

# **BREATH** vs **BLOOD**

Real Starving vs Simulated Starving

Robert Ness

# I tracked ketone bodies with two devices to see how one compared to the other.

- Why I wanted to track ketosis
- Can breath measurement replace blood pricks?
- Full Fast vs Fat fast vs normal keto-diet
- Results
- Conclusions

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# I build statistical models for proteomics and metabolomics, so...

- Super interested in tracking biochemical data
- Most direct way to control what is happening inside
- Focusing on tracking **ketone bodies**



*Google smart contact lens*

KENKODO  
InsideTracker



# Ketogenic diet induces ketosis in the body, leading to some desirable outcomes

- Ketosis: metabolic state where most of the body's energy supply comes from ketone bodies in the blood
- Can be induced through dietary program
- Favored as a weight-loss approach, research suggests other potential benefits
- Gateway to DIY metabolomics: ketone bodies are measured with cheap devices

# Why I'm interested in tracking ketones

- Building a database on nootropics and cognitive interventions with Jesse Lawler at [SmartDrugSmarts.com](https://SmartDrugSmarts.com)
- Reviewing research on the effects of ketosis on neurology and cognition
- Could tracking of ketone bodies be used in pursuit of optimal cognitive function?



*Jesse Lawler*



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# Devices used for tracking ketone bodies

## Precise Xtra Glucose and Ketone monitor

- Measures ketone body called BHB\* in blood
- Reports mmol/L

## Ketonix Sport

- Measures ketone body called acetone in the breath
- Reports integer between 0 and 30, greater numbers meaning higher acetone detection

\* *beta-hydroxybutyrate*





# Sanity testing the Ketonix Sport

- Blood ketone tests are reliable, but strips are expensive and require blood pricks.
- New Ketonix Sport is much easier and affordable, but is it a reliable replacement for blood tests?
- **Do sanity testing! — benchmark your new devices on ones you know work before you just start tracking things!**



## I tried different diets to get full range of measurements

1. Varied the energy economy so data would have more range
2. Repeated measurements over 3 days for each diet to see day-to-day variation
3. Took measurements at 12PM, 1PM, 4PM each day to see hour-to-hour variation. On eating days I ate at 11AM

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# 21 days of measurement:

7 days full fast -> 7 days fat fast -> 7 days keto

STARVING

1. Full fast (except water and tea)



SIMULATED  
STARVING

2. Fat fast (fat only, 0 carb, 0 protein, vitamins, roughage)



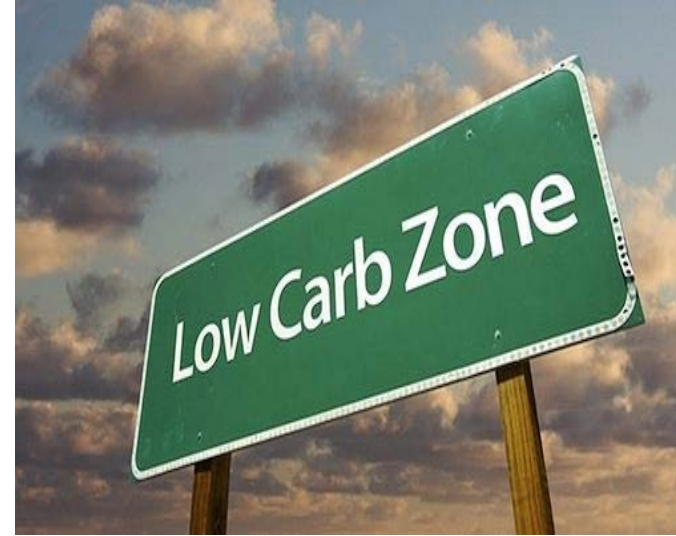
3. Keto diet (high fat, medium protein, low carb)



