OP-0087 – Effects of saturated and monounsaturated fats on incretin responses and endothelial function in healthy human: a cross-over study

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Background

Abnormalities during the postprandial state contribute to the development of atherosclerosis. Postprandial hyperglycemia, hypertriglyceridemia, and hyperlipacidemia independently cause postprandial cytokine activation. However, it is not clear which dietary composition preferentially affects postprandial endothelial function in healthy subjects. Previously, we reported postprandial endothelial function was impaired only after the high-fat diet and not after the high-carbohydrate or standard test meal in healthy subjects, suggesting that postprandial state could be hazardous, mostly through acute hyperlipacidemia in healthy subjects (Am J Clin Nutr 2007;86:923). It has been reported that monounsaturated fatty acids favorably increase postprandial GLP-1 (glucagon-like peptide-1) responses and decrease hypertriglyceridemia as compared to saturated fatty acids (Am J Clin Nutr 1999;69:1135). However, effects of saturated and monounsaturated fatty acids on postprandial endothelial function have not been clarified.

Purpose

To compare effects of saturated and monounsaturated fatty acids or dipeptidyl peptidase-4 inhibitor, sitagliptin on the postprandial endothelial function and the incretin responses in healthy human.

Methods

Subjects with normal glucose tolerance, screened by a 75 g oral glucose tolerance, underwent oral load test with (A) glucose 75 g (300 kcal), (B) glucose 75 g (300 kcal) + butter (240 kcal), (C) glucose 75 g (300 kcal) + olive oil 27 g (240 kcal), (D) glucose 75 g (300 kcal) + sitagliptin 50mg. Each test was repeated in a randomly assigned order at least 7 day apart. Before and 240 min after oral load, flow mediated dilatation and nitroglycerin-mediated dilatation and blood parameters were measured (Fig. 1). Statistical significance was examined by one- or two way ANOVA or Kruskal-Wallis test. (Clinical trial UMIN000013023)

Fig. 1. Flow-mediated dilatation of the brachial artery (FMD)

Conclusion

Saturated and monounsaturated fats changed incretin responses and endothelial function in healthy human. Postprandial endothelial function can be deteriorated postprandially and incretin responses to coexisting saturated and monounsaturated acids may affect endothelial function even in healthy human. (Clinical trial UMIN000013023)

Results

Blood glucose and insulin levels were not altered after oral load in butter (B) and olive oil (C), but decreased in sitagliptin (D) as compared to (A) (Fig. 2). Although total, LDL, non-HDL and HDL-cholesterol were not altered, free fatty acids were decreased markedly in all 4 groups (Fig. 3). Active GLP1 was increased butter (B) and olive oil (C) (Fig. 4). Active GIP was increased only in butter (B), but not in olive oil (C). Postprandial FMD was decreased only in (A)(baseline $9.1 \pm 1.4\%$, 120 min $7.7 \pm 0.7\%$ and 240 min $8.7 \pm 1.2\%$, $p < 0.05$), but not in (B), (C) and (D) (Fig. 5).

Fig. 2. Changes in plasma glucose and insulin levels

Fig. 3. Changes in serum lipid levels

Fig. 4. Changes in plasma incretin levels

Fig. 5. Blood pressure, heart rate and FMD