

Effect of Low Carbohydrate Bread Containing Beta-glucan Enriched Barley on Postprandial Glucose Response and Its Second-meal Effect



Yasuo Nakatsuka¹ Ikuo Kanamoto Ph.D.²

¹ The Low Carbohydrate Bread Society of Japan (Flag Shop ; Henriette) , Tsukuba, Japan

² Laboratory of Drug Safety Management, Faculty of Pharmaceutical Sciences, Josai University , Japan

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Background & Objectives

The consumption of low-carbohydrate meal is known to suppress postprandial glucose response. On the other hand, the health benefits of high molecular weight β -glucan are highly interesting and there is an approved health claim from the European Food Safety Authority. It has been shown that the suppression effect on postprandial glucose response for low carbohydrate (LC) breads with/without containing (1-3),(1-4)- β -glucan enriched barley. We have evaluated two types of LC breads compared with refined wheat flour bread, whole grain bread and rice. Both LC breads are made of natural powdered materials (soybean, almond, walnuts, barley, wheat bran, tofu, wheat gluten etc.), without containing wheat-flour and industrial fiber-enriched materials (e.g. indigestible dextrin).

Test breads & Rice

Table 1 Nutrient composition of the test breads and rice (per 100grams)

	Comparison			Low carbohydrate (LC) breads	
	Rice	Sweet bread	Whole grain bread	Mild LC bread	Super LC bread
Energy (kcal)	150	270	217	235	257
Protein (g)	2.3	8.6	9.9	23.5	25.2
Fat (g)	0.1	4.0	2.1	10.5	14.5
Carbohydrate (g)	33.3	48.8	37.2	9.5	4.2
Dietary fiber (g)	0.3	2.2	4.7	4.2	4.6
Ash (g)	0.1	1.1	1.5	1.9	2.1
Salt (mg)	1	320	320	310	300

Table 2 Test conditions of "Second meal effect" on β -glucan contents in Mild LC bread

Test conditions in Mild LC bread	β -glucan contents		
	Low (Test)	Medium (Standard ¹)	High (Test)
Bread intakes at first meal	114g	119g	125g
Energy (kcal)	280	280	280
β-glucan (g)	0	1.1	2.2
Carbohydrate (g)	6.5	11.3	16.6

¹ Standard Mild LC bread consists of 0.9% β -glucan.



Fig.1 Experimental results of material design for each LC breads



Fig.2 Mild LC breads and appearance after baking

Evaluation Method

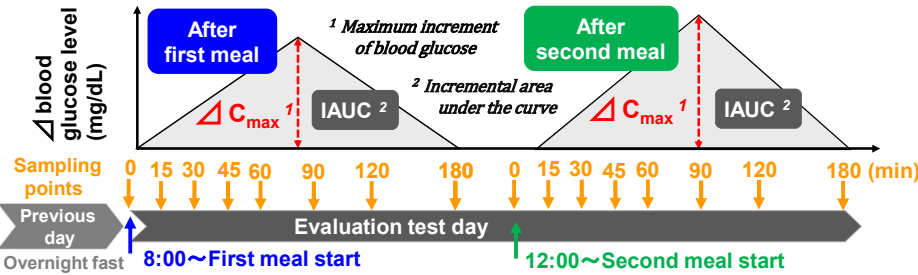


Fig.3 Blood sampling points and evaluation contents (ΔC_{max} & IAUC)



Fig.4 Blood glucose meter (Arkray, Glucocard™)

Table 3 Clinical characteristics

Ourselfs (husband & wife)		
Age (year)	65	65
Body height (cm)	170	150
Body weight (kg)	70	59
BMI (kg/m ²)	24.2	26.2
FBG ¹ (mg/dL)	100-110	100-110
HbA1c (%)	6.0	6.1

¹ Fasting blood glucose

Results & Discussions

The mild LC bread containing β -glucan enriched barley was only shown that suppression effect persisted to postprandial glucose response after next meal (second-meal effect). The present study suggested that the mild LC bread containing beta-glucan enriched barley had an advantageous potential for diabetes self care.

