-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. New improved drugs against overweight and obesity are therefore desirable. In USA and Canada, $\alpha$-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 $\alpha$-CD to a diet resulted in greater weight loss compared to placebo and in another study $\alpha$-CD prevented weight gain. The underlying mechanism for $\alpha$-CDs possible weight loss ability is still to be accounted for. Findings from two studies show that $\alpha$-CD can significantly lower the post-prandial plasma glucose response after a starch-rich meal. It is therefore hypothesized that $\alpha$-CD inhibits the enzymatic degradation of starch, which this study aims to investigate further.

$\gamma$-cyclodextrin ($\gamma$-CD) and a starch solution was chosen as substrates. The hydrolysis by porcine pancreatic $\alpha$-amylase (PPA) in the presence of $\alpha$-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 $\gamma$-CD revealed that the presence of $\alpha$-CD inhibited the enzymatic degradation in a dose-dependent manner. $\alpha$-CD in a molar ratio of 0.2:1 ($\alpha$-CD:$\gamma$-CD) was not sufficient to inhibit the degradation, whereas $\alpha$-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 $\alpha$-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 $\alpha$-CD. These results shows that $\alpha$-CD is capable of inhibiting the enzymatic degradation of $\gamma$-CD considerably and that there might be an upper limit to the inhibitory effect.

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