

# The glycaemic response to a renal-specific oral nutritional supplement and its effect on appetite in patients with type 2 diabetes during haemodialysis: a randomised crossover trial

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# Rationale

- Both the loss of renal function and dialysis affect the maintenance of optimal glucose control in patients with diabetes.
- Malnutrition is common in patients with end stage kidney disease (ESKD) undergoing haemodialysis<sup>1</sup>.
- Oral nutrition support is the first line option, however, the use of standard oral nutritional supplements (ONS) may be undesirable for patients with diabetes<sup>2</sup>.
- More recently renal-specific ONS with modified carbohydrate have been developed, however the evidence for their use is limited.

# Hypothesis

A renal-specific ONS would elicit a lower postprandial blood glucose response than either a standard ONS or a macronutrient matched ONS, whilst not affecting appetite in patients with diabetes and ESKD undergoing haemodialysis.



# Methods

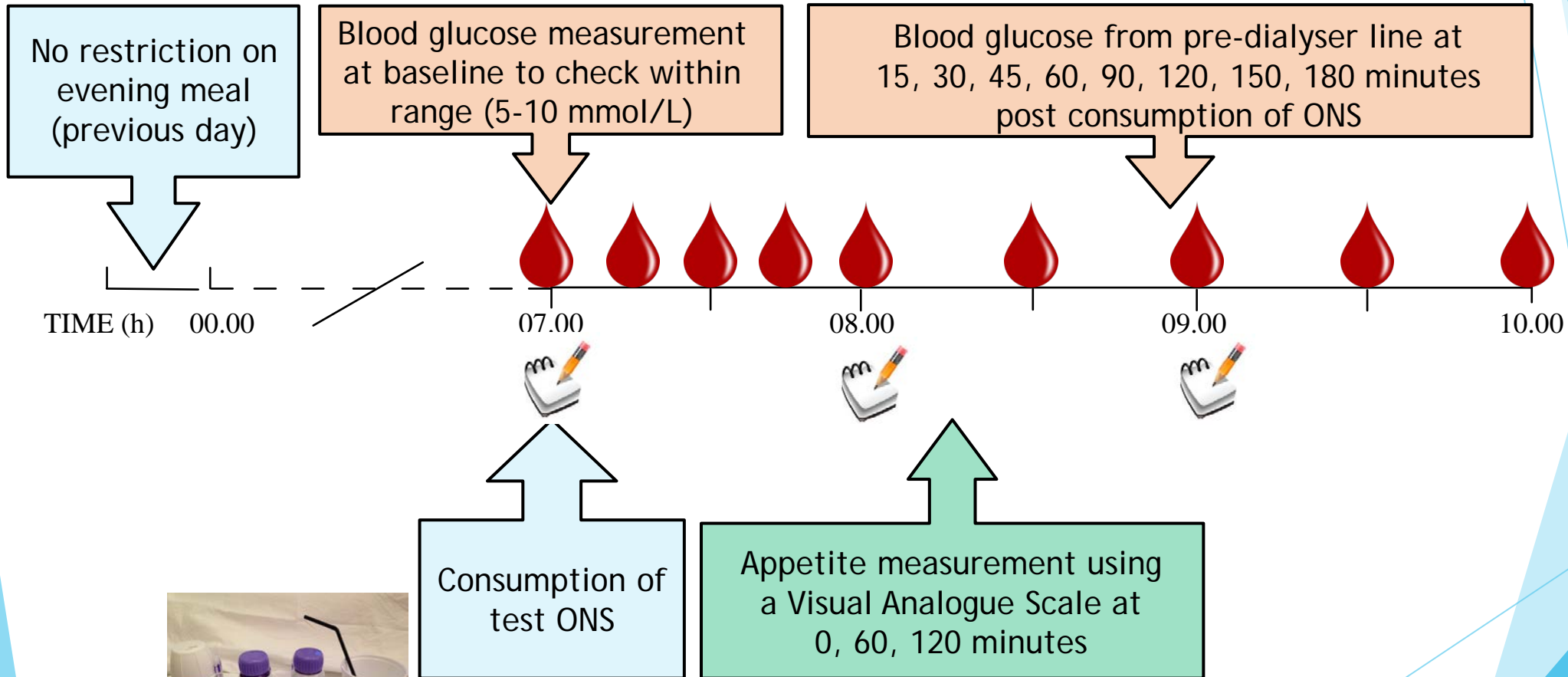
- A randomised single-blinded crossover trial in 8 patients at King's College Hospital Renal Unit and at four satellite haemodialysis units.
- Patients undertook three study sessions over three weeks. During each study session, patients consumed one of the following ONS within 10 minutes, given in a random order:
  1. A renal-specific ONS (220 ml Nepro HP [Abbott Nutrition])
  2. A macronutrient matched ONS (125 ml Fortisip Compact Protein [Nutricia] mixed with 20ml Calogen [Nutricia])
  3. A standard ONS (125 ml Fortisip compact [Nutricia]).
- There was a one week wash out period between each study session to minimise any carryover effect.

