinine reading that looks fine in isolation looks different when it has been slowly climbing across three years of draws, alongside a pattern of inconsistent hydration and worsening fatigue. The individual result was accurate each time. The pattern is what carries the clinical signal.

The research here also points to something worth understanding about where reference ranges come from. The ranges printed on a standard lab report are built from population data, what is statistically common in a large group of people, many of whom may not have been in optimal health. A result that falls inside that range is normal for that population and is not a guarantee that your physiology is functioning well. The standard panel was designed to catch established disease. There is a significant stretch of terrain between functioning well and having diagnosable disease, and most standard blood panels are not built to map that territory.

— Practical Reflections & Takeaways

Think back to your most recent blood draw. Do you know what the conditions looked like that morning? How long you had actually fasted, whether you were well hydrated, what your sleep and stress load had been in the days before? Those details are part of the reading, and they are worth tracking alongside the result itself.

If you have received a series of normal results while still feeling like something is off, it may be worth asking a different question: what does the pattern across those numbers, drawn under different conditions at different points in your life, show about how your physiology actually behaves under real-world load?

— References

Nordin N, Ab Rahim SN, Wan Omar WFA, et al. Preanalytical errors in clinical laboratory testing at a glance: source and control measures. *Cureus*. 2024;16(3):e56771. doi: 10.7759/cureus.56771. PMID: 38559530.

Zhou J, Fabros A, Lam SJ, et al. The stability of 65 biochemistry analytes in plasma, serum, and whole blood. *Clin Chem Lab Med*. 2024;62(8):1548-1558. doi: 10.1515/cclm-2023-1331. PMID: 38443327.

Özçürümez MK, Coşkun A, Arzideh F, et al. Time-dependent characteristics of analytical measurands. *Clin Chem Lab Med*. 2024;62(11):2141-2152. doi: 10.1515/cclm-2024-0493. PMID: 38965833.

Want Dr. Kenny's eyes on your case?

Start with a free training that shows how root cause investigation works, and how to prepare to apply for a Health Mystery Map Call.

Available if you're in one of the states I currently practice in.

[Watch the Free Training >](#)