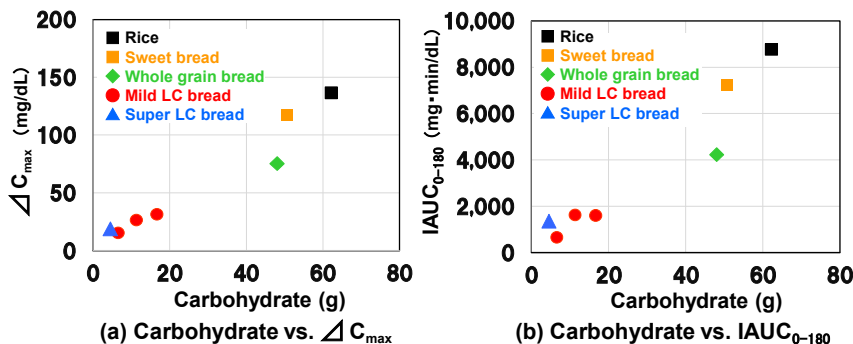


Fig.5 Relationship between Carbohydrate and ΔC_{max} , IAUC after first meal

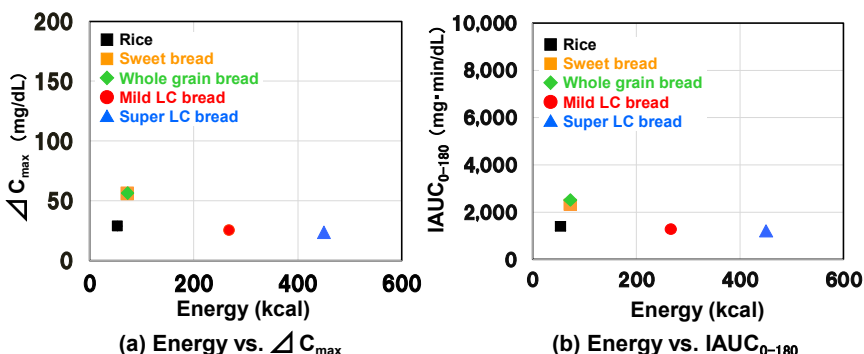


Fig.6 Relationship between Energy and ΔC_{max} , IAUC after first meal

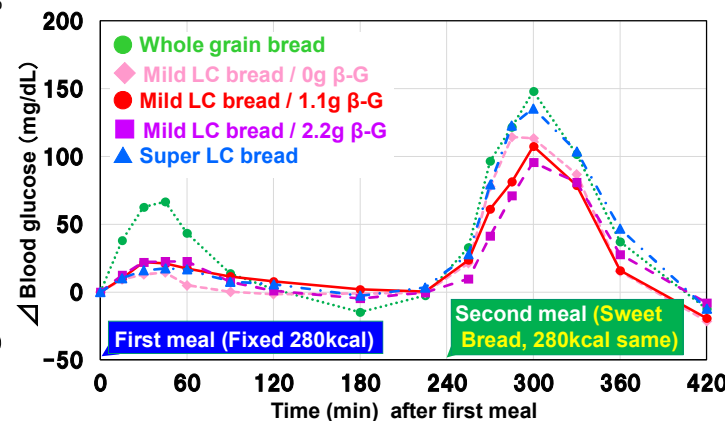


Fig.7 Blood glucose response after first & second meals

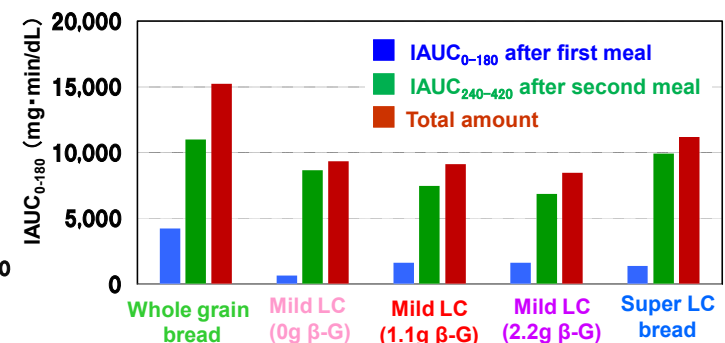


Fig.8 Comparison of IAUC_{0-180, 240-420} after first & second meals