

**STUDY ON EFFECTS OF RESISTANT DEXTRIN ON SELECTED HEALTH
MARKERS IN VITRO AND IN VIVO**

mgr inż. Michał Włodarczyk

Supervisor: prof. dr hab. inż. Katarzyna Śliżewska

Supervisor: dr hab. Renata Barczyńska-Felusiak, prof. uczelni

Abstract

In developed countries people began to pay more attention to maintaining healthy dietary habits of society as the increased rate of childhood obesity was observed. There are various types of foods dedicated to children, but there is still a lack of functional foods that boost their overall health by i.e., enhancing the gut microbiota and maintaining a healthy weight.

Several types of fiber have an unfavorable influence on the sensory properties of meals or the digestive system, which is why the production of modified dietary fibers, which have little or no effect on the taste of the meals, and have all the advantages of prebiotics, such as modulating gut microbiota composition, promoting satiety, and enhancing human metabolic parameters is of high importance.

In the presented research, a resistant dextrin from potato starch with prebiotic properties was tested as a possible additive to new vegetable-fruit preparations that comprise the functional food category and are primarily intended to help overweight children lose weight and improve their health markers due to changes in the gut microbiota. It was hypothesized that the resistant dextrin will be a viable source of carbon for the intestinal bacteria and will cause a positive change in the metabolic profiles of overweight children.

In vitro study aimed to evaluate the viability of resistant dextrin as a carbon source for growth of intestinal bacteria in co-culture (*Lactobacillus*, *Bifidobacterium*, *Enterococcus*, *E. coli*, *Clostridium*, *Bacteroides*). Furthermore, parameters such as Prebiotic index of the resistant dextrin, pH of co-culture were assessed. Moreover, the effect of resistant dextrin on selected health markers such as concentration of lactic acid, SCFA (formic, acetic, propionic, butyric, valeric acids), BCFA (isobutyric and isovaleric acid) and the activity of fecal enzymes (α -glucosidase, β -glucosidase, α -galactosidase, β -galactosidase, β -glucuronidase) was measured.

In vivo study aimed to investigate the effects of vegetable-fruit preparation with resistant dextrin on the abovementioned health markers. Furthermore, the abovementioned health markers were compared between groups of overweight and normal weight children.

The activity of selected bacterial enzymes was determined by spectrophotometric methods. The reactions involved the cleavage of a p-nitrophenol molecule from the substrate by the enzyme.

The concentration of lactic acid, SCFA, and BCFA was analyzed using the HPLC method.

The results of *in vitro* study disclosed that intestinal bacteria isolated from the fecal samples exhibited better growth dynamics on the medium enriched with resistant dextrin with a clear dominance of probiotic strains (*Lactobacillus*, *Bifidobacterium*), which was reflected in a positive value of prebiotic index. Furthermore, addition of resistant dextrin caused a decrease in pH of the co-culture over time. Comparison of the fermentation metabolites of resistant dextrin and control glucose by selected strains of intestinal bacteria showed noticeably increased concentrations of SCFA, with concomitantly decreased concentrations of BCFA in the samples. In addition, when the bacteria were cultured in medium with resistant dextrin the concentration of potentially mutagenic fecal enzymes, i.e., β -glucosidase, β -glucuronidase, decreased significantly compared to the culture with glucose.

The results of *in vivo* study demonstrated that the addition of resistant dextrin to vegetable-fruit preparations caused an increase in the concentrations of the studied acids after 6 months of their intake. It is probable that the regular consumption of vegetable-fruit preparation unaided contributed to the increases in SCFA concentrations (and decreases in BCFA). There was also a positive effect of the addition of resistant dextrin to preparations on the maintenance of the positive effects 3 months after discontinuation of intake.

The addition of resistant dextrin to vegetable-fruit preparations also had a positive effect on fecal enzyme activities after 6 months of taking the preparations, and positively affected the prolonged persistence of increased α -glucosidase and α -galactosidase activities (3 months after the last administration). Nonetheless, there was no significantly positive effect of dextrin addition on the other fecal enzymes.

As it was hypothesized, studies have shown that the addition of resistant dextrin to vegetable-fruit preparation contributes to improving the metabolic parameters of obese and overweight children, which satisfactorily justifies the use of the above preserves on an industrial scale. Despite the growing interest in functional foods, there are nonetheless relatively few empirical studies on the correlation between the concentration of bacterial metabolites (especially fecal enzymes) and, for example, anthropometric parameters such as child weight or BMI. In addition, it is apparent that the existing literature does not present sufficient data on the subject, which also underlines the relevance of addressing the research topic.