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Abstrakt:

α-cyclodextrin – a weight loss agent?

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In recent years, an alarming increase in overweight, obesity and the following diseases has been observed. Unfortunately, the current pharmacological treatments lack effectiveness or display a severe side effect profile[v]. New improved drugs against overweight and obesity are therefore desirable. In USA and Canada, α-CD is marketed as a dietary fibre and used as a weight loss supplement (Mirafit FBCx™, Alpha-Fibe FBCx™). Moreover, a study has shown that adding α-CD to a diet resulted in greater weight loss compared to placebo[ii] and in another study α-CD prevented weight gain[iii]. The underlying mechanism for α-CDs possible weight loss ability is still to be accounted for. Findings from two studies show that α-CD can significantly lower the post-prandial plasma glucose response after a starch-rich meal[i, iv]. It is therefore hypothesized that α-CD inhibits the enzymatic degradation of starch, which this study aims to investigate further.

γ-cyclodextrin (γ-CD) and a starch solution was chosen as substrates. The hydrolysis by porcine pancreatic α-amylase (PPA) in the presence of α-CD was monitored at 37°C, pH 6.5. The degradation reactions were followed over time by quantification of the amount of reducing ends as maltose equivalents. The hydrolysis of γ-CD revealed that the presence of α-CD inhibited the enzymatic degradation in a dose-dependent manner. α-CD in a molar ratio of 0.2:1 (α-CD:γ-CD) was not sufficient to inhibit the degradation, whereas α-CD in a molar ratio of 1:1 showed some effect since the initial degradation rate decreased (from 4.6 mM/hour for the control (no α-CD present) to 4.0 mM/hour). In ratio 5:1 the degradation rate was almost 50% less (2.4 mM/hour). Lastly, the initial degradation rates in ratio 15:1 and 20:1 were only one third (1.2 mM/hour) of what was observed in the absence of α-CD. These results shows that α-CD is capable of inhibiting the enzymatic degradation of γ-CD considerably and that there might be an upper limit to the inhibitory effect.

[i] Buckley, J. D., A. A. Thorp, *et al.* (**2006**). "Dose-Dependent Inhibition of the Post-Prandial Glycaemic Response to a Standard Carbohydrate Meal following Incorporation of Alpha-Cyclodextrin." *Annals of Nutrition and Metabolism* 50: 108-14.

[ii] Comerford, K. B., J. D. Artiss, *et al.* (**2010**). "The Beneficial Effects [alpha]-Cyclodextrin on Blood Lipids and Weight Loss in Healthy Humans." *Obesity* 19(6): 1200-4.

[iii] Grunberger, G., K. L. C. Jen, *et al.* (**2007**). "The benefits of early intervention in obese diabetic patients with FBCx™ — a new dietary fibre." *Diabetes/Metabolism Research and Reviews* 23(1): 56-62.

[iv] Schmid, G., H. Reuscher, *et al.* (**2004**). Method for reducing the glycemic index for foods. United States, Wacker-Chemie GmbH. US 2004/0161526 A1: 1-9.

[v] Svendsen, O. L., S. Toubro, *et al.* (**2006**). "Medikamentel behandling af fedme." *Ugeskrift for læger* 168(2): 163-7.