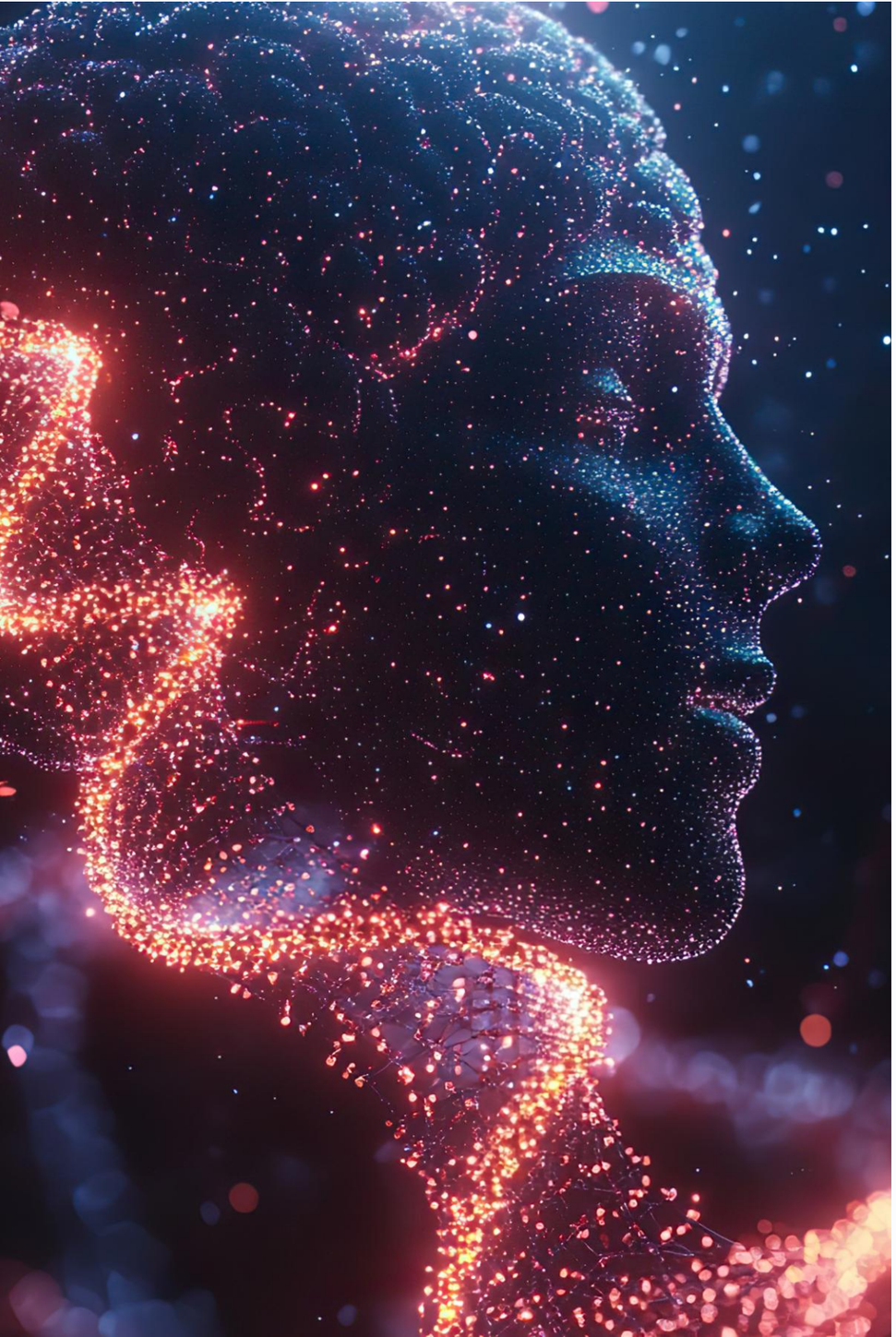


Nutritional Ketosis

Are You Going in the Right Metabolic Direction?

Dorian Greenow | IPM Congress 2026 | London

Disclaimer, Conflict of Interest / Bias

Disclaimer, Conflict of Interest / Bias

Nutritional Ketosis since 2015

Founder and CEO/CFO Keto-Mojo

President and Co-Founder of the Ketogenic Foundation

Advisory Board Member, Keto Live Center, Non-Profit

Advisory Committee Member, Metabolic Terrain Institute of Health, Non-Profit

But first the ABC's…

***A**cknowledge bias*

***B**e curious*

***C**onscientious research*

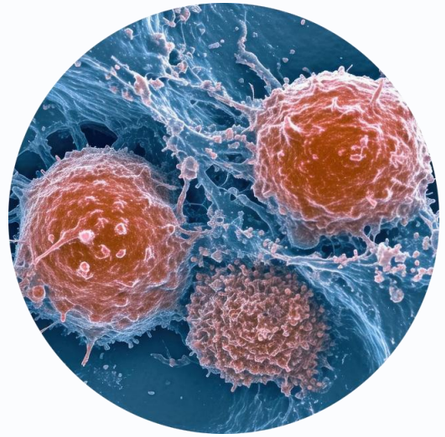
Only 15% of British Adults Are Metabolically Healthy

Metabolic dysfunction is the root cause of multiple non-communicable diseases

Metabolic Dysfunction Drives Chronic Disease

Type 2 Diabetes

Cardiovascular Disease



Certain Cancers

Cognitive Decline

Fatty Liver Disease

The Common Thread: Insulin Resistance

- 208 healthy, non-overweight adults (avg. age 50)
- Grouped by insulin sensitivity; matched for BMI, age, smoking
- Followed for 6 years

- Zero hospitalisations in the insulin-sensitive group
- 1 in 3 hospitalised in the insulin-resistant group
- Insulin resistance outpredicted age, smoking, and exercise for chronic disease risk

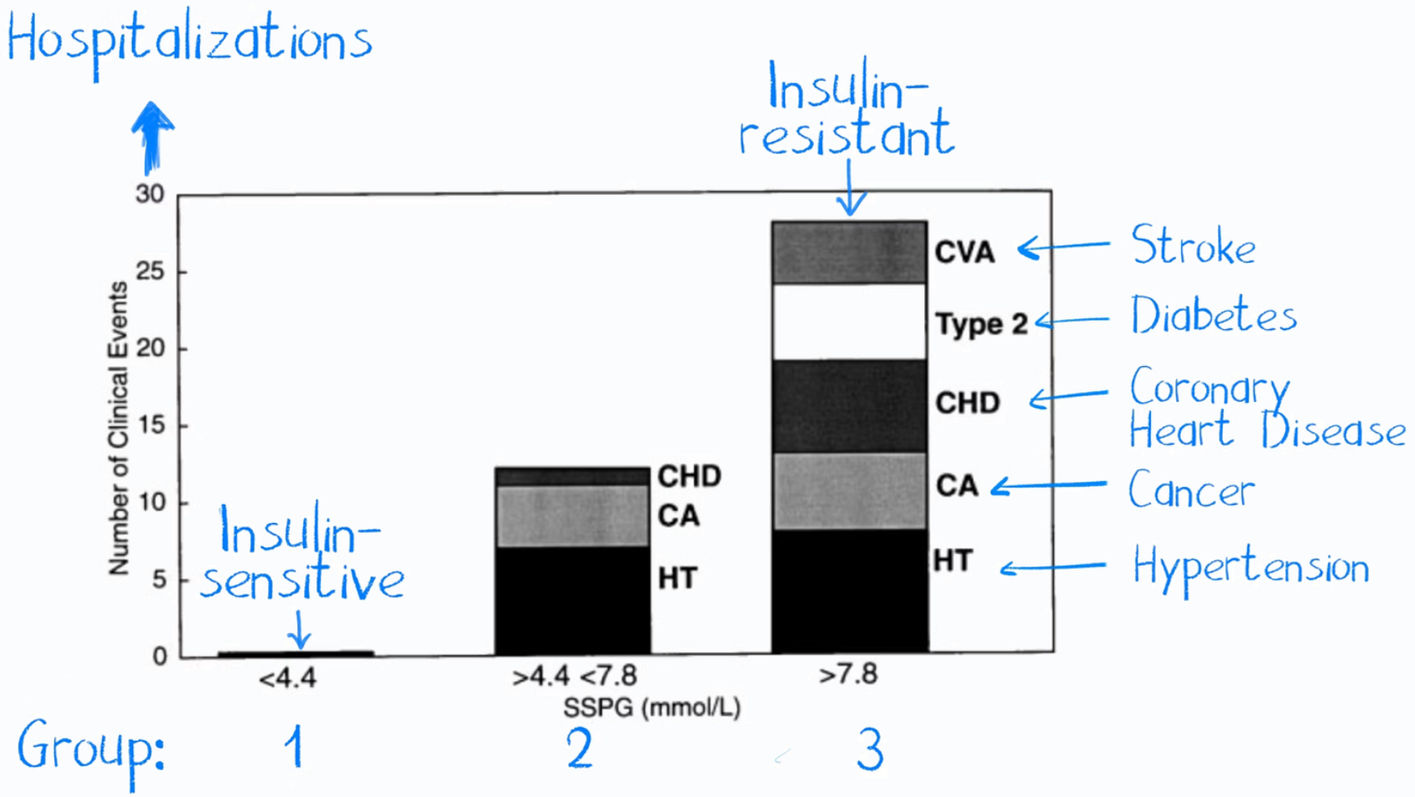


FIG. 1. The number of clinical events observed, as a function of insulin resistance tertile at baseline. CA, Cancer; Type 2, type 2 diabetes. These were 28 events in the highest tertile (SSPG $>$ 7.8 mM), 12 in the intermediate tertile (SSPG $>$ 4.4 $<$ 7.8 mM), and none in the most insulin-sensitive tertile (SSPG $<$ 4.4 mM).

Image from https://doi.org/10.1210/jcem.86.8.7763 , F. S. Facchini et al: Insulin Resistance as a Predictor of Age-Related Diseases.

