Potential benefits of reduced carbohydrate diet for better cardiometabolic and cognitive health in older adults living in a retirement home

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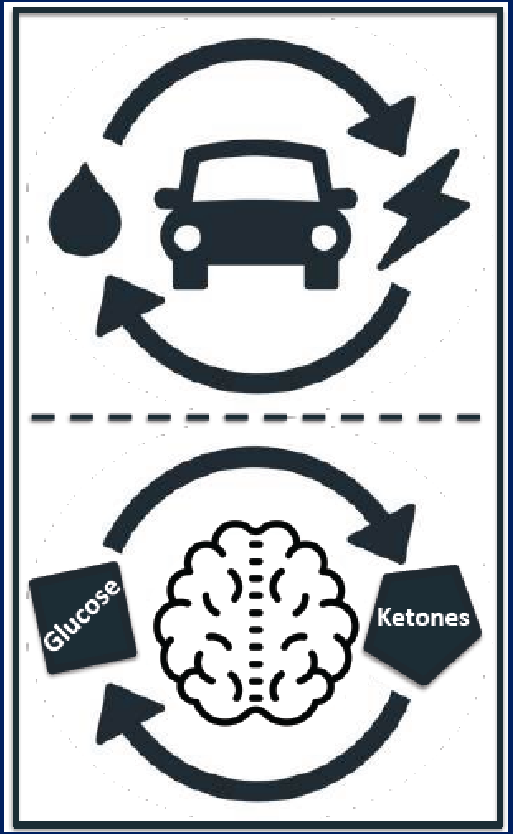
Université de Sherbrooke

