Summary

Thus, an object of the present disclosure relates to a microorganism, a composition and a method for treating a pathogenic bacterial infection in a subject, such as in a mammal.

In particular, it is an object of the present disclosure to describe a microorganism, a composition and a method for treating a pathogenic bacterial infection in a subject, such as in a mammal, which solves the above-mentioned problems of the prior art with skin infections, skin diseases, morbidity; mortality caused by infection and antibiotic resistance.

In one aspect, the present disclosure refers to a bacterial strain selected from a *Lactobacillus plantarum*, wherein the *Lactobacillus plantarum* is *Lactobacillus plantarum* LB244R, which is deposited as DSM 32996; or *Lactobacillus plantarum* LB356R, which is deposited as DSM 33094, wherein the bacterial strain is provided as one or more lyophilized strains, one or more dead or inactivated strains, one or more strain lysate; one or more strain metabolites or a combination thereof.

In another aspect, the present disclosure refers to a bacterial strain having a genetic homology of at least 95% to one or more of the bacterial strains selected from the group consisting of:

- *Lactobacillus plantarum* LB244R, which is deposited as DSM 32996;
- *Lactobacillus plantarum* LB356R, which is deposited as DSM 33094;

wherein the bacterial strain inhibits the growth of pathogenic microorganisms, like *Staphylococcus aureus*, and/or reduce the colonization level of pathogenic microorganisms, like Staphylococcus, associated with skin diseases, wherein the bacterial strain is provided as one or more lyophilized strains, one or more dead or inactivated strains, one or more strain lysate; one or more strain metabolites or a combination thereof.

Thus, another example of the disclosure relates to a bacterial strain having a genetic homology of at least 95% to one or more of the bacterial strains selected from the group consisting of:

- *Weissella viridescens* LB10G, which is deposited as DSM 32906;

In another aspect, the present disclosure refers to a composition comprising one or more of the bacterial strains as disclosed herein.

In one aspect, the present disclosure refers to a composition comprising a bacterial strain selected from a *Lactobacillus plantarum*, wherein the *Lactobacillus plantarum* is Lactobacillus plantarum LB244R, which is deposited as DSM 32996; or *Lactobacillus plantarum* LB356R, which is deposited as DSM 33094, wherein the composition is formulated into an emulsion; an oil; a gum; a paste; a powder; a talc; a lotion; a custard; a foam; a crème; a gel; an ointment; a suspension; a mist; or a liquid.

In another aspect, the present disclosure refers to a composition comprising a bacterial strain selected from a *Lactobacillus plantarum*, wherein the *Lactobacillus plantarum* is Lactobacillus plantarum LB244R, which is deposited as DSM 32996; or *Lactobacillus plantarum* LB356R, which is deposited as DSM 33094, wherein the composition is a topical composition, an oral composition or a rectal composition, preferably the composition is a topical composition.

In one aspect, the present disclosure refers to a use of the composition as disclosed herein in the manufacture of a medicament for treating; alleviating, suppressing; prophylaxis; and/or preventing growth of a pathogenic micro-organism.

Yet another example of the present disclosure relates to a composition according to the present disclosure for use in treating; alleviating, suppressing; prophylaxis; and/or preventing growth of a pathogenic micro-organism.

In another aspect, the present disclosure refers to a use of the composition as disclosed herein in the manufacture of a medicament for the treatment; alleviation; suppression; and/or the prophylaxis of one or more pathogenic bacterial infection in a mammal.

In yet another aspect, the present disclosure refers to a use of the composition as disclosed herein in the manufacture of a medicament for the treatment; alleviation; suppression; and/or the prophylaxis of one or more antibiotic resistant bacterial infection in a mammal.

In one aspect, the present disclosure refers to a use of the composition as disclosed herein in the manufacture of a medicament for the treatment; alleviation; suppression; and/or the prophylaxis of diseases resulting from Staphylococcus infections, such as dermatitis, atopic dermatitis, eczema, carbuncle, cellulitis, rosacea, psoriasis, diaper rash, impetigo or wounds.

Detailed description of the invention

The present invention relates to probiotic bacteria and a composition for use to prevent or treat infections from pathogenic microorganisms, such as Staphylococcus infections. The present invention also relates to composition and to new microbial strains which can inhibit the growth of pathogenic microorganisms, like MRSA.

MRSA may be spread from one subject to another through direct contact with a carrier, e.g. an infected surface or another infected person, such as by sharing personal items that have touched infected skin, or by touching contaminated subjects including skin, nasal passages, animals, surfaces or items.

Despite improvements in treatment, invasive MRSA infections, especially those with an onset in the community or livestock setting, remain problematic and result in a significant financial burden for the healthcare systems in addition to a substantial discomfort to the patient. Similarly, in the European Union, MRSA accounts for 44% of all healthcare-associated infections (HAIs), 22% of attributable extra deaths, and 41% of extra days of hospitalization associated with HAIs. MRSA is a serious public health concern in Japan, which has one of the world's highest crude prevalence rates of MRSA among the various strains of *S. aureus*.

The present invention provides new microbial strains and new composition which can inhibit growth of Staphylococcus without contributing to further development of antibiotic resistance.