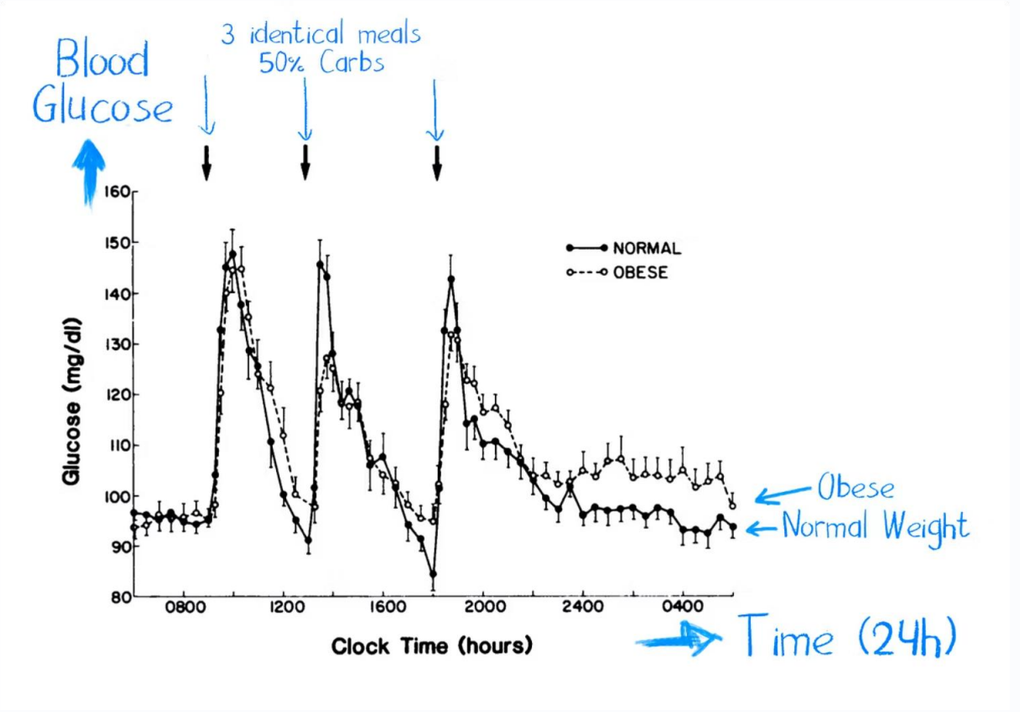


Image from https://doi.org/10.1172/JCI113339, K. S. Polonski et at.: Twenty-four-hour profiles and pulsatile patterns of insulin secretion in normal and obese subjects.

Insulin Resistance Comes Silently

Hyperinsulinemia precedes loss of glucose control—by the time blood sugar rises, the problem has been developing for years.

→ This is ICE:
Insulin Compensated Euglycemia

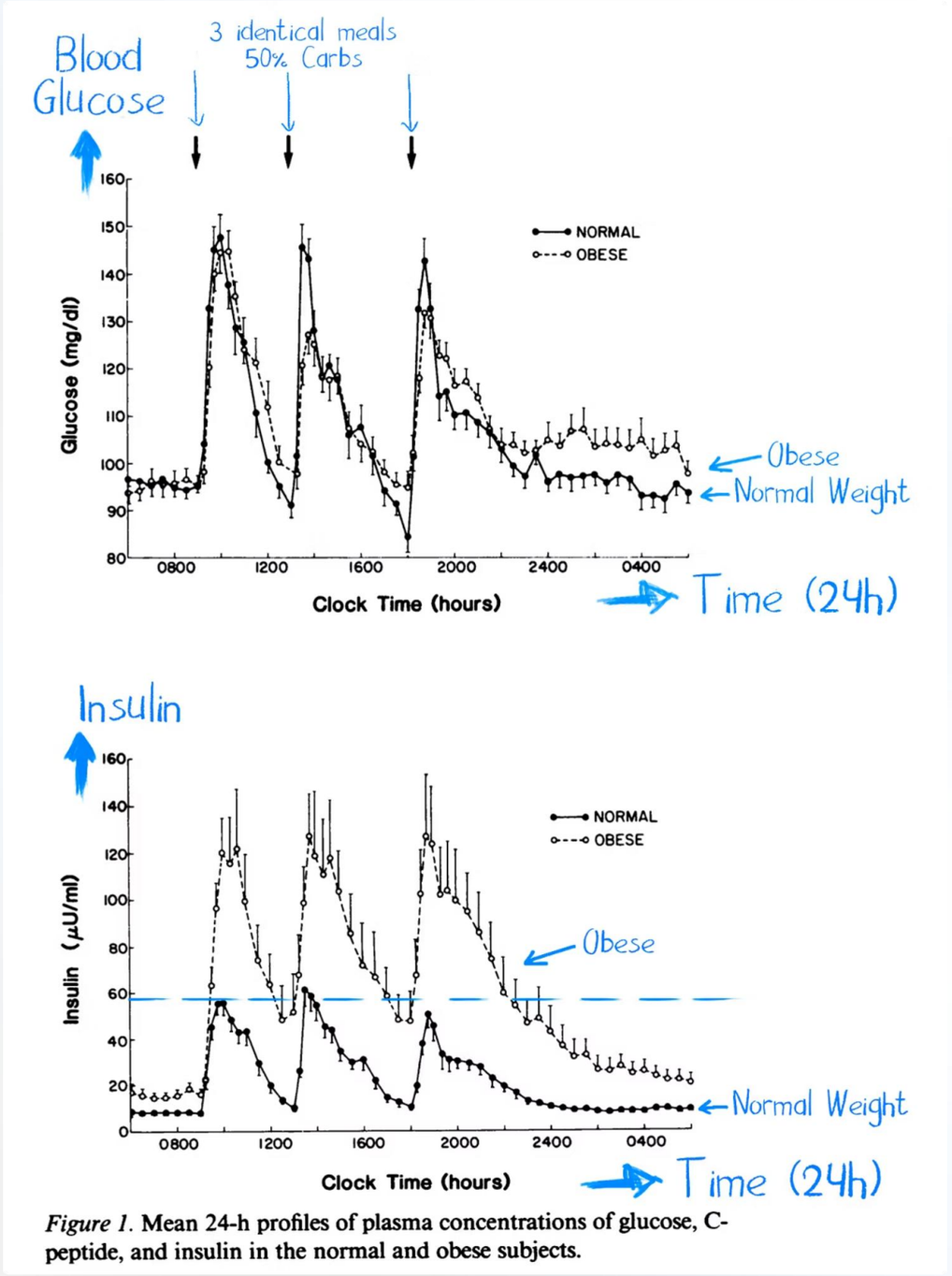


Figure 1. Mean 24-h profiles of plasma concentrations of glucose, C-peptide, and insulin in the normal and obese subjects.

Image from https://doi.org/10.1172/JCI113339, K. S. Polonski et at.: Twenty-four-hour profiles and pulsatile patterns of insulin secretion in normal and obese subjects.

A Self-Reinforcing Problem

Image from "Food For Health: Nutrition Principles For Optimal Metabolism", Dr. Sofia Deloudi, 2022

A Self-Reinforcing Problem

The Lever: Carbohydrate Intake

Carbohydrates drive insulin more than any other macronutrient. Reducing carbohydrate intake lowers insulin demand, allowing the cycle to reverse.

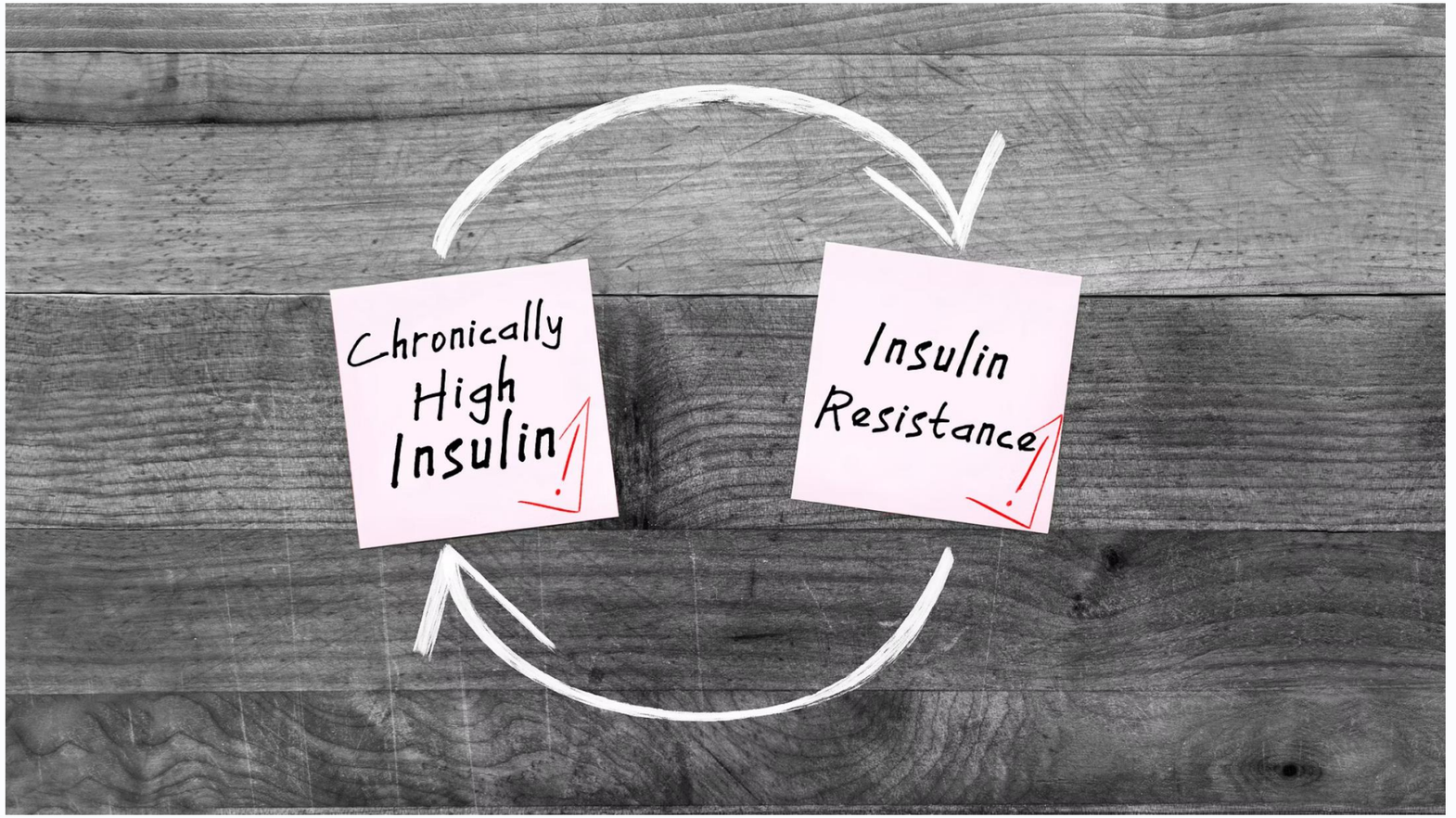


Image from “Food For Health: Nutrition Principles For Optimal Metabolism”, Dr. Sofia Deloudi, 2022