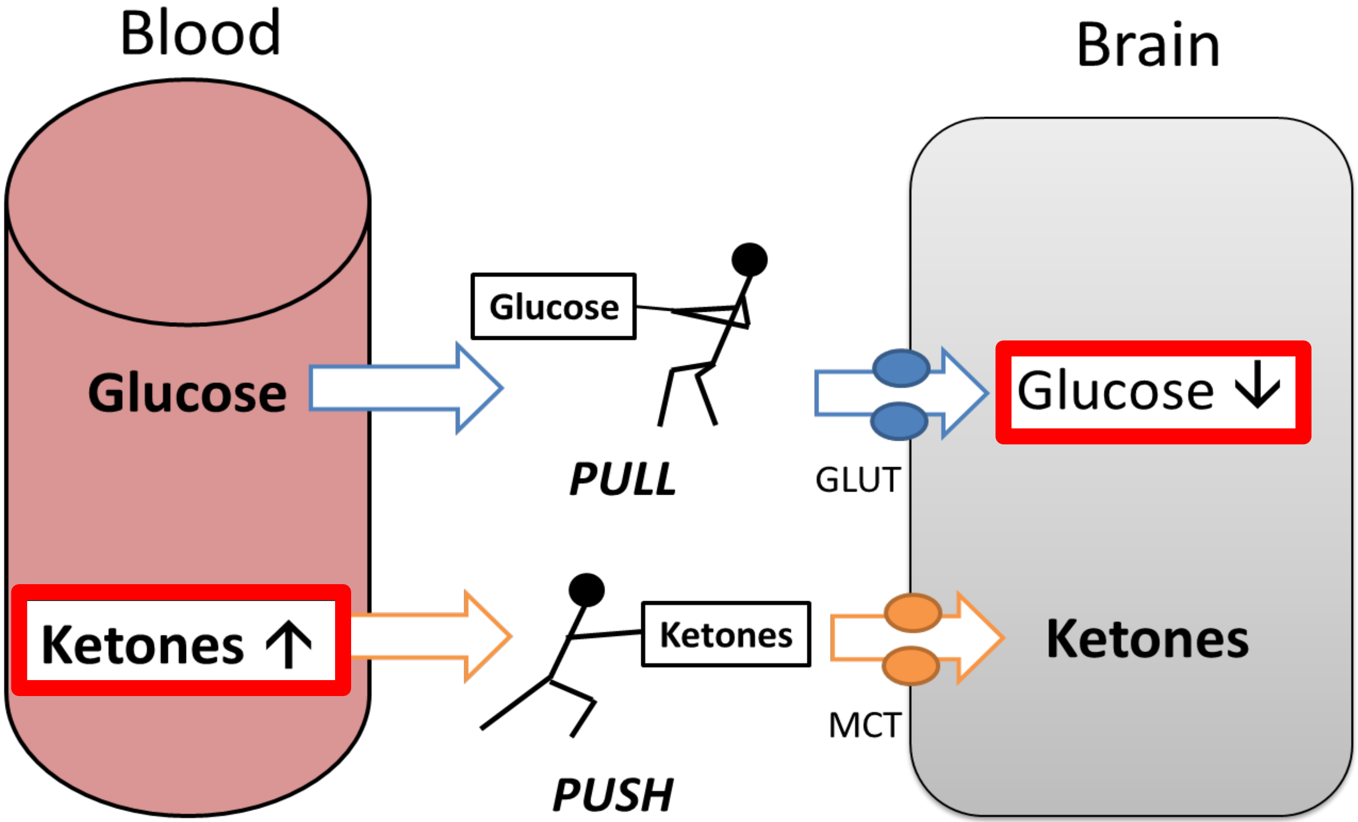
NOTE

The contents of this presentation are for research purposes only and should not be interpreted as nutritional or medical advice.

The brain: a hybrid car



Brain energy metabolism:
Two distinctly different strategies for the two main fuels