# Macronutrient composition of test ONS

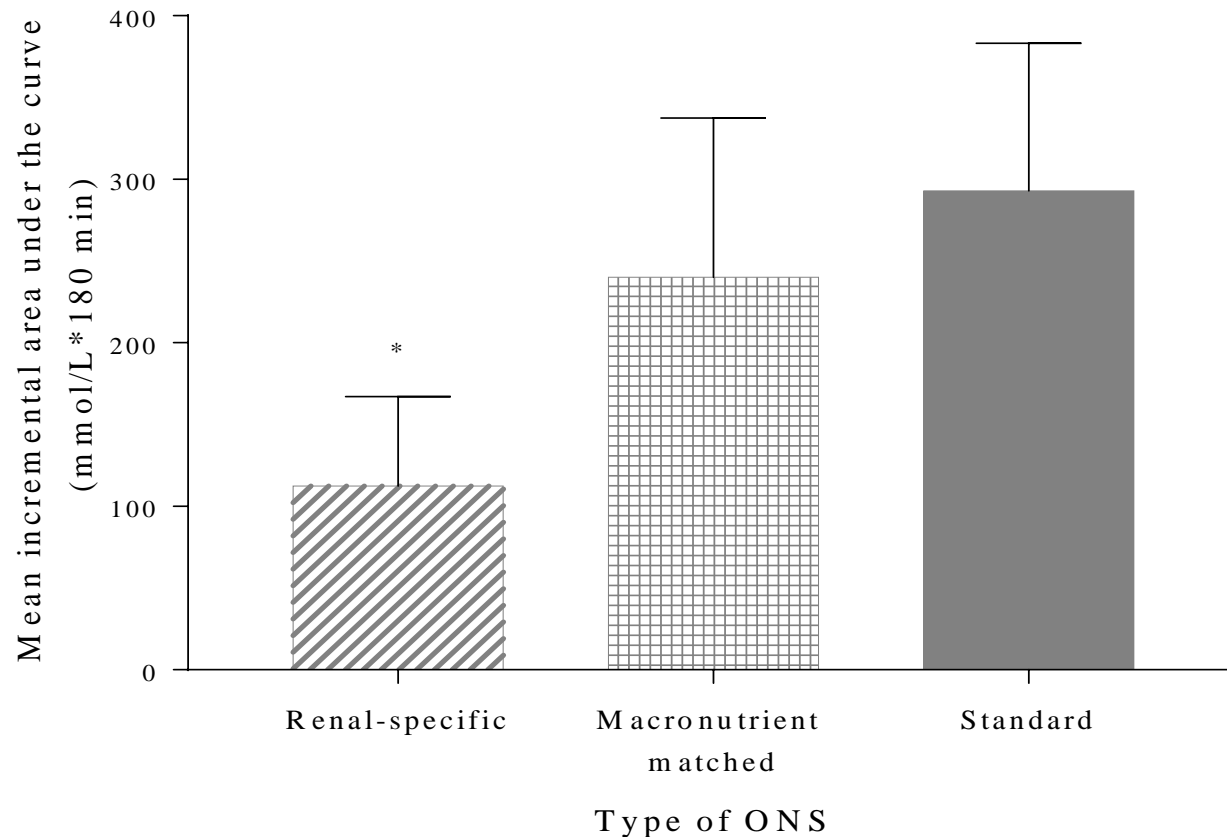
	Renal-specific	Macronutrient matched	Standard
Energy (kcal)	396	390	300
Protein: g (En%)	17.8 (18)	18.0 (19)	12.0 (16)
Carbohydrate: g (En%)	34.3 (32)	30.5 (29)	37.1 (46)
Sugars	7.0	16.6	18.8
Fibersol®-2	23.1	0.0	0.0
FOS	1.9	0.0	0.0
Glycerine	2.3	0.0	0.0
Fat: g (En%)	21.5 (49)	21.8 (50)	11.6 (35)
Saturated	1.6	2.2	1.1
Monounsaturated	15.6	13.2	7.0

Abbreviations: En%, Energy percent; FOS, fructooligosaccharides.