Small Changes, Real Impact

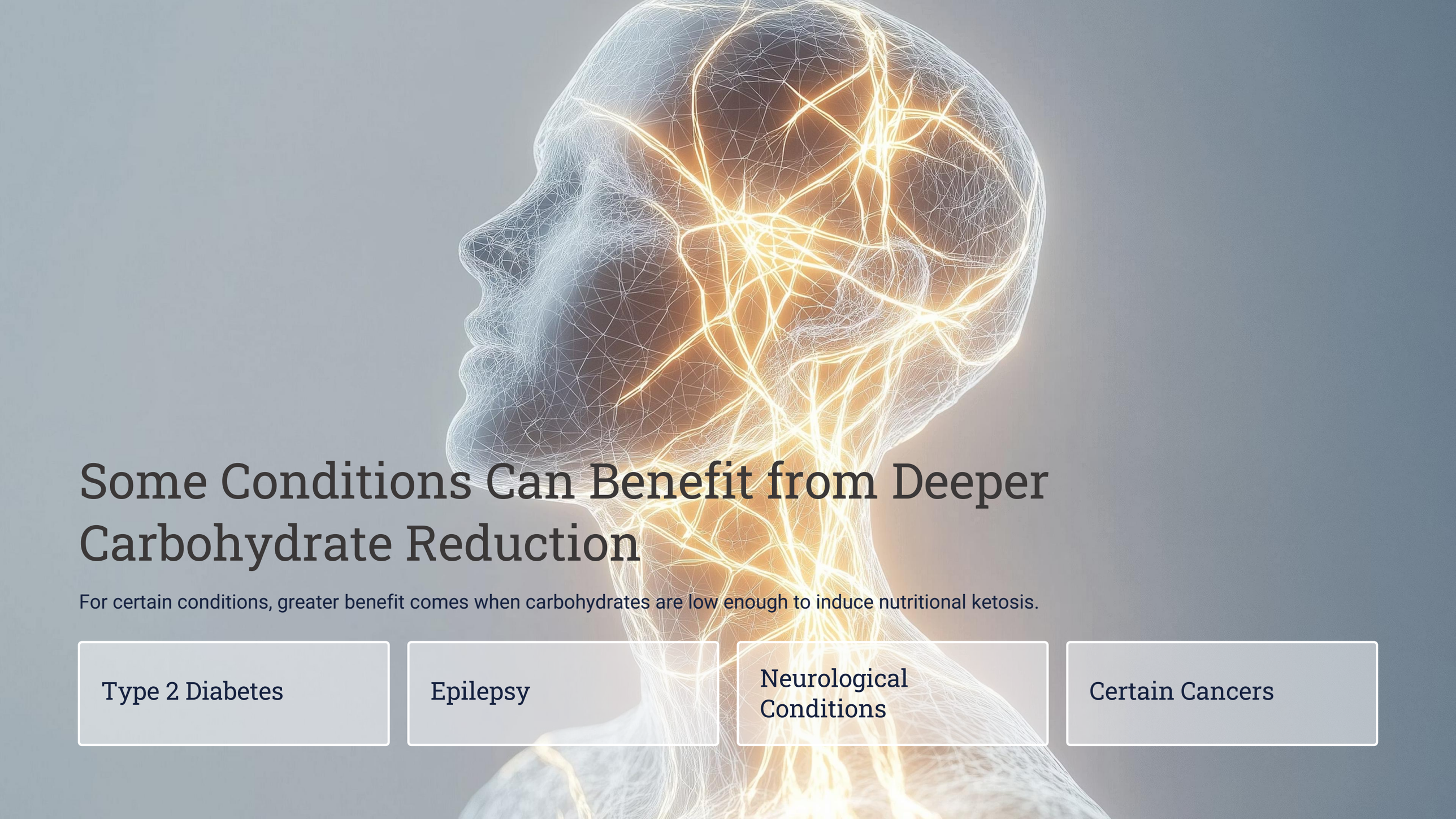
Even modest carbohydrate reduction improves insulin sensitivity. People don't need to adopt the most restrictive approach to benefit—any movement along the spectrum helps.

Image from "Food For Health: Nutrition Principles For Optimal Metabolism", Dr. Sofia Deloudi, 2022

Personalization Matters

People have different levels of carbohydrate tolerance based on their metabolic state, genetics, activity level, and health history. What works for one person may not work for another.

Image from “Food For Health: Nutrition Principles For Optimal Metabolism”, Dr. Sofia Deloudi, 2022



Some Conditions Can Benefit from Deeper Carbohydrate Reduction

For certain conditions, greater benefit comes when carbohydrates are low enough to induce nutritional ketosis.

- Type 2 Diabetes
- Epilepsy
- Neurological Conditions
- Certain Cancers

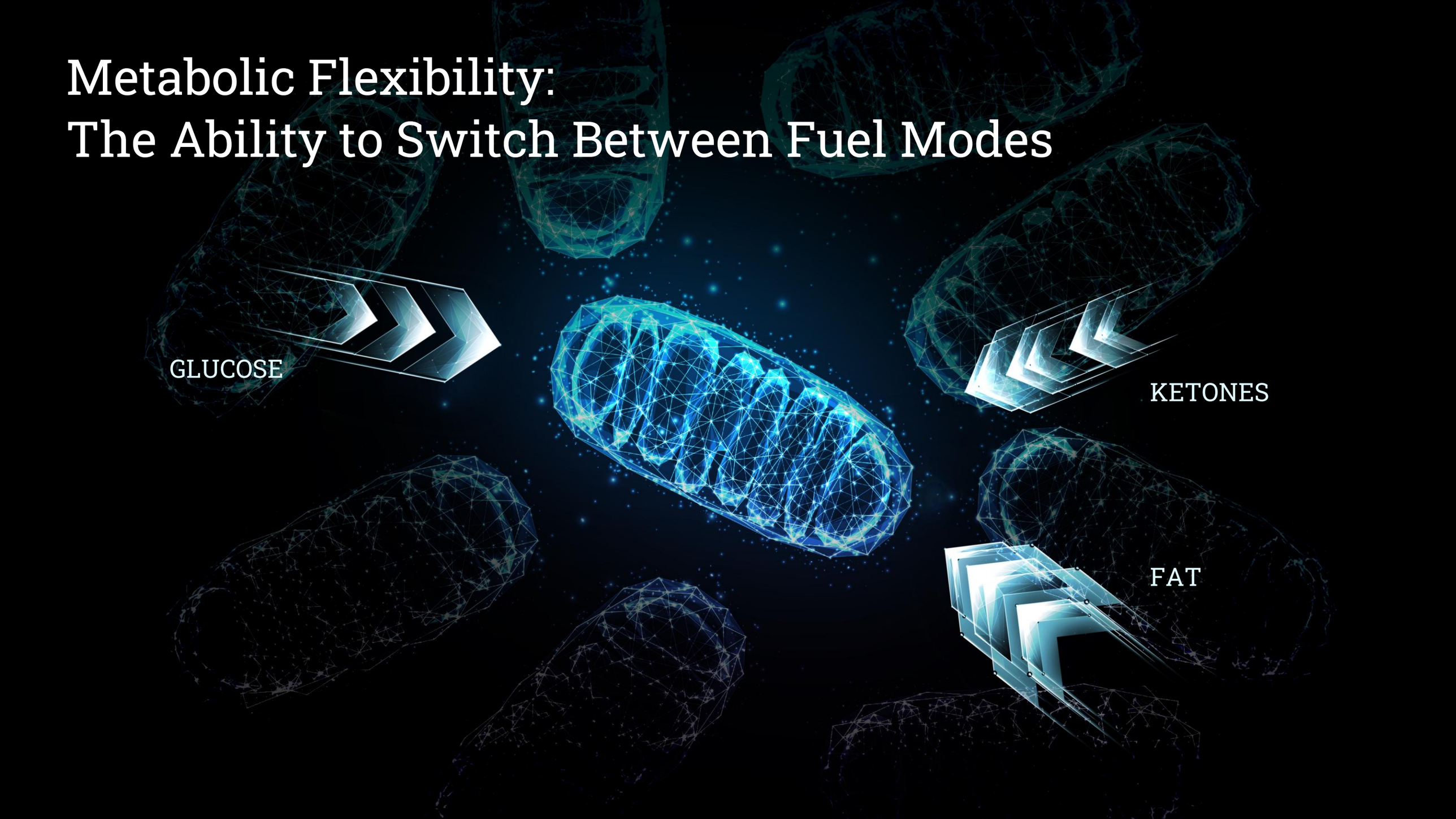
The Metabolic Switch

Nutritional ketosis occurs either through lower carbohydrate intake, exercise or fasting.

