# BACTERIAL STRAIN AND THE USE THEREOF

## Technical field

The present application relates to a bacterial strain and a biologically active culture thereof, as well as the uses of said bacterial strain and said biologically active culture in food- or feed-grade substance, food or feed composition and food or feed product.

## Background

It is well accepted in the art that probiotics are live micro-organisms contributing to the health and/or the well-being of a subject, such as a human or an animal, when being consumed. For example, it has been observed the influence of probiotics on intestine, wellbeing and balance of immune system of a subject. Also their effect on metabolism, including overcoming and prevention of diseases, protection of body against harmful microbiota and even providing positive effects on mental health has been suggested.

However, probiotics are neither always effective with improvement in the gut microbiota, nor capable of contributing the quality of food or feed substance whereto they are added. In addition, in many cases a mixture of several probiotic strains is necessary for achieving an effect.

Thus, there is a continuous need for new probiotics.

## Summary

An aim of the invention is to provide a bacterial strain or a culture for probiotic use and other versatile uses, as well as to provide methods for using such strain or culture.

Thus, one aspect of the invention is a bacterial strain of *Lactiplantibacillus plantarum* Provege, deposited on 24 August, 2021 with DSMZ under number DSM 33989. Another aspect of the invention is a bacterial strain of

*Lactiplantibacillus plantarum* Provege, deposited on 24 August 2021 with DSMZ under number DSM 33989, or a mutant or derivative thereof. DSMZ stands for Deutsche

Sammlian von Mikroorganisrmen und Zellkulturen GmbH, German Collection of Microorganisms and Cell Cultures GmbH.

Another aspect of the invention is a biologically active culture comprising the strain of *Lactiplantibacillus plantarum* Provege, deposited on 24 August 2021 with DSMZ under number DSM 33989, or a mutant or derivative thereof. The biologically active culture comprises the strain and a cultural medium or residues of it. Another aspect of the invention is a biologically active culture comprising the strain as described herein, and a cultural medium or residues of it, for example peptone water containing 0.1% peptone.

Another aspect of the invention is an encapsulated product, such as freeze-dried powder, a tablet, or a capsule, comprising the strain as described herein. Another aspect of the invention is an encapsulated product, such as freeze-dried powder, a tablet, or a capsule, comprising the strain of *Lactiplantibacillus plantarum* Provege, deposited on 24 August 2021 with DSMZ under number DSM 33989, or a mutant or derivative thereof. The biologically active culture may be obtainable by incubating the strain in a cultural medium at 30 ˚C overnight, and preferably centrifuging the cultural medium to obtain a pellet and redissolving the pellet in another cultural medium or residues of it, for example peptone water containing 0.1% peptone.

Another aspect of the invention is a food or feed composition, a food or feed product, a formulation for food or feed enrichment, a food or feed supplement, or a nutraceutical formulation, comprising the strain, the biologically active culture, or the encapsulated product according to the presently disclosed invention.

Another aspect of the invention is a method of manufacturing a probiotic food or feed composition. Said method comprises preparing, and preferably also fermenting, a mixture of food or feed composition and the strain, the biologically active culture, or the encapsulated product according to the presently disclosed invention. Another aspect of the invention is a method of manufacturing a probiotic food or feed composition, comprising the steps:

- a) contacting the bacterial strain, the biologically active culture, or the encapsulated product as described herein, with a food or feed composition;

optionally,- b) fermenting the food or feed composition obtained from the step a).

Another aspect of the invention is a method of increasing nutritional value of food- or feed-grade substance. Said method comprises fermenting a mixture of food- or feed-grade substance and the strain, the biologically active culture, or the encapsulated product according to the presently disclosed invention.

Another aspect of the invention is a method of prolonging shelf-life of a food or feed product. Said method comprises fermenting a mixture of a food or feed

product or a starting material of a food or feed product and the strain, the biologically active culture, or the encapsulated product according to the presently disclosed invention.

Another aspect of the invention is use of the strain, the biologically active culture, or the encapsulated product as described herein, for example in manufacturing a food or feed composition, a food or feed product, a formulation for food or feed enrichment, a food or feed supplement, or a nutraceutical formulation. Another aspect of the invention is a use of the strain, the biologically active culture according, or the encapsulated product, in manufacturing a food or feed composition, a food or feed product, a formulation for food or feed enrichment, a food or feed supplement, or a nutraceutical formulation.

The main embodiments are characterized in the independent claims. Various embodiments are disclosed in the dependent claims and the description. The features recited in dependent claims and in the embodiments are mutually freely combinable unless otherwise explicitly stated.

Brief description of the drawings

Fig. 1 shows a microscopic view of L. plantarum Provege.

Fig. 2a – Fig. 2d show the effects of *Lactiplantibacillus plantarum Provege* in increasing abundance of gut bacteria *Fusicatenibacter*, *Tyzzerella*, *Oscillospira* and *Eubacterium*, respectively.

Fig. 3a – Fig. 3d show the effects of *Lactiplantibacillus plantarum Provege* in decreasing abundance of gut bacteria *Prevotella 2*, *Prevotella 7*, *Alloprevotella* and *Tyzzerella 4*, respectively.

Fig. 4 shows the levels of Enterobacteria and Lactic acid bacteria in gut before, during and after the consumption of smoothies containing *Lactiplantibacillus plantarum Provege*.

Fig. 5 shows the levels of Enterobacteria and Lactic acid bacteria in gut before, during and after the consumption of smoothies without *Lactiplantibacillus plantarum Provege*.

Fig. 6 shows the growth curves of mold on Prevege fermented breads and control samples.