ENDOGENOUS KETONES

Dietary or stored fatty acids,
i.e. Keto diet, fasting, carb restriction

$$CH_3 - \overset{\overset{\large O}{\|}}{C} - CH_2 - COOH$$

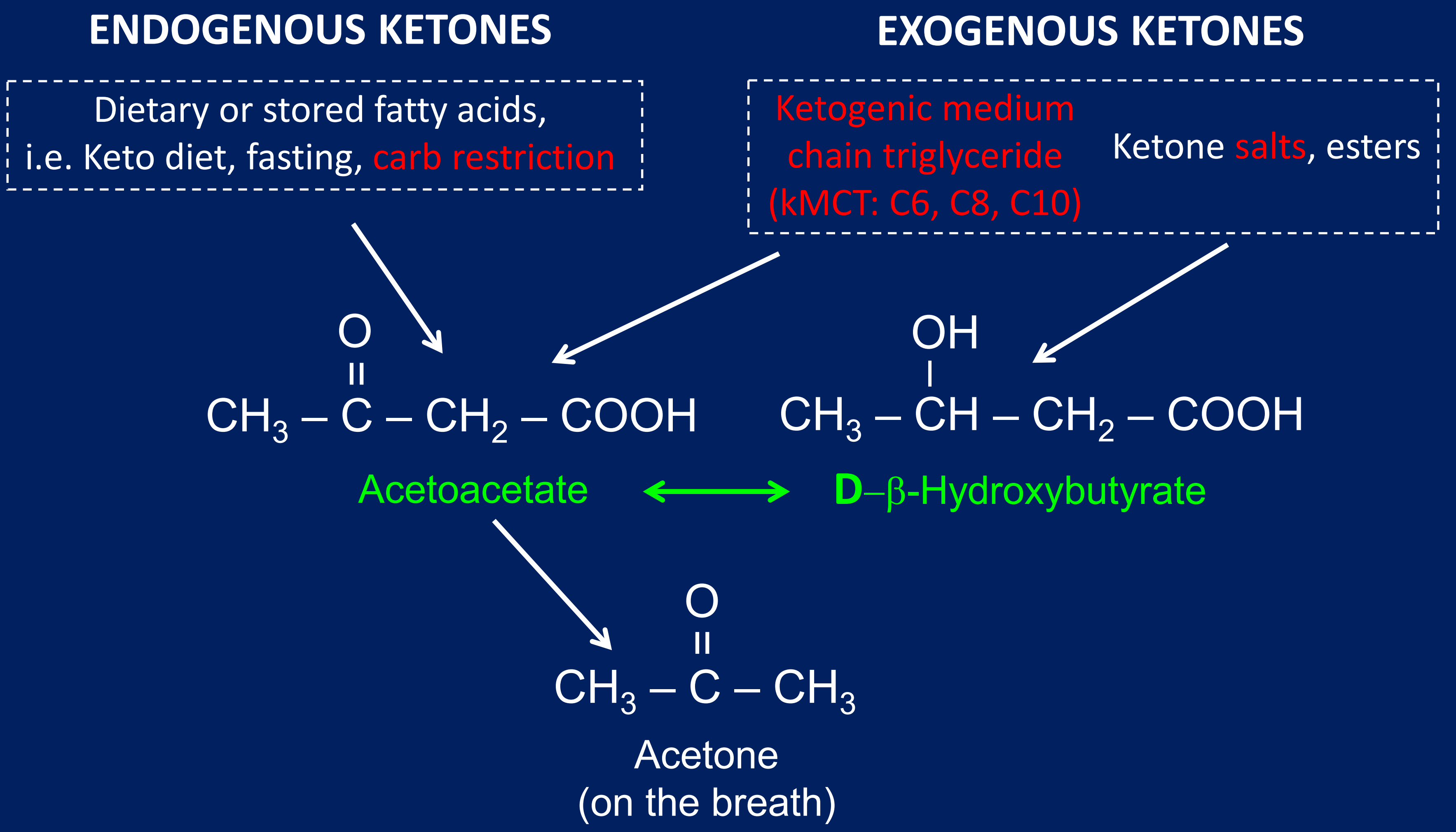
Acetoacetate

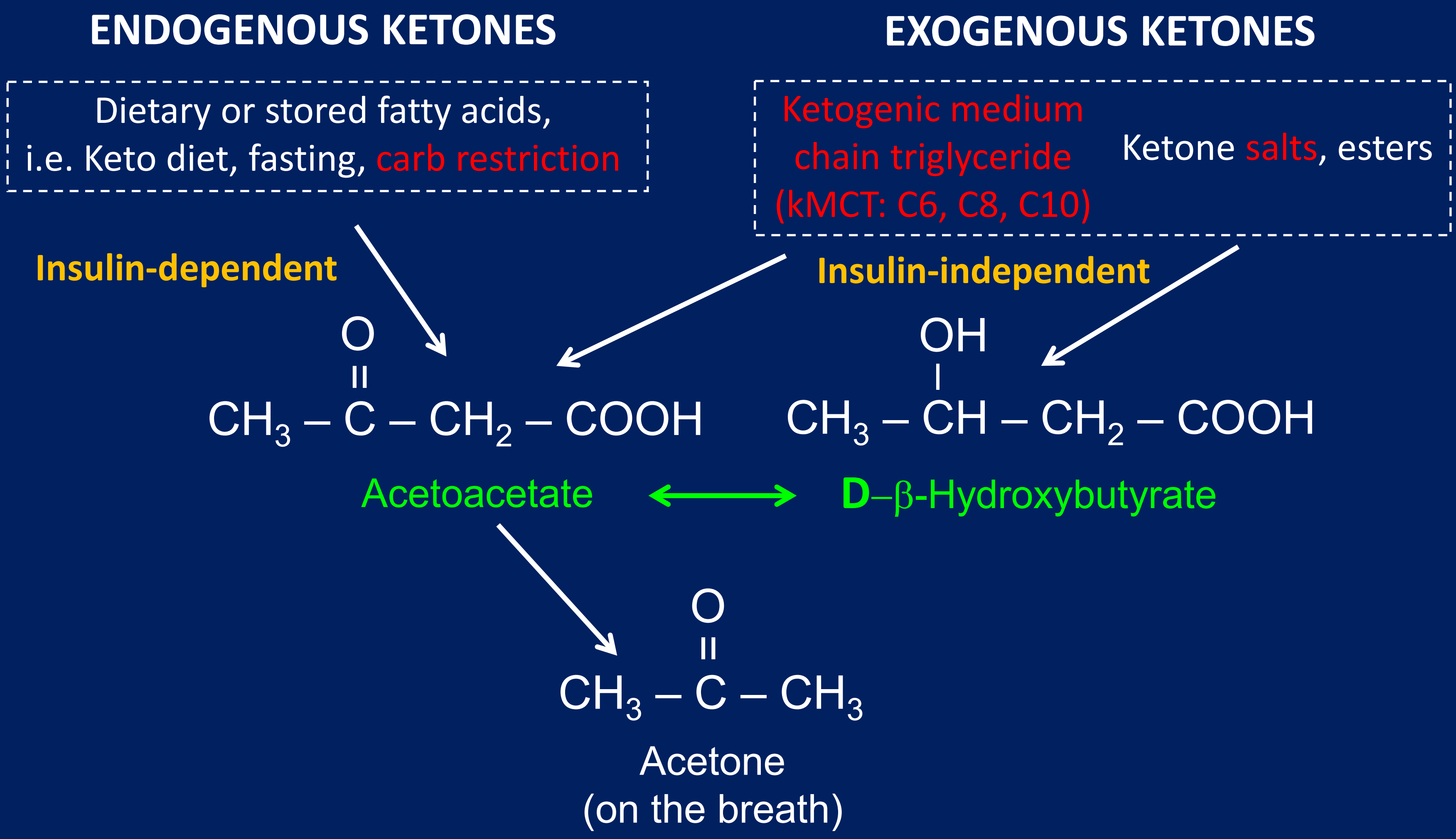
$$CH_3 - \overset{\overset{\large OH}{|}}{CH} - CH_2 - COOH$$