The body shifts to burning fat and producing ketones as an alternative fuel source.

Typically achieved below ~50g total carbs/day, though individual thresholds vary.

Metabolic Flexibility:
The Ability to Switch Between Fuel Modes



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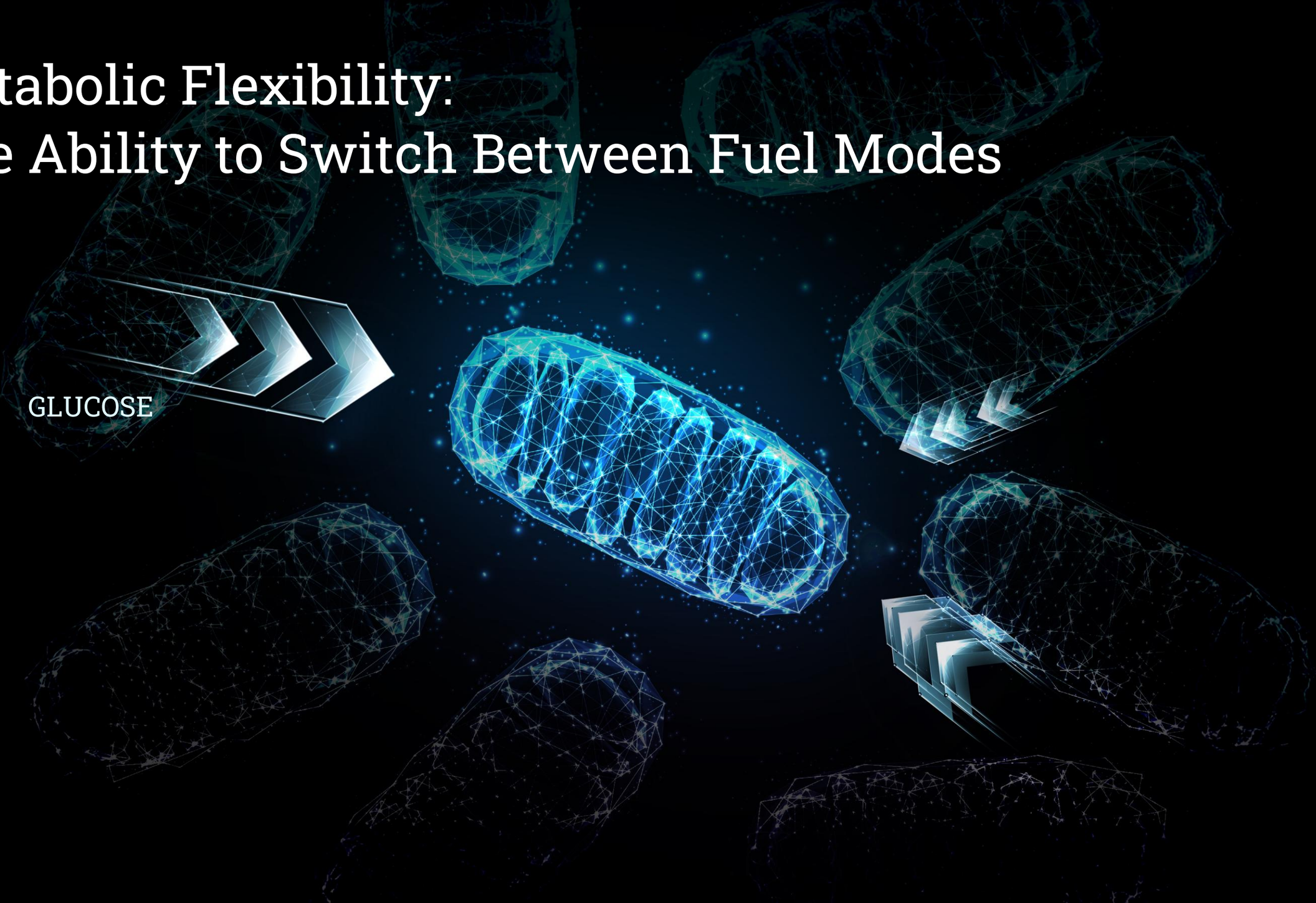

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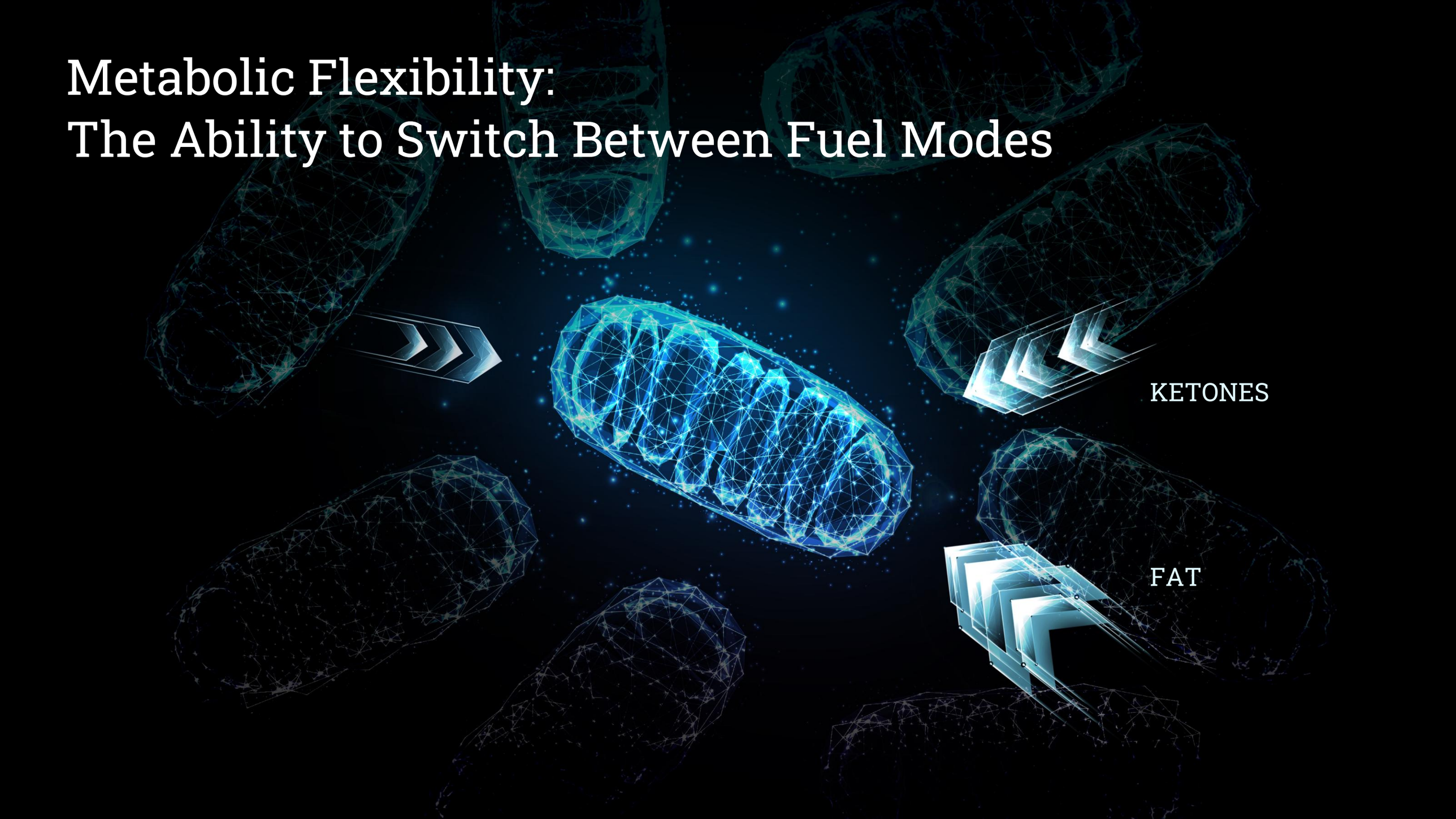

Three Main Fuels: Glucose, Fat, and Ketones

→ Metabolic flexibility means the body can switch smoothly between fuel modes.

→ A simple test: after an overnight fast, a flexible metabolism will produce ketones. If it doesn't, the body is stuck in carb-burning mode.

Ketosis: Our Metabolic Starting Point

Newborns are in ketosis—it's our first metabolic state.

Ketones are critical for early brain development.

This isn't an extreme intervention; it's a return to a natural physiological state.

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ISSN: 2644-3031
Original Research Article: Open Access

Ketone Bodies in the Fetus and Newborn During Gestational Diabetes and Normal Delivery

Tetsuo Muneta[1], Miho Hayashi[2], Yasushi Nagai[3], Momoyo Matsumoto[3], Hiroshi Bando[4], Koji Ebe[5], Hiroko Watanabe[6] and Shaw Watanabe[7*]

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[3]Nagai Mothers Hospital, Misato, Saitama, Japan

[4]Tokushima University / Medical Research, Tokushima, Japan

[5]Takao Hospital, Kyoto, Japan

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ABSTRACT

Background: Authors successfully treated gestational diabetes by a very low carbohydrate diet without insulin and other drugs. Increased ketone bodies seemed to play an essential role in energy metabolism, and the fetus and newborn also showed hyperketosis. It is necessary to clarify how much ketone bodies were present in the placenta and umbilical cord in the fetus and newborn and the pregnant mother with or without gestational diabetes.

Subjects and Methods: All cases were patients of Muneta OB/GYN Clinic in Chiba, where about 700 deliveries were done every year, 90% normal and 10% gestational diabetic. Blood of 313 mothers and babies at health check-up postpartum, 192 samples of placenta and cord blood at the delivery, and 122 cases were obtained at the time of miscarriage. Abbott's kit measured βHB, and 101 samples obtained at the post partem health check-up were biochemically analyzed for both βHB and glucose. The IBM-SPSS did the statistical analysis.

