Antidiabetic potential of *Salvia fruticosa* infusion: effects on intestinal glucose transporters

University of Minho
School of Sciences

**Azevedo, M. J.; Lima, C. F.; Fernandes-Ferreira, M.; Almeida, M. J.; Pereira-Wilson, C.**

Department of Biology, School of Sciences, University of Minho - Campus de Gualtar, 4710-057 Braga, Portugal

**INTRODUCTION**

Diabetes mellitus type 2 (DM2) or Non-Insulin-Dependent Diabetes mellitus (NIDDM) is a disease characterized by a deficient control of blood glucose, that is currently estimated to affect over 100 million people worldwide and is predicted to double by 2010. NIDDM is the most prevalent in populations with western-type lifestyles and data. Complications such as vision loss, renal failure, nerve damage and cardiovascular diseases are common. Glucose represents a large proportion of the carbohydrate present in western diets and the consequent high plasma glucose levels are thought to contribute to the hyperinsulinemia and subsequent insulin resistance seen in DM2 patients. Glucose is absorbed through the enterocyte via two types of glucose transporters: the SGLT1, a sodium-dependent glucose transporter in the apical brush border membrane, and the facilitated glucose transporter GLUT2 located mainly on the basolateral membranes of the enterocyte (Fig. 1). Intracellular mannose-6-phosphate transport capacity of diabetics is 3 to 4 times higher [1] than that of healthy individuals - which aggravates (post-prandial) hyperglycemia. Therefore, control of both carbohydrate digestion and intestinal absorption of resulting products would improve blood glucose levels and help reduce diabetic complications.

At present, management of diabetes relies mainly on dietary manipulation and use of agents to lower circulating glucose levels. However, the epidemic proportions of DM2 justifies the search for new drugs effective in the treatment and preferably also in the prevention of this disease. Folk medicine has empirically identified plants and plant extracts (tea) and essential oil fraction shown in Table 2.

**RESULTS**

**1. Dyer, J.**

**ACKNOWLEDGEMENTS**

M. Azevedo (SFRH/BD/12527/2003) and C.F. Lima (SFRH/BD/6942/2001) were supported by MCT/MCTES/FCT under PTDC/SAU-BIO/2040/2004. The work of M. Azevedo is supported by the framework of the project: "Functional evaluation of the anti-inflammatory and antipathogenic activity of medicinal plants evaluated by in vitro and in vivo experiments" funded by POCTI.

**REFERENCES**


**METHODS**

**PREPARATION OF BRUSH-BORDER MEMBRANE VESICLES (BBMV)**

BBMV were prepared from rat intestinal sections of jejunum, duodenum and ileum (Fig. 3), using a combination of carbon precipitation (with NaCl) and differential centrifugation as described in [2]. The final purified BBMV were suspended in a buffer containing 300mM mannitol and 5mM HEPES pH 7.4.

**WESTERN BLOTTING**

The abundance of SGLT1 protein was measured by quantitative Western blotting as described in [3]. The BBMV proteins were separated on an 8% polyacrylamide gel containing 0.1% (w/v) SDS and electrophoresed to PVDF membranes. The membranes were blocked and incubated with the antibody to SGLT1 (1:2000 in 1×PBS-0.5%Tween 20 in PBS pH 7.4) for 2h (Chemicon, AB1524), washed in TBSS, and incubated for 1h with the secondary antibody, goat anti-rabbit horseradish peroxidase-linked whole antibody diluted 1:10000 in TBSS. Cross-reactive bands were detected by ECL (Amerham). The exposed film was scanned and the resulting digital images were analysed using densitometry software (Sigma Scan).

**IMMUNOHISTOCHEMISTRY**

Jejunal tissue was fixed in 4%FA/FPS, processed for paraffin embedding and 5μm sections were mounted on glass slides and dehydrated in ClearAll.

After dehydration in TBSS (PBS with 0.5% Tween 20), the sections were incubated for 20 min in blocking agent (5% normal goat serum/1% bovine serum albumin diluted in PBS pH 7.4). Following incubation with the primary antibody to SGLT1 (1:200) overnight, sections were then rinsed in TBSS and incubated with secondary antibody (goat anti-rabbit, Alkaphar Fluorescence (AB9064) for 1h at 37°C. After rinsed in TBSS the sections were covered with a fluorescent mounting medium. Negative controls were processed on the same slide in a normal medium, replacing the primary antibody with normal rabbit serum. (Fig. 5 (C) and (D)).

**RESULTS**

**1. Dyer, J.**

**ACKNOWLEDGEMENTS**

M. Azevedo (SFRH/BD/12527/2003) and C.F. Lima (SFRH/BD/6942/2001) were supported by MCT/MCTES/FCT under PTDC/SAU-BIO/2040/2004. The work of M. Azevedo is supported by the framework of the project: "Functional evaluation of the anti-inflammatory and antipathogenic activity of medicinal plants evaluated by in vitro and in vivo experiments" funded by POCTI.

**REFERENCES**