Each diet lasted 7 days, took measurements on the last 3 days

# But Robert, why didn't you carb up?

- I often go on full fasts and fat-only fasts
- I normally eat keto.
- I very rarely break my diet with high carb foods
- Not interested in measurements during carb digestion
- Ketonix can't just work in general, it must be precise enough to be useful in the ketosis range

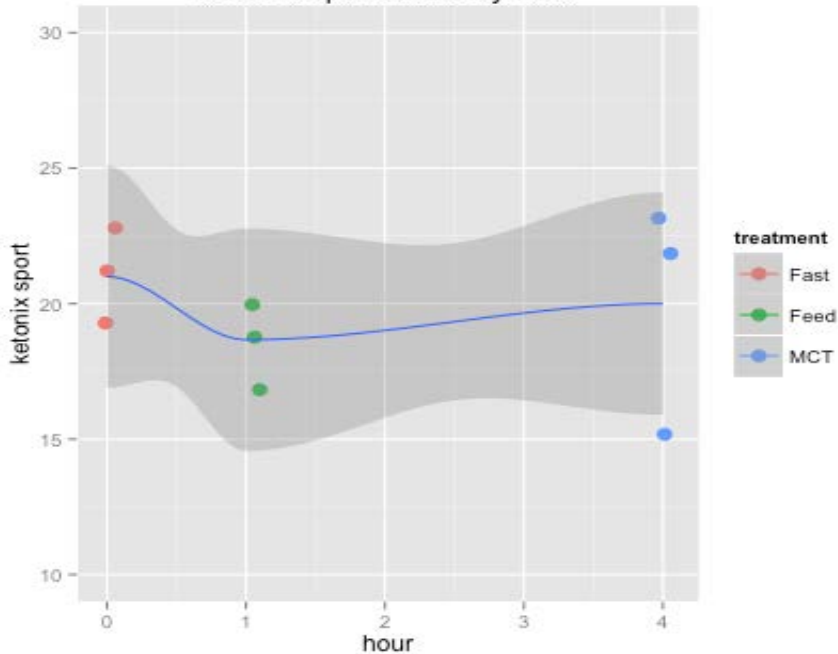


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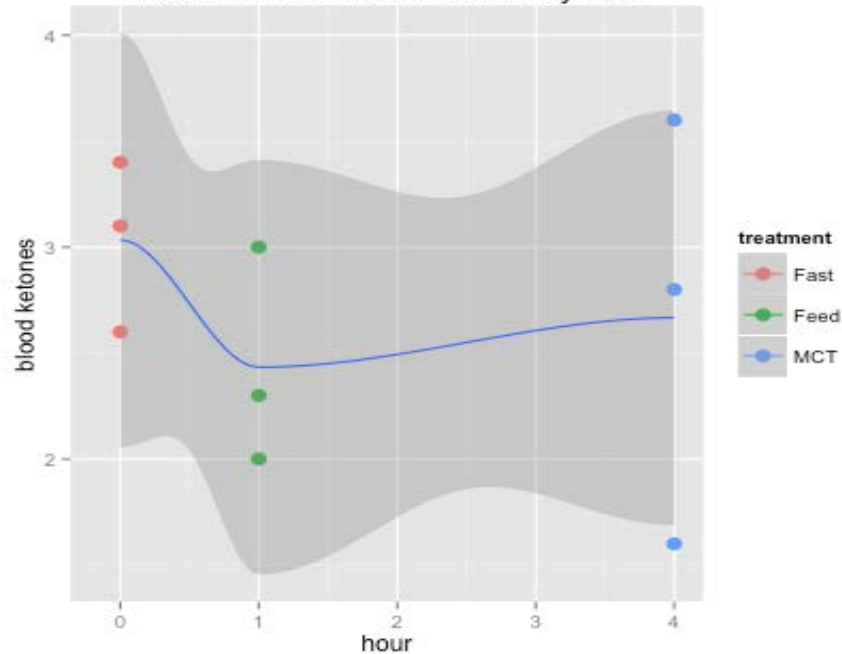
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# Similar behavior between devices over the course of the day