Results: βHB in Mothers' and newborns' blood at four days postpartum was 0.062 and 0.244 mmole/L (median), respectively, and glucose was 4.55±0.81 mmole/L. βHB was high throughout the pregnancy; In the placenta, βHB in the first-, second-and-third trimester was 1.95±0.9 mmole/L, 2.82±0.49 mmole/L, 1.87±0,65 mM/L, respectively. In the cord blood, it was 2.3±1.13 mmole/L, 1.36±0.76 mmole/L, and 0.69±0.6 mmole/L, respectively. Placental βHB at the delivery was 1.99±0.78 mmole/L, and that of the umbilical cord was 0.75±0.36 mmole/L. In the first trimester miscarriage, βHB in spontaneous abortion was 1.84±0.85 mmole/L, while it was 2.09±0.94 mmole/L in artificial abortion. Aborted cases in the second trimester showed 1.96±0.38 mmole/L βHB and 3.74±0.75 mmole/L glucose in the cerebrospinal fluid.

Discussion: Our data showed βHB and glucose concentration in the human fetus and newborn under the normal physiological condition. βHB was present in the placenta and umbilical cord blood throughout fetal life and after birth. Different concentrations between the placenta and umbilical cord blood suggested the fetus's uptake for energy and intrauterine growth. High βHB in the cerebrospinal fluid suggested the effects on neuronal development.

Keywords: 3-hydroxybutyric acid, Ketone bodies fetus, Placenta, Umbilical cord, Cerebrospinal fluid, Miscarriage, Gestational diabetes

Abbreviations: βHB: 3-hydroxybutyric acid

Muneta T, Hayashi M, Nagai Y, Matsumoto M, Bando H, et al. (2023) Ketone Bodies in the Fetus and Newborn During Gestational Diabetes and Normal Delivery. Int J Diabetes, 5(1): 157-163.

The Decline of Metabolic Flexibility

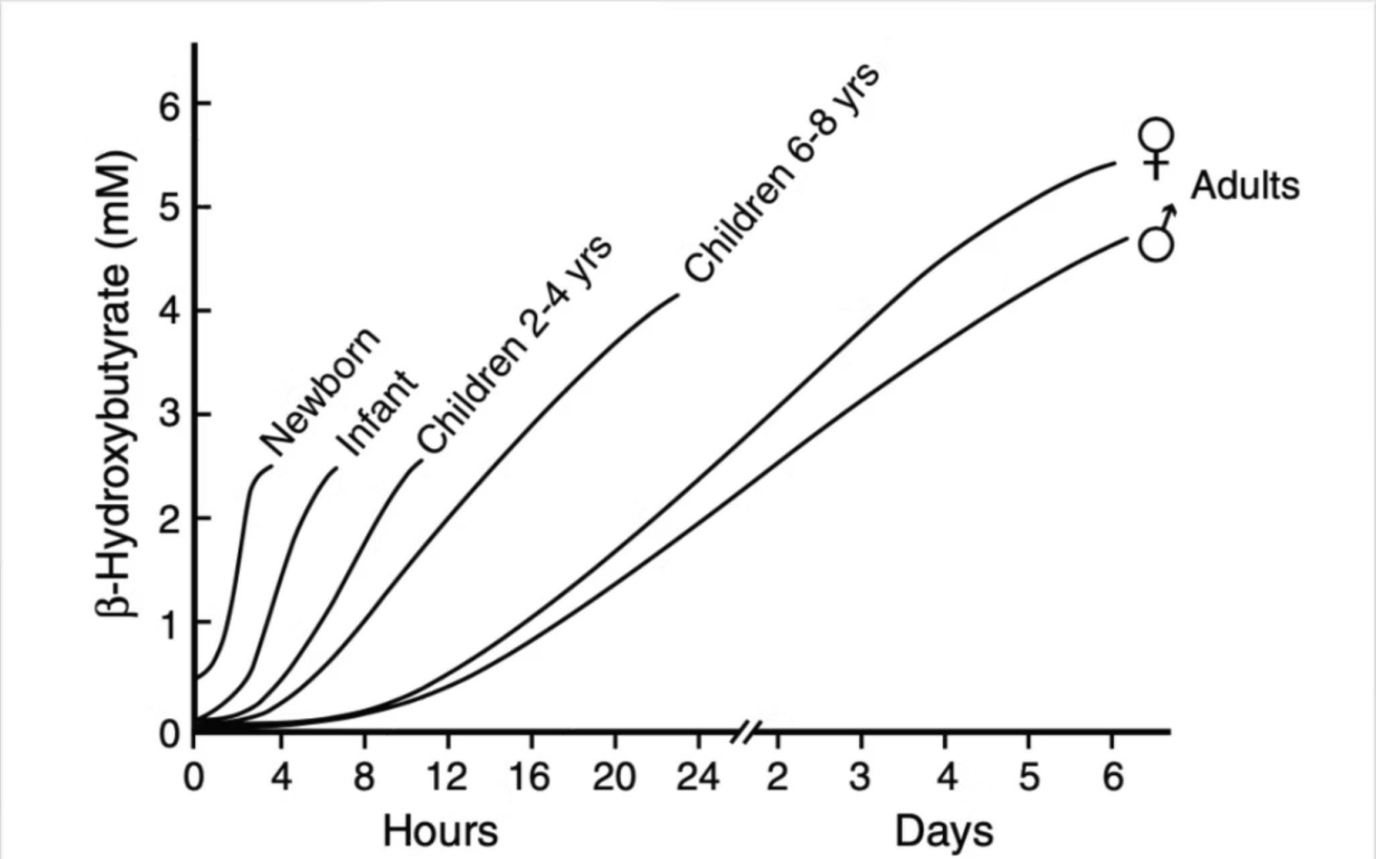
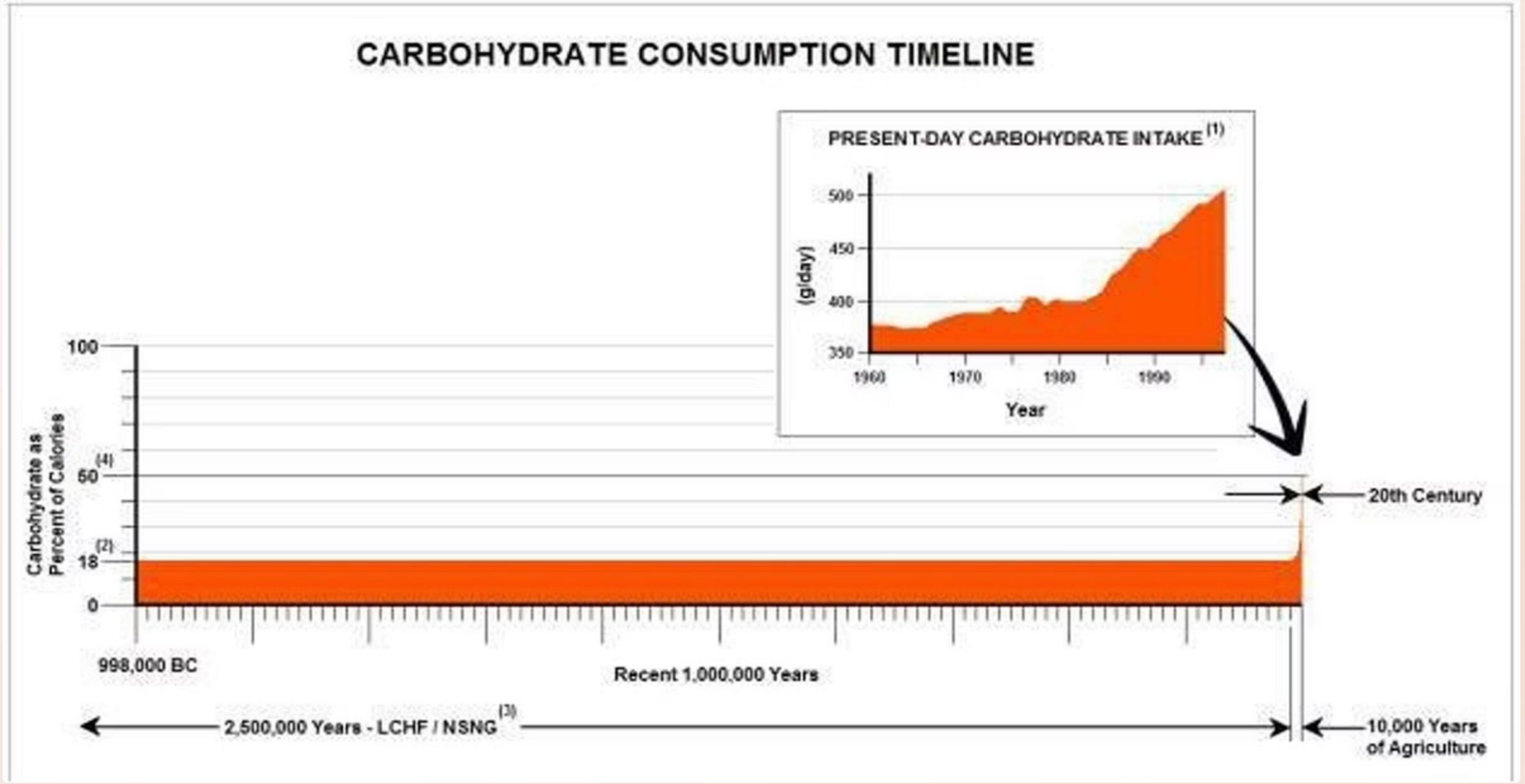


Figure 6 Levels of β-hydroxybutyrate in starving subjects of different ages (5, 13, 30, 54, 59, 66). Not shown is the accelerated ketosis in fasting pregnant or lactating women or in any subject with marked renal glucosuria requiring increased gluconeogenesis, e.g., when the renal threshold is surpassed, as in type 1 diabetes (40), or with genetic renal glucosuria or chemical inhibition of tubular reabsorption of glucose (phlorizin administration).