# A typical study day



# Results: glucose (incremental area under the curve)

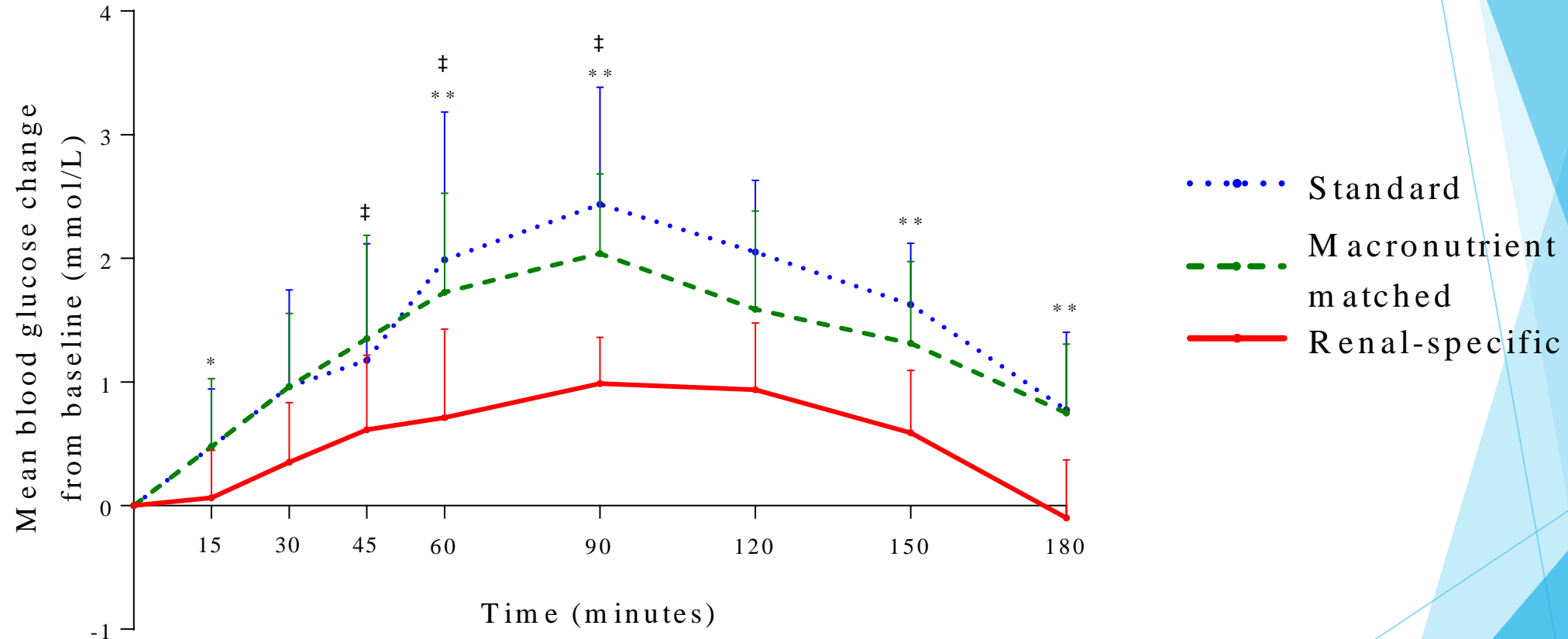


3 hour postprandial glucose response (mean incremental area under the curve) was significantly lower following renal-specific ONS compared to:

- macronutrient matched ONS ( $P=0.017$ )
- standard ONS ( $P=0.006$ ).

Data are mean  $\pm$  95% confidence intervals (error bars). \* $P<0.05$  compared to macronutrient matched and standard ONS.

# Results - glucose



\* $P < 0.05$  between renal-specific ONS and standard ONS. † $P < 0.05$  between renal-specific ONS and macronutrient matched ONS. \*\* $P < 0.01$  between renal-specific ONS and standard ONS.