D–β-Hydroxybutyrate

$$CH_3 - \overset{\overset{\large O}{\|}}{C} - CH_3$$

Acetone
(on the breath)

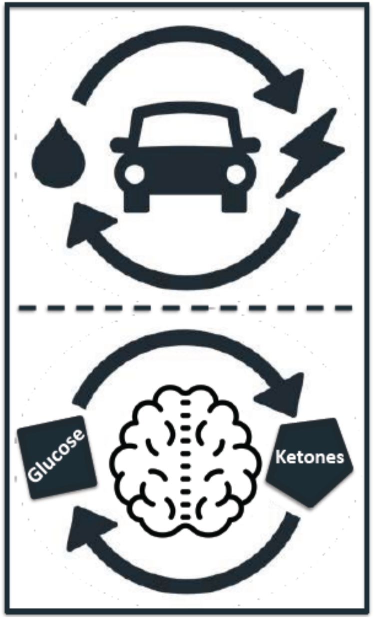

ENDOGENOUS KETONES
EXOGENOUS KETONES
Dietary or stored fatty acids, i.e. Keto diet, fasting, carb restriction
Ketogenic medium chain triglyceride (kMCT: C6, C8, C10)
Ketone salts, esters
Acetoacetate
D–β-Hydroxybutyrate
Acetone (on the breath)


ENDOGENOUS KETONES
EXOGENOUS KETONES
Dietary or stored fatty acids,
i.e. Keto diet, fasting, carb restriction
Ketogenic medium chain triglyceride (kMCT: C6, C8, C10)
Ketone salts, esters
Insulin-dependent
Insulin-independent
$CH_3 - C(=O) - CH_2 - COOH$
$CH_3 - CH(OH) - CH_2 - COOH$
Acetoacetate
D–β-Hydroxybutyrate
$CH_3 - C(=O) - CH_3$
Acetone
(on the breath)

Brain glucose hypometabolism in Alzheimer and Parkinson disease: the hybrid car in difficulty

GLUCOSE

(down to 70-85%
from the normal 95-98%;
no known way to increase it)



KETONES

(2-5%)

Brain glucose hypometabolism in Alzheimer and Parkinson disease: the hybrid car in difficulty

GLUCOSE
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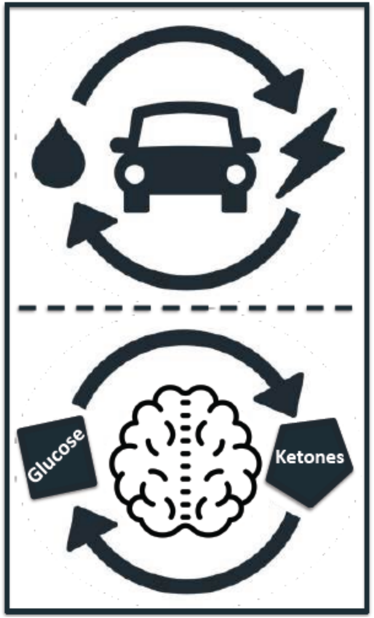


KETONES
(2-5%)

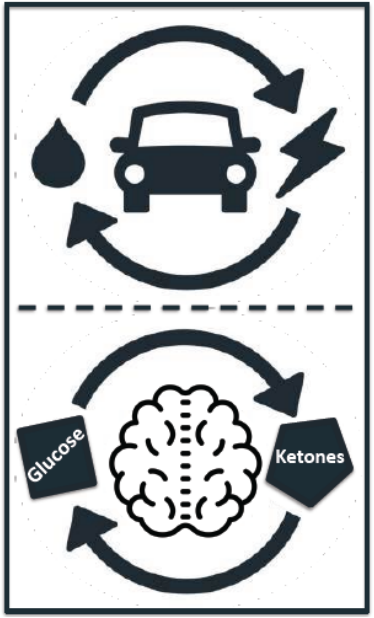
BRAIN ENERGY GAP

Drift towards type 2 diabetes with insulin blocking the normal endogenous ketone production in response to low plasma glucose

Brain glucose hypometabolism in Alzheimer and Parkinson disease: the hybrid car in difficulty

GLUCOSE

(down to 70-85% from the normal 95-98%; no known way to increase it)