Image from https://doi.org/10.1146/annurev.nutr.26.061505.111258 , George F. Cahill, Jr.: Fuel Metabolism in Starvation.

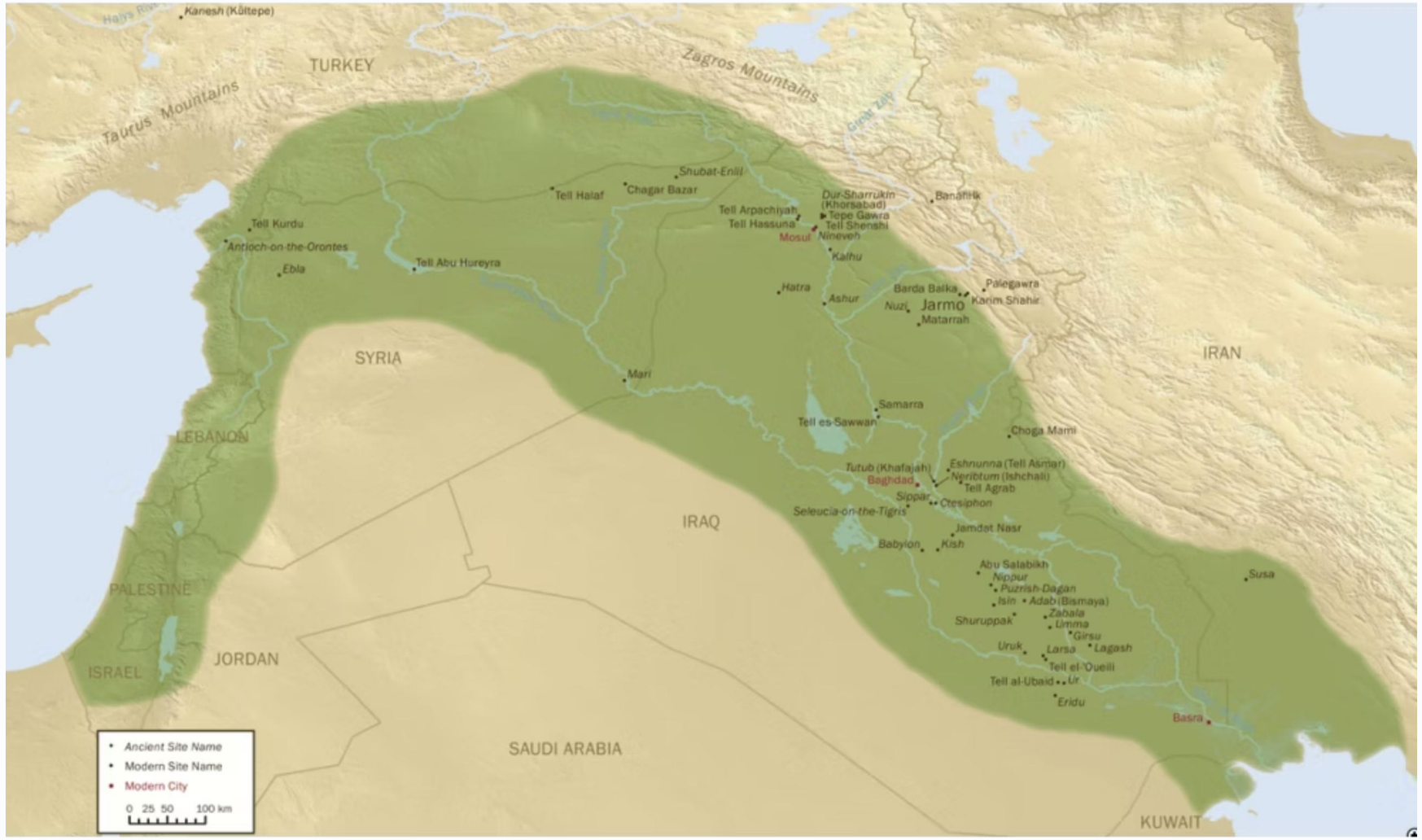
Built for Carbohydrate Scarcity, Living in Abundance

For most of human history, carbohydrates were scarce and seasonal. Our bodies evolved to switch between glucose and ketones depending on availability.



The Globalisation of Carbohydrates Over the Last 450 Years

Cereal Production & the Cradle of Civilization



Keep in mind:
Complex carbs are also only glucose holding hands

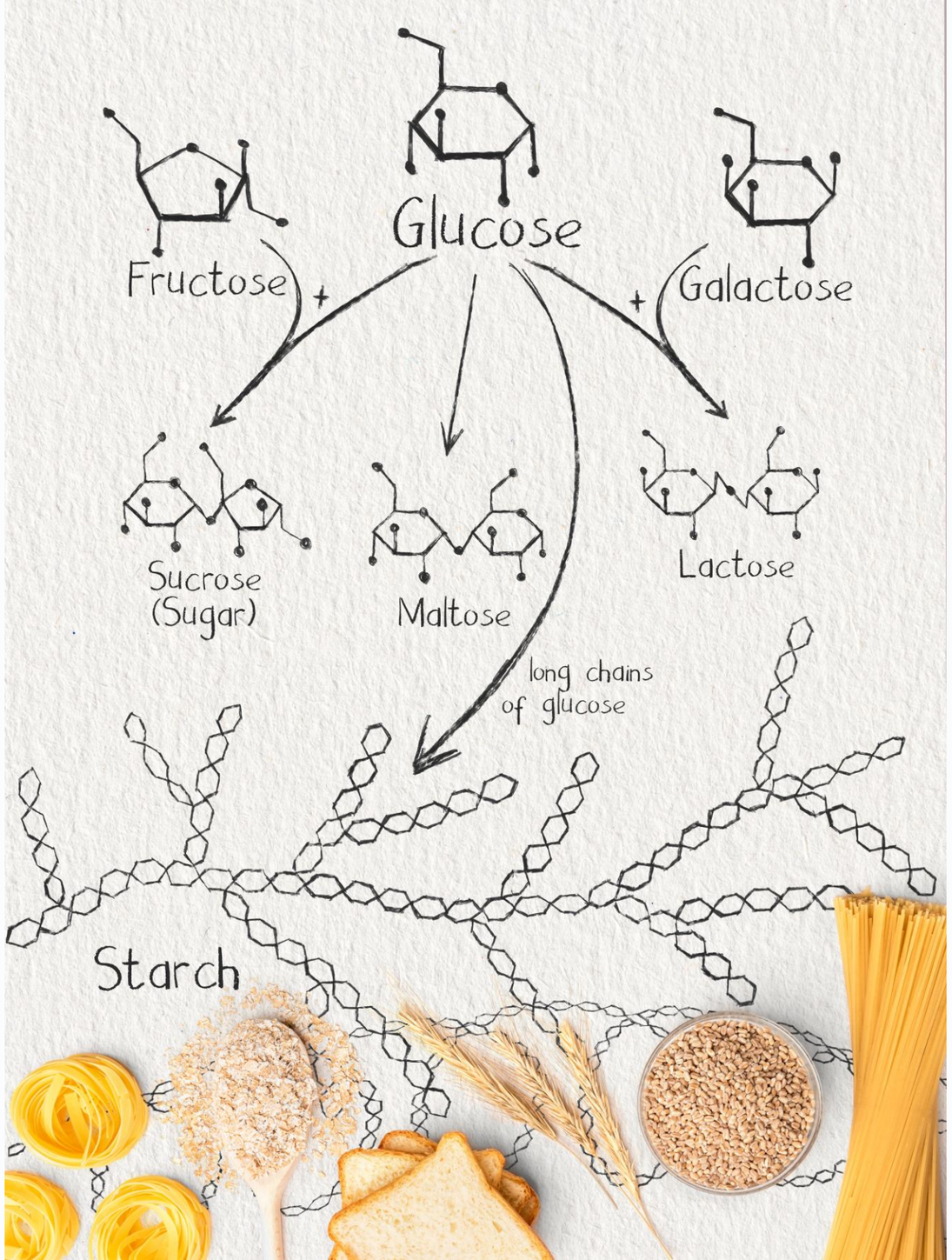


Image from "Food For Health: Nutrition Principles For Optimal Metabolism", Dr. Sofia Deloudi, 2022

