-cyclodextrin – a weight loss agent?

Hansen, Lisbeth ; Sørensen, Ditte ; Ganesaratnam, Nirooshitha; Lumholdt, Ludmilla; Larsen, Kim Lambertsen

Publication date:
2011

Document Version
Early version, also known as pre-print

Publikationstitel: α-cyclodextrin – a weight loss agent?

Konference: 2nd European Cyclodextrin Conference, Asti, Italien, Oktober 2011

Abstrakt:

α-cyclodextrin – a weight loss agent?

Lisbeth Hansen, Ditte Sørensen, Nirooshitha Ganesaratnam, Ludmilla Lumholdt Riisager and Kim Lambertsen Larsen

Section of Chemistry, Department of Biotechnology, Chemistry and Environmental Engineering, Aalborg University, Sohngaardsholmsvej 57, DK-9000 Aalborg, Denmark

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.