# MICROBIAL POLYSACCHARIDES AS PREBIOTICS: β-GLUCAN AND LEVAN

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## Introduction

Use of prebiotics, nondigestible food ingredients beneficially affecting the health of the host by selectively stimulating the growth and/or metabolic activation of one or a limited number health-promoting bacterial species in the intestinal tract, has a significant role in human and animal nutrition [1]. Beta glucans and levans from microbial origin are very actual due to many positive biological properties: anticancer and antiviral activity as well as immunomodulatory and immunostimulatory activity and this is why they have broad application in many areas [2,3].

## Aim

The aim of this work was the testing prebiotic properties of two polysaccharides: levan, exopolysaccharide obtained from the strain of *Bacillus licheniformis* and β-glucan isolated from baker's yeast *Saccharomyces cerevisiae*. These two polysaccharides are structurally very different.

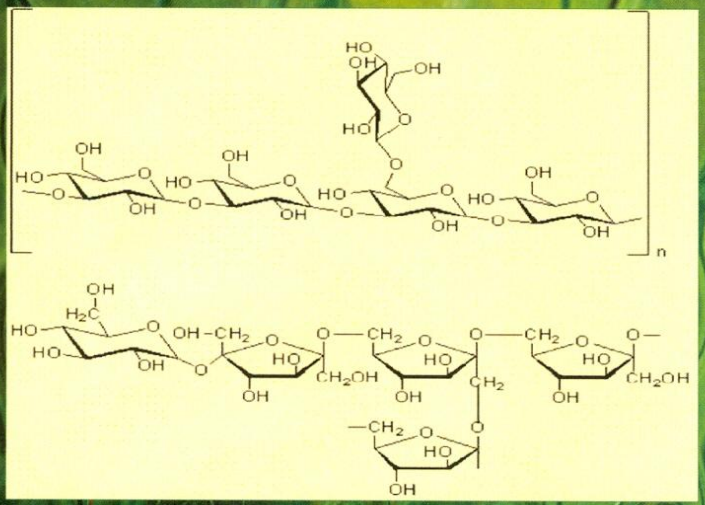

**Figure 1. Structure of β-glucan and levan**

## Material and methods

Bifidogenic effect of β-glucan was tested in a model system based on infant formulas. Infant formula (IF) were prepared according to the producer's instructions with no cell wall extract added (control), with cell wall extracts of different glucan content (49.30%, 75.54%, 93.15% and 99.54%) or with inulin (IN, reference substrate). Mature breast milk (MBM) was also used as a reference substrate. Bifidogenesis lasted 48 h at 37 °C in an anaerostat with 5% $CO_2$. Total number of bifidobacteria was determinated on BML agar plates.

Prebiotic properties of levan were studied by growth of pure strains of *Lactobacillus rhamnosus* (ATCC 7469) on native polysaccharide and levan after *in vitro* digestion in gastric and pancreatic juice. Different carbon sources (glucose, inulin, fructose, FOS and levan) were used for comparing growth on MRS media after 72 h i 120 h incubation time at 37 °C.

## Results

β-D-glucan from cell wall of *S. cerevisiae* is composed of (1,3)-linked β-glucopyranoses in the main chain of which part is substituted through the position C-6 by single glucopyranosyl residues [3]. This polysaccharide is nondigestible in the gastrointestinal tract and by testing in a model system based on infant formulas it was shown that pure β-glucan has the greatest bifidogenic effect in relation to the crude glucan samples (Figure 2), which makes it a promising candidate for prebiotic.

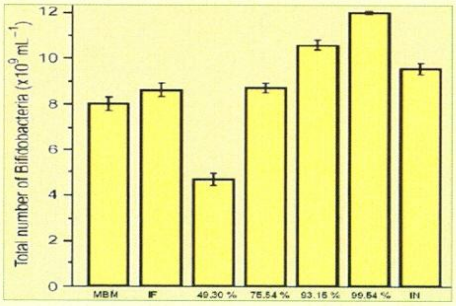


**Figure 2. Bifidogenic effect of β-glucan**

Levans are fructans, consisting of β-D-fructose residues connected by (2,6)-glycosidic linkages and one terminal α-D-glucose at nonreducing end of the main chain. Branching occurs through C-1 by fructofuranosyl residues [2]. Results on Figure 3. suggested that in comparison to other carbon source, inulin and levan stimulated growth of tested strains to a greater extent. Both native polysaccharide and the levan sample after digestion stimulated growth of tested strains (Figure 4).

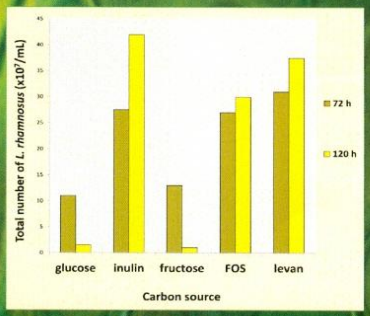


**Figure 3. The effects of different carbon source on *Lactobacillus rhamnosus* growth**

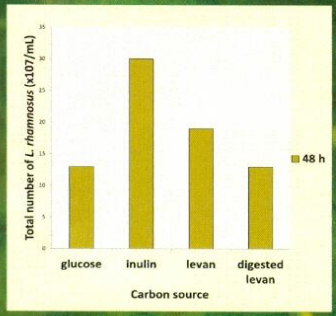


**Figure 4. Comparison of prebiotic effect for native and digested levan**

## Conclusion

The present study showed that investigated levans and β-glucans are microbial polysaccharides which are promising candidates for prebiotics.

## References

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