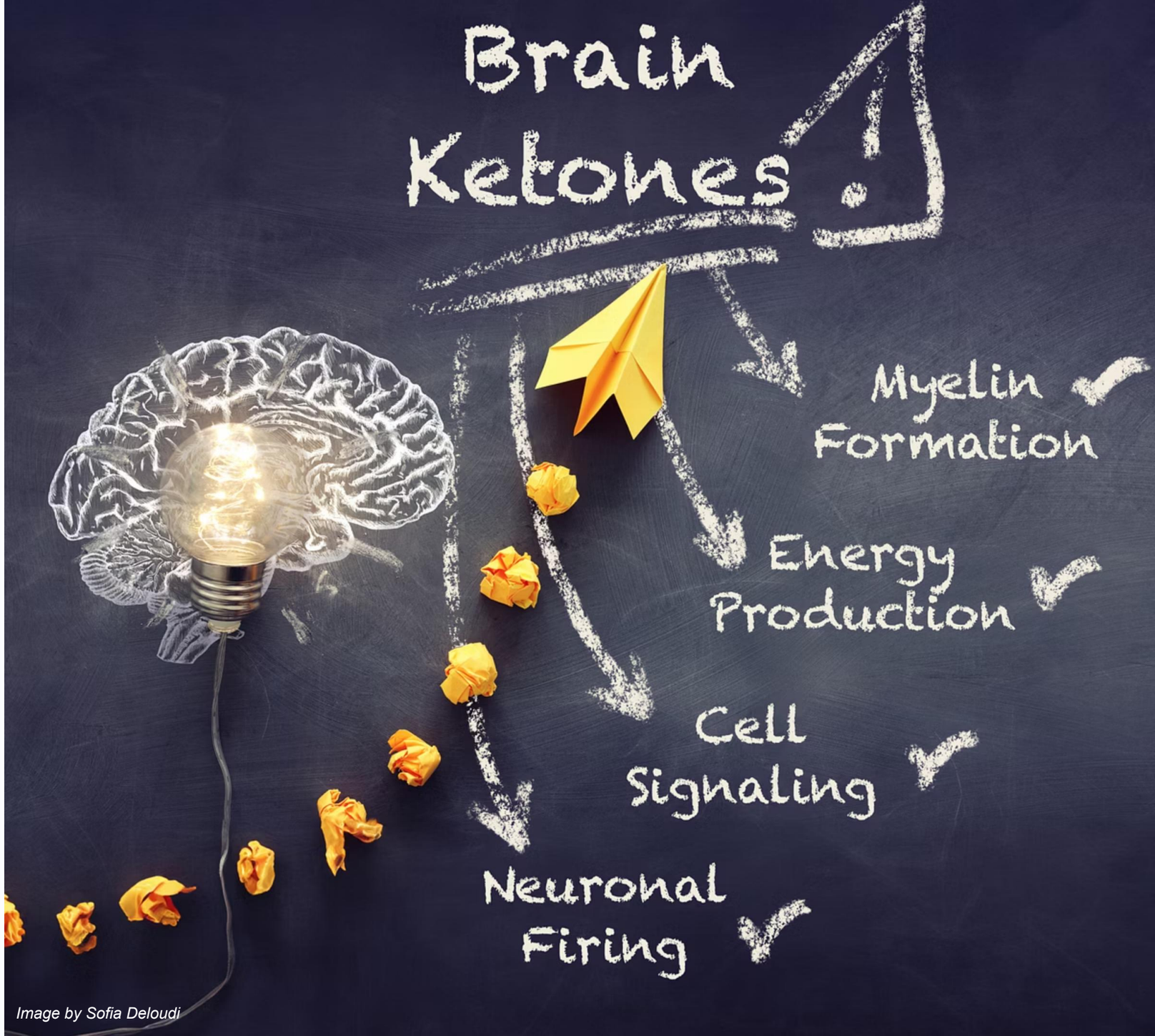
Image from "Food For Health: Nutrition Principles For Optimal Metabolism", Dr. Sofia Deloudi, 2022

This Is Your Brain on Sugar

Not a Lack of Willpower—A Hijacked Brain

Ketosis: Unique Advantage for the brain

Ketones play a key role in optimal brain function. The brain not only actively transports ketones across the blood-brain barrier—it also produces them locally in astrocytes.



N. Auestad, R. A. Korsak, J. W. Morrow, J. Edmond: Fatty Acid Oxidation and Ketogenesis by Astrocytes in Primary Culture, Journal of Neurochemistry, https://doi.org/10.1111/j.1471-4159.1991.tb11435.x

How Can We Utilise Today's Technology?

We have the technology to move beyond one-size-fits-all dietary advice. Biomarker feedback allows individuals to see how their bodies respond—enabling personalisation and improving adherence.

Keto Is Uniquely Measurable

Ketogenic diets are the only dietary approach with a built-in biomarker. You can objectively test whether someone is in the metabolic state—no guessing, no relying on food diaries alone.

Personalisation Through Measurement

With objective data, interventions can be calibrated to the individual. Some people need strict carbohydrate reduction; others see benefits with modest changes. Testing reveals the minimum effective dose.

01

Collect Objective Data

Measure individual biomarker responses

02

Calibrate Intervention

Determine minimum effective dose

03

Personalise Approach

Tailor carbohydrate levels to individual needs

frontiers | Frontiers in Nutrition

TYPE Review
PUBLISHED 01 September 2025
DOI 10.3389/fnut.2025.1629921

The role of β-hydroxybutyrate testing in ketogenic metabolic therapies

Cristina Fante [1,2*], Franziska Spritzler [2], Lori Calabrese [3], Nicole Laurent [4], Caroline Roberts [5], and Sofia Deloudi [2,6]

1 BHB testing enables monitoring of dietary adherence

2 BHB testing supports the interpretation of clinical outcomes

3 BHB testing informs personalized adjustments based on individual metabolic responses

4 BHB testing may facilitate behavior change through real-time feedback

C: Fante, F. Spritzler, L. Calabrese, N. Laurent, C. Roberts, S. Deloudi: The role of β-hydroxybutyrate testing in ketogenic metabolic therapies. Front. Nutr. 2025;12:1629921

The Key to Long-Term Success

When people see their own data and understand their individual threshold, they're more likely to sustain the change. It's no longer an arbitrary prescription—it's a personalised approach based on their biology.

A Feedback Loop

Patient

- Adherence
- Empowerment
- Reinforcement
- Awareness

Practitioner

- Precision medicine
- Shared and data-driven decision making
- Real-time monitoring and consultions

C: Fante, F. Spritzler, L. Calabrese, N. Laurent, C. Roberts, S. Deloudi: The role of β-hydroxybutyrate testing in ketogenic metabolic therapies. Front. Nutr. 2025;12:1629921

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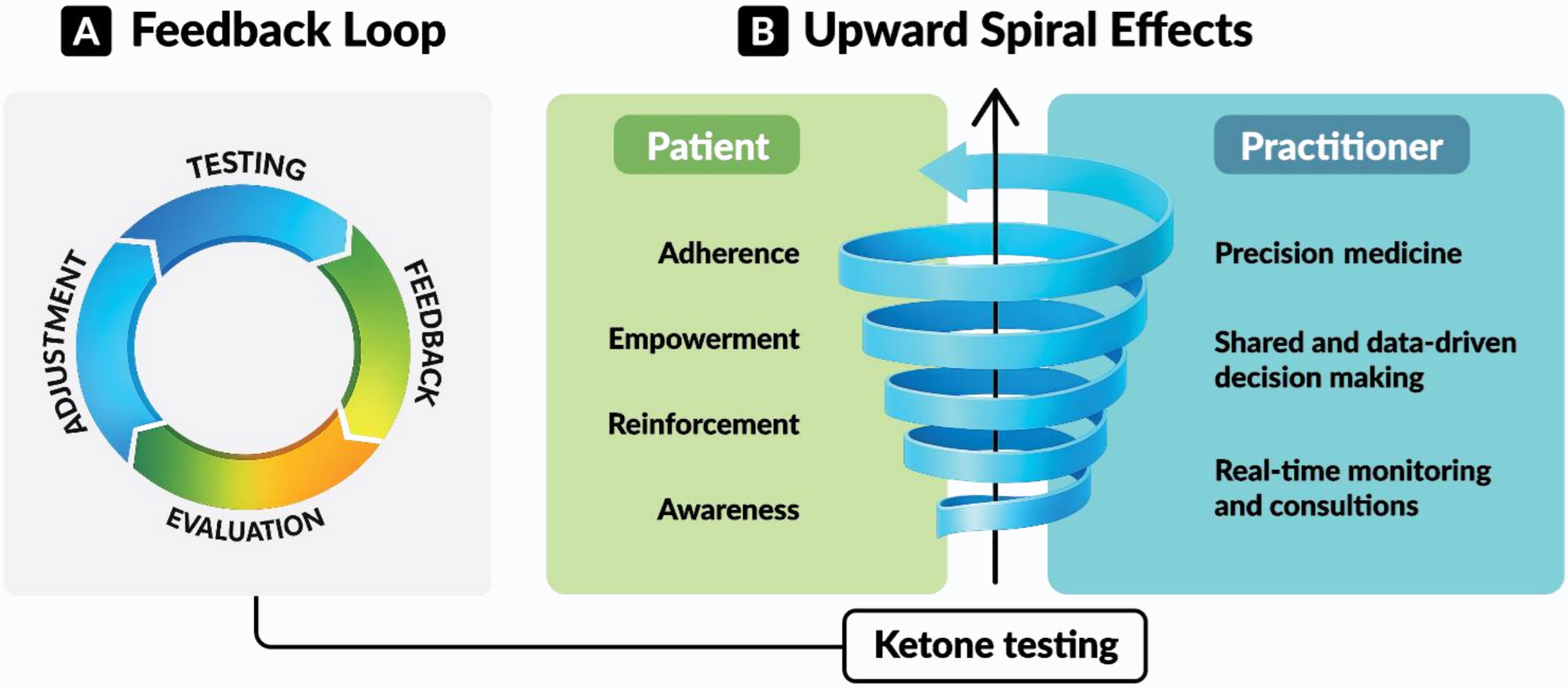


C: Fante, F. Spritzler, L. Calabrese, N. Laurent, C. Roberts, S. Deloudi: The role of β-hydroxybutyrate testing in ketogenic metabolic therapies. Front. Nutr. 2025;12:1629921

Evidence on BHB Testing in Key Applications

Type 2 Diabetes

Higher BHB levels were associated with better lipid profiles and greater likelihood of sustained remission over 5 years.

Psychiatric Conditions

Preliminary evidence suggests a dose-response relationship — higher BHB levels correlated with greater symptom improvement in bipolar disorder and schizophrenia.

Oncology

Greater depth and consistency of ketosis linked to disease stability. Lower BHB levels more often associated with disease progression.

Weight Loss

A mean BHB of approximately 0.5 mmol/L in the first 90 days was identified as the threshold for achieving 10% or greater weight loss at one year.

C: Fante, F. Spritzler, L. Calabrese, N. Laurent, C. Roberts, S. Deloudi: The role of β-hydroxybutyrate testing in ketogenic metabolic therapies. Front. Nutr. 2025;12:1629921

The Largest Analysis of BHB - Glucose Pairs

Retrospective observational analysis of BHB and glucose pairs collected via Keto-Mojo meters synchronized to **MyMojoHealth**.

