Research Article

A study to determine the effects of monosodium glutamate on insulin secretion and glucose tolerance in healthy volunteers of south Indian population

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Abstract

Aim: The aim of this study was to investigate the effects of monosodium (L)-glutamate on insulin secretion and glucose tolerance during an oral glucose tolerance test in healthy volunteers. **Materials and Methods:** Monosodium (L) glutamate (10 g) packed in capsules were given orally to 20 healthy volunteers, aged 20–30 years, with an oral (75 g) glucose load. Blood samples were taken at 15, 45, 75, 90 and 120 min after the start of the oral glucose tolerance test (OGTT). **Results:** The increase in serum insulin concentrations after glucose absorption tended to be higher. In the subjects with higher glutamate bioavailability, after glutamate oral administration, significantly higher insulin response was reached. Oral (L)-glutamate enhances glucose-induced insulin secretion in healthy volunteers in a concentration-dependent manner. **Discussions:** Oral glutamate is able to amplify glucose-induced insulin secretion in a concentration-dependent manner in humans.
Keywords: Monosodium glutamate, Insulin, Glucose tolerance, insulin secretion, glutamate.

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INTRODUCTION

Studies providing the evidence of MSG toxic effects have raised the increasing interest in MSG intake as flavour enhancer. Neurotoxic effects in brain, obesity and metabolic defects, "Chinese restaurant syndrome" and detrimental effects on sex organs are the most discussed in the connection with MSG intake. Glutamate is known to stimulate insulin secretion in vivo and in vitro with glucose tolerance improvement. Oral administration of MSG in fasting healthy subjects was reported to increase plasma insulin levels without altering glucose concentrations.

OBJECTIVE OF THE STUDY

The aim of this study was to investigate the effects of monosodium (L)-glutamate on insulin secretion and glucose tolerance during an oral glucose tolerance test in healthy volunteers.

MATERIALS AND METHODS

Study Design

Randomized double blind placebo-cross over study

Study Population

20 healthy volunteers, aged 20–30 years, with weight varying between 50-80kg was selected for the study. Single dose of Monosodium (L)-glutamate (10 g) packed

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in capsules (in fasting condition for at least 12hrs) were given orally to 20 healthy volunteers, with an oral (75 g) glucose load. Again after 7 days, single dose of placebo capsules were given orally to healthy volunteers with an oral glucose load. Blood samples were taken at 0, 15, 30, 45, 75, 90 and 120 min after the start of the oral glucose tolerance test (OGTT). Blood glucose concentrations were determined by the GOD/POD method and insulin by ELISA. Insulin secretion was assessed as the area under the curve (AUC) of insulin concentrations during OGTT, glucose tolerance as the glucose AUC during OGTT.

RESULT

The increase in serum insulin concentrations after glucose absorption tended to be higher. In the subjects with higher glutamate bioavailability, defined as glutamate from 0 to 120 min after glutamate oral administration, significantly higher insulin response was reached. Oral (L)-glutamate enhances glucose-induced insulin secretion in healthy volunteers in a concentration-dependent manner. The mean of insulin secretion in both MSG and placebo volunteers were compared. Insulin secretion was significantly increased in MSG administered healthy volunteers.

Table 1: Insulin secretion level in healthy volunteers with MSG and placebo

	0min	15 min	30 min	45 min	75 min	90 min	120 min
MSG	8.03 ±0.50	8.36 ±1.75	40.96 ±2.53	63.71 ±3.28	40.7± 3.32	33.9± 2.58	30.27 ±2.65
PLACEBO	8.42 ±1.71	9.34 ±1.12	19.66 ±1.59	53.13 ±2.84	36.02 ±1.71	33.99 ±2.97	30.52 ±2.07

The glucose concentration also compared in both groups. There was a significant difference between both groups.

Table 2: Glucose concentration with and without MSG

	0min	15 min	30 min	45 min	75 min	90 min	120 min
MSG	90.4 ±9.5	92.8± 12.3	94.5± 12.8	97.1± 13.8	93.6± 10.5	90.1± 10.2	86.2± 11.3
PLACEBO	83.7 ±3.6	98.5± 4.2	108.3 ±7.8	123.2 ±9.3	160.4 ±13.2	144.7 ±10.8	120.1 ±10.2

DISCUSSION

(L)-glutamate is widely distributed and commonly consumed. It is used in some countries as a flavour enhancer in foods. In this study, healthy subjects were exposed to circulating levels of glutamate exceeding basal concentrations, following an oral dose of 10 gm monosodium (L)-glutamate. The effects of glutamate on insulin secretion and glucose homeostasis in humans are unclear. In a non-controlled study, Thomassen *et al*. observed that intravenous monosodium glutamate stimulated insulin secretion. Oral administration of monosodium glutamate in fasting healthy subjects was reported to increase plasma insulin levels. Thus, during food intake, glutamate may participate in the insulin response to nutrients. We therefore conclude that oral glutamate is able to amplify glucose-induced insulin secretion in a concentration-dependent manner in humans.

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