KETONES

(2-5%; can only be increased by exogenous ketones OR better metabolic control)

BRAIN ENERGY GAP

Drift towards type 2 diabetes with insulin blocking the normal endogenous ketone production in response to low plasma glucose

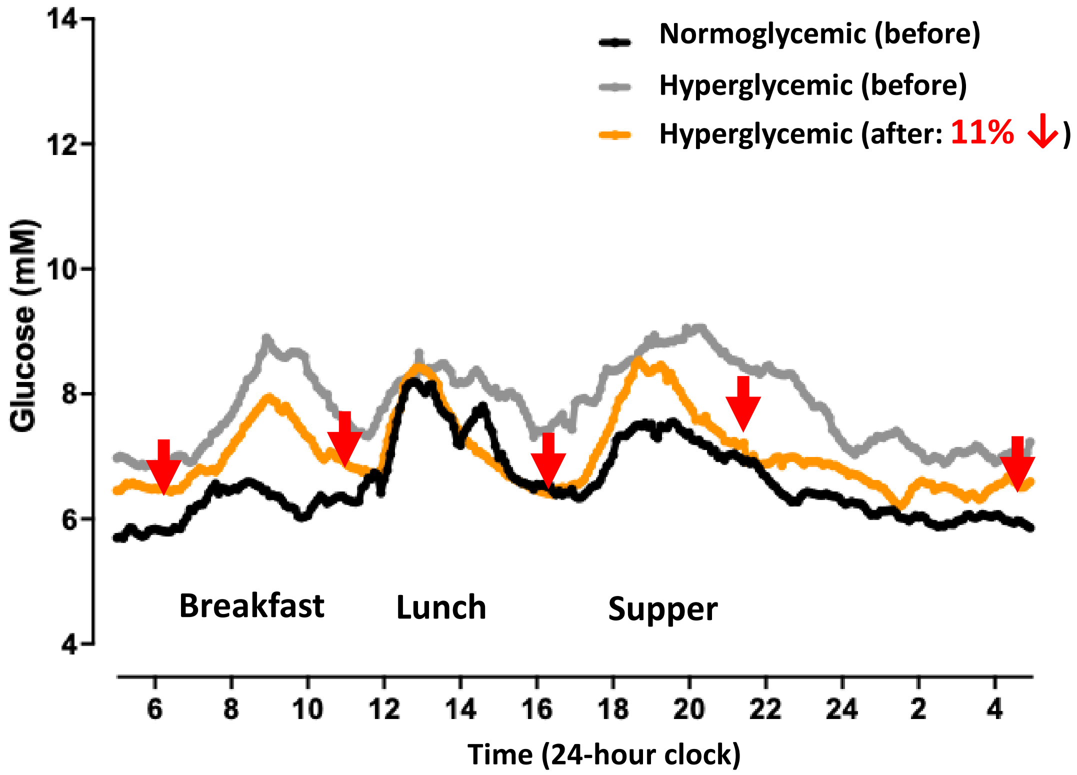
Why restrict carbohydrate in the context of brain fuel supply?

- ‘Excess’ intake of refined carbohydrate contributes to insulin resistance.
- Insulin resistance relatively common in older people.
- Type 2 diabetes ↑ risk of Alzheimer, Parkinson disease.
- Insulin resistance = ↓ brain glucose utilization, ↓ lipolysis, ↓ ketone synthesis.
- Both glucose and ketones are compromised = double jeopardy for the brain.
- HOWEVER - exogenous ketones ↑ cognition in early Alzheimer disease (MCI).
- Carb restriction ↑ insulin sensitivity, ketogenesis - feasible in <u>older people</u>?
- Can it improve cognitive and cardiometabolic health in older people?

Study design – Dietary carb reduction in a retirement home

- Same lunch and supper meal plan for everyone
- N=24, 83 y old, MMSE = 28
- 2-month intervention: dietary carbs ↓32% (190 → 130 g/d; 48 → 33% energy)
- Breakfast – own apartment; lunch and supper – all together in dining room
- Post-hoc separation of normo- and hyperglycemia (fasting glucose)
- Continuous glucose monitoring, smart watch for physical activity
- Blood samples at baseline, 1- and 2-months (end)

2-months of a 32% reduced carbohydrate diet improved metabolic control in hyperglycemic older people