11.8M

BHB and glucose paired readings

138K

Unique Users

5 Years

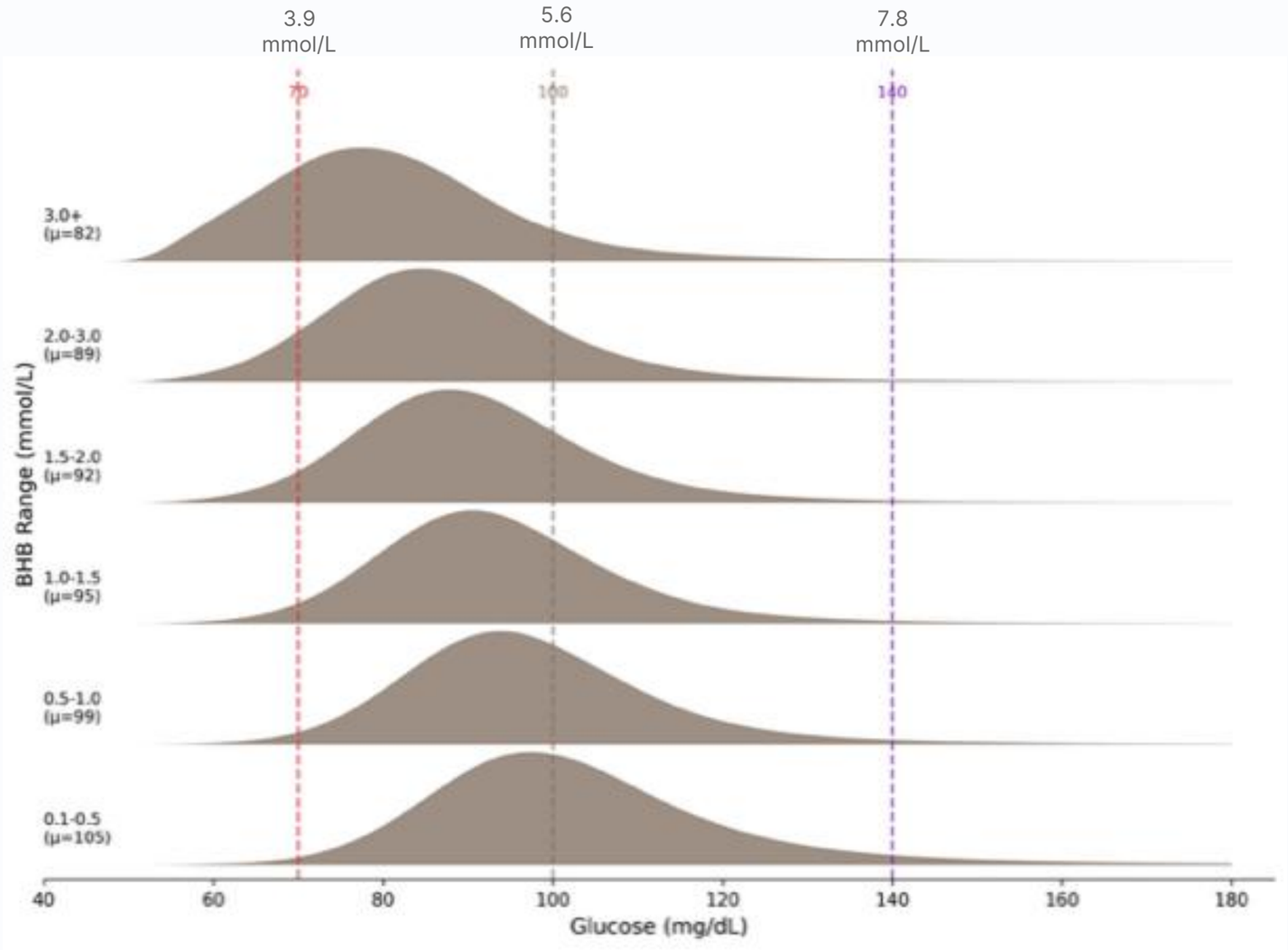
Timeframe: 2020–2025

This naturalistic dataset captures real-world variation in free-living individuals unavailable in controlled studies.

Soto-Mota et al. Manuscript submitted

Higher BHB Is Associated with Lower Glucose

Higher BHB levels were associated with a meaningful shift toward lower glucose levels across the nutritional ketosis range



Soto-Mota et al. Manuscript submitted

What This Means for the Interpretation of BHB Readings

BHB may signal more than “just” dietary adherence

Higher BHB in the range of nutritional ketosis may reflect a favorable metabolic state

BHB monitoring may reduce the need for concurrent glucose testing

Soto-Mota et al. Manuscript submitted

Analysis of BHB circadian rhythm

Retrospective observational analysis of BHB levels collected via Keto-Mojo meters synchronized to the **MyMojoHealth** platform.

11.8M

BHB Readings

140K

Unique Users

5 Years

Timeframe: 2020–2025

This naturalistic dataset captures real-world variation
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Soto-Mota et al. Manuscript submitted

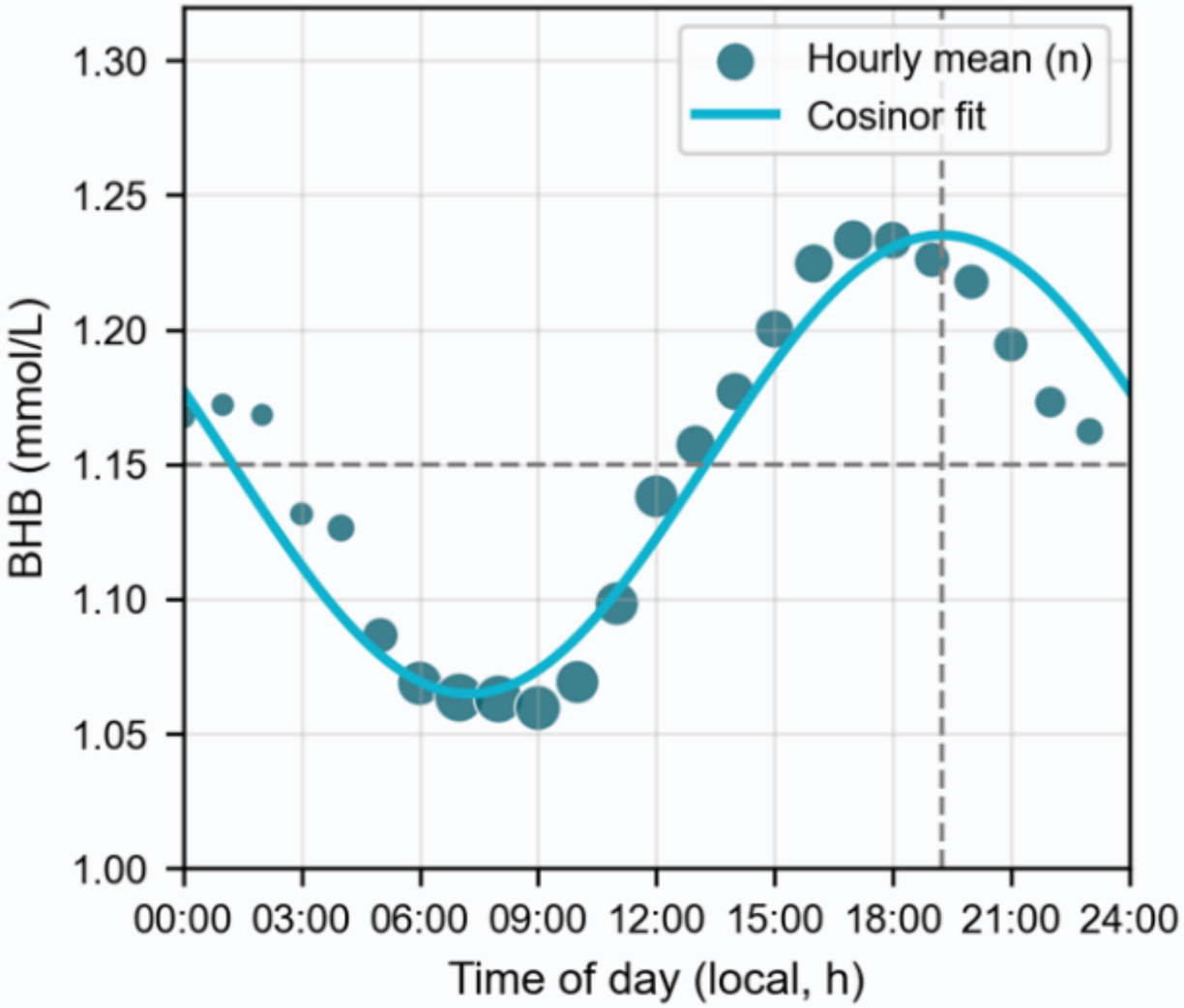
BHB Follows a Natural Circadian Rhythm

Morning Trough
1.06 mmol/L

Evening Peak
1.23 mmol/L

Evening BHB is 15% higher than morning.

Males show a larger morning-evening contrast than females.



Soto-Mota et al. Manuscript submitted

Take-Home Messages

Nutritional Ketosis is a Natural Metabolic State

Ketosis is a fat-burning state enhanced by low carbohydrate intake and low insulin levels.

BHB Follows a Natural Circadian Rhythm

BHB levels exhibit a robust circadian rhythm; standardizing testing times will improve the accuracy and comparability of evaluations.

KMTs Offer Unique Biomarkers

Ketone bodies provide objective, measurable indicators of dietary adherence, setting KMTs apart from other nutritional strategies.

Monitoring BHB is Empowering

Consistent BHB monitoring enables accurate outcome interpretation, empowers patients with real-time insights, and supports personalized, data-driven clinical decisions.

Adherence is the Central Question

Without verifying adherence, the efficacy of a nutritional intervention cannot be accurately interpreted.

BHB May Signal Metabolic Health

Higher BHB is consistently associated with lower glucose, suggesting it reflects a favorable metabolic state, not just dietary compliance. It may also help distinguish true metabolic health from insulin-compensated euglycemia.

Thank You

Dorian Greenow

dorian@keto-mojo.com