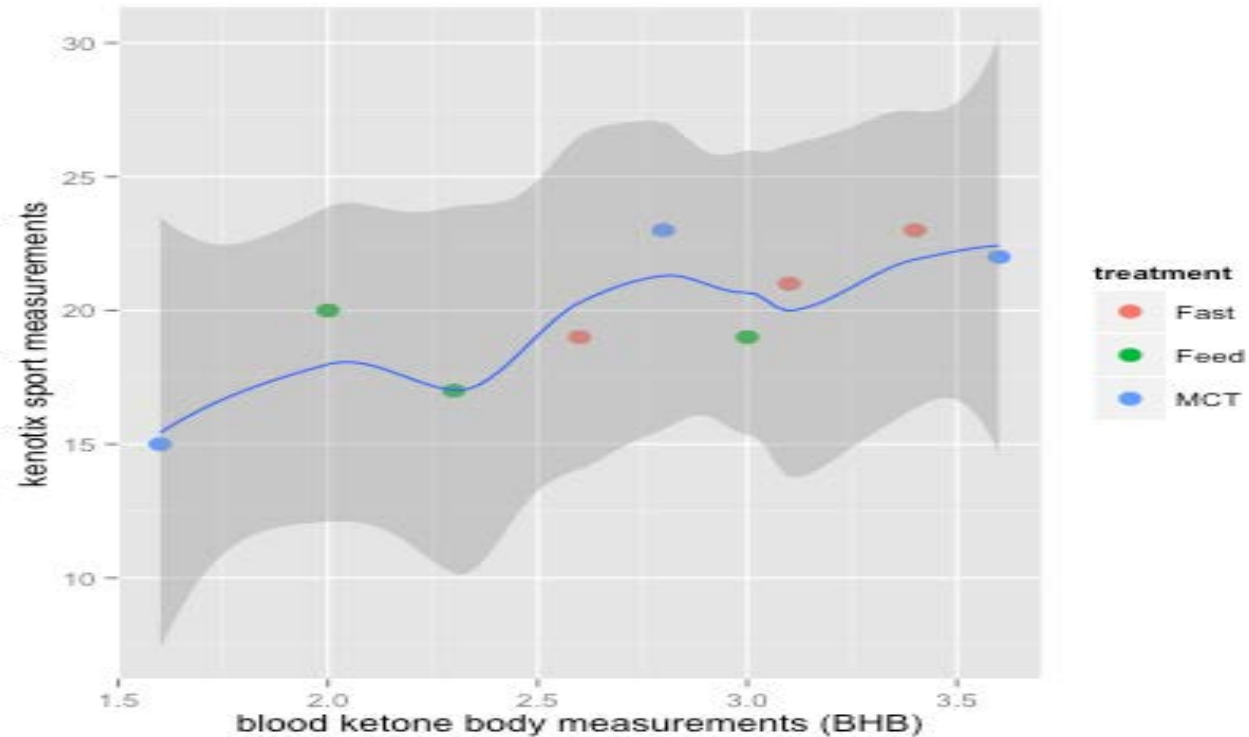
Ketonix sport levels by hour



Blood ketones measurements by hour



# Looks like there's a trend between my blood ketones and Ketonix Sport measurements





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# Conclusions

- Too much variation for strong conclusions, but feeling better about purchasing Ketonix.
- My fat only diet had greater variation in measurements across both devices. Artifact? Post-fast effects? Use of MCT oil?

# Ketone body tracking needs a bigger goal than the diet

- Ketogenic diet = eating few carbs = being in ketosis.
- Diet compliance doesn't require tracking
- So why track?

# Possibilities lie in combining ketone bodies with other analytes to optimize performance

- **Muscle training:** target ketones, glucose, and insulin response for optimal training.
- **Endurance training:** target ketones to optimize VOmax
- **Nootropic effects:** target ketones for optimal cognition?
- More research needed before these can be made into practice.

**THANK YOU**