CLAIMS

1. A method for selecting a bacterial strain for use in treating a disease related to serotonin deficiency, the method comprising:

culturing (S1), under aerobic conditions, bacteria of a *Lactobacillus* bacterial strain selected from the group consisting of a *L. reuteri* bacterial strain and a *L.* mucosae bacterial strain in a culture medium comprising tryptophan, and preferably comprising a carbon source;

detecting (S2) any serotonin produced by the bacteria of the *Lactobacillus* bacterial strain in the culture medium or a sample thereof;

determining (S15) whether the bacteria of the *Lactobacillus* bacterial strain are capable of attaching to intestinal mucus and/or are capable of adhering to a gastrointestinal mucosa; and

selecting (S3) the *Lactobacillus* bacterial strain as effective in treating a disease related to serotonin deficiency in a subject if serotonin is detected in the culture medium or the sample thereof and if the bacteria of the *Lactobacillus* bacterial strain are capable of attaching to intestinal mucus and/or are capable of adhering to the gastrointestinal mucosa, wherein the disease related to serotonin deficiency is selected from the group consisting of anxiety, depressed mood, aggression, poor memory, eating disorders, obsessive-compulsive disorder, panic disorder, post-traumatic stress disorder, social anxiety disorder, irritable bowel syndrome (IBS), inflammatory bowel disease (IBD), a cardiovascular disease, osteoporosis, gastrointestinal motility disorder, autoimmune polyendocrinopathy-candidiasis-ectodermal dystrophy (APECED), osteopenia and a bone loss condition.

2. The method according to claim 1, further comprising:

culturing (S10), under anaerobic conditions, bacteria of the *Lactobacillus* bacterial strain in a culture medium comprising tryptophan;

detecting (S11) any serotonin produced by the bacteria of the *Lactobacillus* bacterial strain in the culture medium or a sample thereof when cultured under anaerobic conditions; and

calculating (S12) a ratio between a concentration of serotonin detected in the culture medium or the sample thereof when cultured under aerobic conditions and a concentration of serotonin detected in the culture medium or the sample thereof when cultured under anaerobic conditions, wherein

selecting (S3) the *Lactobacillus* bacterial strain comprises selecting (S3) the *Lactobacillus* bacterial strain as effective in treating the disease related to serotonin deficiency in a subject if the ratio is equal to or larger than 1.0, preferably larger than 1.0, and if the bacteria of the *Lactobacillus* bacteria strain are capable of attaching to intestinal mucus and/or are capable of adhering to the gastrointestinal mucosa.

3. The method according to any of the claims 1 to 2, wherein selecting (S3) the *Lactobacillus* bacterial strain comprises selecting (S3) the *Lactobacillus* bacterial strain as effective in treating the disease related to serotonin deficiency in a subject if serotonin is detected in the culture medium or the sample thereof and if the bacteria of the *Lactobacillus* bacterial strain have a mucus adhesion ability that is higher than a mucus adhesion ability of *Lactobacillus reuteri* DSM 27131.

4. A *Lactobacillus reuteri* strain DSM 33509, preferably in lyophilized form.

5. A *Lactobacillus reuteri* strain DSM 33632, preferably in lyophilized form.

6. A *Lactobacillus reuteri* strain DSM 33633, preferably in lyophilized form.

7. A *Lactobacillus reuteri* strain DSM 33634, preferably in lyophilized form.

8. A *Lactobacillus reuteri* strain DSM 33635, preferably in lyophilized form.

9. A *Lactobacillus mucosae* strain DSM 33291, preferably in lyophilized form.

10. A *Lactobacillus mucosae* strain DSM 33292, preferably in lyophilized form.

11. A *Lactobacillus mucosae strain* DSM 33293, preferably in lyophilized form.

12. A *Lactobacillus mucosae strain DSM 33661*, preferably in lyophilized form.

13. A *Lactobacillus reuteri* according to any one of claims 4 to 8 or a *Lactobacillus mucosae* strain according to any one of claims 9 to 12 for use as a medicament.

14. A *Lactobacillus reuteri* according to any one of claims 4 to 8 or a *Lactobacillus mucosae* strain according to any one of claims 9 to 12 for use in treatment of a disease related to serotonin deficiency, wherein the disease related to serotonin deficiency is selected from the group consisting of anxiety, depressed mood, aggression, poor memory, eating disorders, obsessive-compulsive disorder, panic disorder, post-traumatic stress disorder, social anxiety disorder, irritable bowel syndrome (IBS), inflammatory bowel disease (IBD), a cardiovascular disease, osteoporosis, gastrointestinal motility

disorder, autoimmune polyendocrinopathy-candidiasis-ectodermal dystrophy (APECED), osteopenia and a bone loss condition.

15. The *Lactobacillus reuteri* strain for use or the *Lactobacillus Mucosae strain for use* according to claim 14, wherein the disease related to serotonin deficiency is selected from the group consisting of IBS, IBD, a cardiovascular disease, osteoporosis