# Results - appetite

No significant differences at 1h or 2h between the type of ONS and:

- ▶ Hunger
- ▶ Fullness
- ▶ Satisfaction
- ▶ Desire to eat
- ▶ Prospective consumption
- ▶ Urge to eat
- ▶ Preoccupation with food

The type of ONS consumed therefore made no significant difference to appetite over time.

Must consider whether using as a supplement or as sole source of nutrition<sup>3</sup>.

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Please complete before you drink the nutrition drink.

Patent ID: \_\_\_\_\_  
Unit: \_\_\_\_\_ Date: \_\_\_\_\_

Please make a vertical mark on each line that best matches how you feel.

How hungry do you feel?  
Not at all hungry \_\_\_\_\_ As hungry as I have ever felt

How full do you feel?  
Not at all full \_\_\_\_\_ As full as I have ever felt

How satisfied do you feel?  
I am completely empty \_\_\_\_\_ I cannot eat another bite

How strong is your desire to eat?  
Very weak \_\_\_\_\_ Very strong

How much do you think you could eat now?  
Nothing at all \_\_\_\_\_ A large amount

How strong is your urge to eat?  
No urge to eat \_\_\_\_\_ Strong urge, want to eat now

Do you have preoccupation with thoughts of food?  
No thoughts of food \_\_\_\_\_ Very preoccupied

# Mechanisms

## Fibersol<sup>®</sup>-2

- a digestion-resistant corn maltodextrin
- more resistant 1,2-, 1,3- $\alpha$  or  $\beta$ -linkages compared to 1,4- $\alpha$  linkages in starch
- Has shown to slow glucose absorption in healthy subjects<sup>4</sup> and in patients with diabetes<sup>5</sup>, but not specifically in patients with ESKD.

## FOS

- Prebiotic, non-digestible dietary fibre
- Reach the colon undigested where they are fermented to form short chain fatty acids such as acetate and propionate which can influence carbohydrate and lipid metabolism.

# Conclusion

- This is the first study investigating the effect of a renal-specific ONS on blood glucose concentrations in patients with diabetes and ESKD whilst on haemodialysis.
- A renal-specific ONS elicited a lower postprandial blood glucose response than both a standard ONS or a macronutrient matched ONS in patients with diabetes and ESKD whilst undertaking haemodialysis.
- The type of ONS consumed did not have an effect on appetite.

# Implications

- May help patients with diabetes achieve optimal glycaemic control, reducing the risk of microvascular and macrovascular complications<sup>6</sup>.
- Further research is warranted using sufficiently powered RCTs to study the potential chronic effects of renal-specific ONS in order to elucidate the mechanisms underlying this association.

# References

1. Bossola, M., Tazza, L., Giungi, S., Rosa, F., and Luciani, G. (2010). Artificial nutritional support in chronic hemodialysis patients: a narrative review. *Journal of Renal Nutrition* 20(4), 213-223.
2. Coulston, A.M. (1998). Clinical experience with modified enteral formulas for patients with diabetes. *Clinical Nutrition* 17, 46-56.
3. Whelan, K., Efthymiou, L., Judd, P.A., Preedy, V.R., and Taylor, M.A. (2006). Appetite during consumption of enteral formula as a sole source of nutrition: the effect of supplementing pea-fibre and fructo-oligosaccharides. *British Journal of Nutrition* 96(2), 350-356.
4. Tokunaga, K., and Matsuoka, A. (1999). Effects of a FOSHU (food for specified health use) containing indigestible dextrin as a functional component on glucose and fat metabolisms. *Journal of the Japanese Diabetes Society* 42, 61-63.
5. Nomura, M., Nakajima, Y., and Abe, H. (1992). Effects of long-term administration of indigestible dextrin as soluble dietary fiber on lipid and glucose metabolism. *Journal of Japan Society Nutrition Food Sciences* 45, 21-25.
6. Ricks, J., Molnar, M., Kovesdy, C., Shah, A., Nissenson, A., Williams, M., and Kalantar-Zadeh, K. (2012). Glycemic control and cardiovascular mortality in hemodialysis patients with diabetes: a 6-year cohort study. *Diabetes* 61(3), 708-715.

# Any questions?