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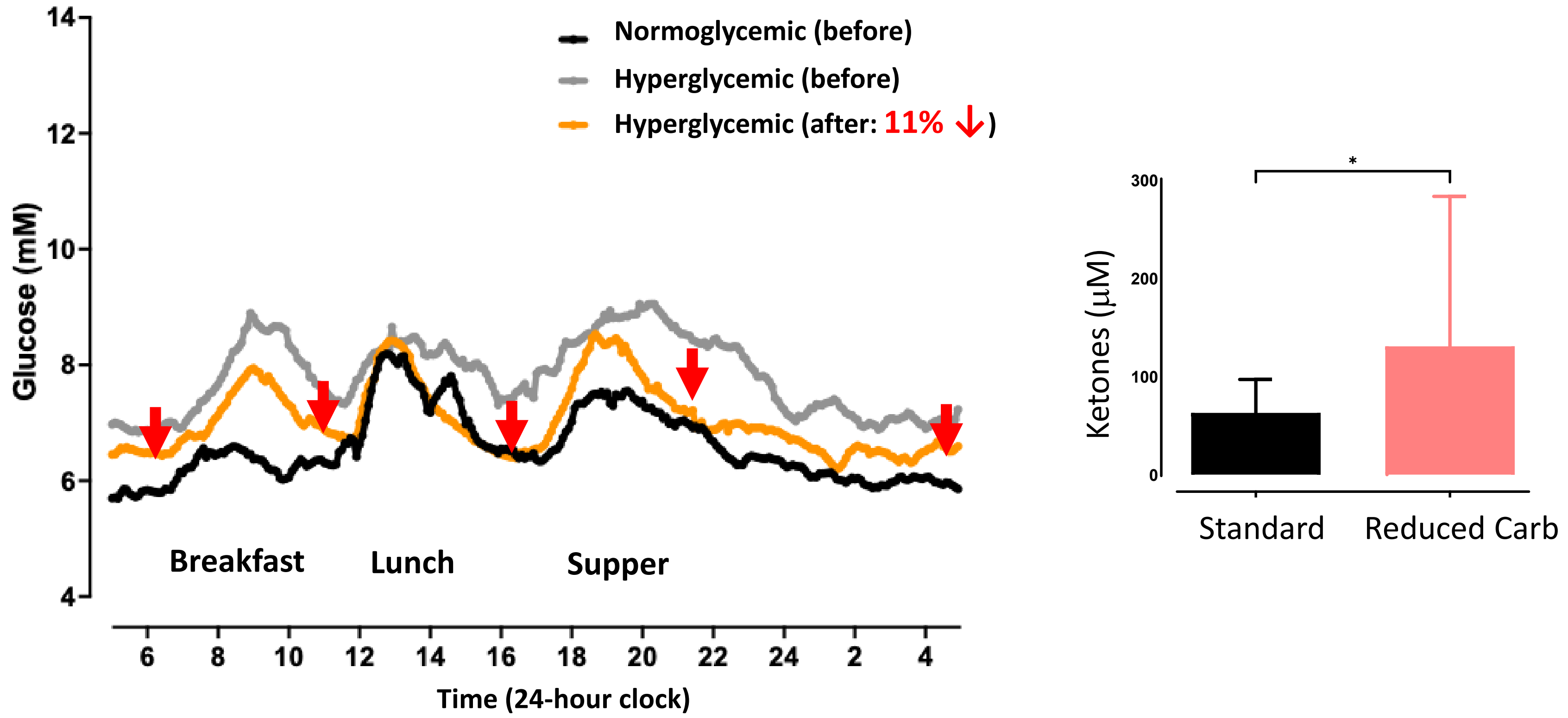

Overall benefit of moderately reduced carb intake

- Glucose control ↑; hyperglycemics closer to normoglycemic
- Cardiometabolic health markers:
  - Fasting, post-prandial glucose ↓, HbA1c ↓, tCH ↓, LDL↓, TG ↓
  - No change: body wt, BMI, insulin, blood pressure
- Improved reaction time in hyperglycemics
- No change in physical activity
- Mild ketosis
- ~10% ↑ general wellbeing vs. standard menu
- No adverse effects

Gaps and implications

- Longer-term assessment of sustainability
- Potential to reduce medication, insulin for type 2 diabetes
- Larger sample size, longer intervention needed for full assessment of cognition, cardiometabolic improvement
- Feasibility, efficacy in those with significant cognitive decline ?
- Clear opportunity to test in other retirement homes

THANK YOU !

Team and collaborators:

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Université de Sherbrooke

Résidence le VÜ

Participants

https://recherche-cerveau-sherbrooke.ca/