

feces, and its level may account for an additional 15% of the given dose. The missing fraction may be ascribed partly to a total degradation of stevioside by the colon microflora.

Conclusions

These preliminary data suggest that: 1) Stevioside is absorbed. 2) Steviol glucuronide is the unique metabolite present in plasma and urine, as steviol 16,17 α -epoxide, 15-oxo-steviol and 15 α -hydroxy steviol were not detected. 3) Steviol is present only in feces.

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References

- ¹Koyama, E., Kitazawa, K., Ohori, Y., Izawa, O., Kagekawa, K., Fujino, A. and Ui, M. 2003. *In vitro* metabolism of the glycosidic sweeteners, *Stevia* mixture and enzymatically modified *Stevia* in human intestinal microflora. *Food Chem. Toxicol.* **41**: 359-374.
- ²Koyama, E., Sakai, N., Kitazawa, K., Ohori, Y., Izawa, O., Kagekawa, K., Fujino, A. and Ui, M. 2003. Absorption and metabolism of the glycosidic sweeteners, *Stevia* related compounds in human and rat. *Food Chem. Toxicol.* **41**: 875-883.
- ³Geuns, J.M.C., Augustijns, P., Mols, R., Buyse, J.G. and Driessen, B. 2003a. Metabolism of stevioside in pigs and intestinal absorption characteristics of stevioside, rebaudioside A and steviol. *Food Chem. Toxicol.* **41**: 1599-1607.
- ⁴Gardana, C., Simonetti, P., Canzi, E., Zanchi, R. and Pietta, P.G. 2003. Metabolism of stevioside and rebaudioside A from *Stevia rebaudiana* extracts by human microflora. *J. Agric. Food Chem.* **51**: 6618-6622.

The short-term effects of stevioside on blood pressure and glucose concentrations in healthy subjects

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Introduction

Stevioside is a natural plant glycoside isolated from the plant *Stevia rebaudiana*. It is 300 times sweeter than sugar but contains no calories. Stevioside would therefore be suitable for diets of e.g. diabetic and obese persons. In addition, studies suggested hypotensive and hypoglycemic effects of stevioside when administered in high dosage. This study was undertaken to evaluate the short-term effects on blood pressure, urinary excretion of electrolytes and blood glucose/insulin concentrations, in healthy subjects.

Methods

The study group consisted of 10 healthy subjects from 18 to 40 years. During 3 days, each subject was given capsules containing stevioside (250 mg) thrice daily. A blood sample was collected and blood pressure was measured before (after a nocturnal fast) and at different time-points after 3 days of stevioside. In addition, two 24-hour urines (before and after) and was collected by the volunteers to evaluate the concentrations of urinary electrolytes.

Results

The average systolic and diastolic blood pressure was 113 mmHg and 72 mmHg for the stevioside and 113 mmHg and 73 mmHg for the control condition, respectively. No significant differences were found between the stevioside and the control condition for each time-point. Twenty-four hour urinary volume and urinary excretion of electrolytes was, not significantly ($P=0.06$ for urinary volume and $P=0.08$ for urinary sodium excretion), higher between on the stevioside (24 hour urine volume of 1561 ± 489 ml and 184 ± 70 mmol sodium excreted) and the control condition (24 hour urine volume of 1150 ± 488 and 131 ± 52 mmol sodium excreted). Mean blood glucose and insuline were 83.5 mg/dL and 5.9 mU/L for the stevioside and 83.5 mg/dL and 5.6 mU/L for the control condition, respectively and did not differ between them.

Conclusions

Stevioside, when administered orally for three days in three 250 mg capsules, is not directly effective as hypotensive or hypoglycemic agent in healthy subjects, although it may stimulate water and sodium excretion via the urine. More information is needed on longer-term and postprandial effects.

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