Thus, a preferred embodiment of the present invention relates to a bacterial strain having a genetic homology of at least 95% to one or more of the bacterial strains selected from the group consisting of:

- *Weissella viridescens* LB10G, which is deposited as DSM 32906;
- *Lactobacillus paracasei* LB113R, which is deposited as DSM 32907;
- *Lactobacillus plantarum* LB244R, which is deposited as DSM 32996;

Claims

1. A bacterial strain selected from a *Lactobacillus plantarum*, wherein the *Lactobacillus plantarum* is Lactobacillus plantarum LB244R, which is deposited as DSM 32996; or *Lactobacillus plantarum* LB356R, which is deposited as DSM 33094, wherein the bacterial strain is provided as one or more lyophilized strains, one or more dead or inactivated strains, one or more strain lysate; one or more strain metabolites or a combination thereof.

2. A bacterial strain having a genetic homology of at least 95% to one or more of the bacterial strains selected from the group consisting of:
   - *Lactobacillus plantarum* LB244R, which is deposited as DSM 32996;
   - *Lactobacillus plantarum* LB356R, which is deposited as DSM 33094;

   wherein the bacterial strain inhibits growth of pathogenic microorganisms, like *Staphylococcus aureus*, and/or reduce the colonization level of pathogenic microorganisms, like Staphylococcus, associated with skin diseases, wherein the bacterial strain is provided as one or more lyophilized strains, one or more dead or inactivated strains, one or more strain lysate; one or more strain metabolites or a combination thereof.

3. The bacterial strain according to claim 2, wherein the growth of *Staphylococcus aureus*, such as methicillin resistant *Staphylococcus aureus* (MRSA), in co-culture is reduced by at least 20%; such as reduced by at least 30%, e.g. reduced by at least 40%; such as reduced by at least 50%, e.g. reduced by at least 60%.

4. The bacterial strain according to any one of the preceding claims, wherein the bacterial strain is an isolated bacterial strain.

5. A composition comprising one or more of the bacterial strains according to any one of claims 1-4.

~~6. The composition according to claim 5, wherein the one or more of the bacterial strains is provided as one or more viable strains, one or more dead or inactivated strains, one or more strain lysate; one or more strain metabolites or a combination hereof.~~

~~7.~~6. The composition according to ~~any one of~~ claim~~s~~ 5 ~~or 6~~, wherein the composition is formulated into an emulsion; an oil; a gum; a paste; a powder; a

talc; a lotion; a custard; a foam; a crème; a gel; an ointment; a suspension; a mist; or a liquid.

7. A composition comprising a bacterial strain selected from a *Lactobacillus plantarum*, wherein the *Lactobacillus plantarum* is Lactobacillus plantarum LB244R, which is deposited as DSM 32996; or *Lactobacillus plantarum* LB356R, which is deposited as DSM 33094, wherein the composition is formulated into an emulsion; an oil; a gum; a paste; a powder; a talc; a lotion; a custard; a foam; a crème; a gel; an ointment; a suspension; a mist; or a liquid.

8. The composition according to any one of claims 5-7, wherein the composition is a topical composition, an oral composition or a rectal composition, preferably the composition is a topical composition.

9. A composition comprising a bacterial strain selected from a *Lactobacillus plantarum*, wherein the *Lactobacillus plantarum* is Lactobacillus plantarum LB244R, which is deposited as DSM 32996; or *Lactobacillus plantarum* LB356R, which is deposited as DSM 33094, wherein the composition is a topical composition, an oral composition or a rectal composition, preferably the composition is a topical composition.

~~9.~~10. The composition according to any one of claims 5-~~8~~9, wherein the concentration of the bacterial strain, preferably the one or more viable strain and/or the one or more dead strain, is in the range of 10^3 to 10^{14} colony forming units (CFU); such as in the range of 10^5-10^{13} CFU; e.g. in the range of 10^7-10^{12} CFU; such as in the range of 10^9-10^{11} CFU.

~~10.~~11. The composition according to any one of claims 5-~~8~~10, wherein the concentration of the bacterial strain, preferably one or more dead/inactivated strains, one or more strain lysate; one or more strain metabolites is in a concentration of 0.001% (w/w) to 20% (w/w).

~~11.~~12. The composition according to any one of claims 5-~~10~~11, wherein the bacterial strain according to claims 1-4 is the only bacteria present in the composition.

~~12.~~13. Use of the composition according to any one of claims 5-~~11~~12 in the manufacture of a medicament for treating; alleviating, suppressing; prophylaxis; and/or preventing growth of a pathogenic micro-organism.

~~13.~~14. Use of the composition according to any one of claims 5-12 in the manufacture of a medicament for the treatment; alleviation; suppression; and/or the prophylaxis of one or more pathogenic bacterial infection in a mammal.

~~14.~~15. Use of the composition according to any one of claims 5-~~13~~ 12 in the manufacture of a medicament for the treatment; alleviation; suppression; and/or the prophylaxis of one or more antibiotic resistant bacterial infection in a mammal.

~~15.~~16. The use according to any one of claims ~~12~~13-~~14~~15, wherein bacterial infection is a *Staphylococcus* infection in a mammal.

~~16.~~17. The use according to claim ~~15~~16, wherein the Staphylococcus infection is an MRSA-infection.

~~17.~~18. Use of the composition according to any one of claims ~~1~~5-~~16~~ 12 in the manufacture of a medicament for the treatment; alleviation; suppression; and/or the prophylaxis of diseases resulting from Staphylococcus infections, such as dermatitis, atopic dermatitis, eczema, carbuncle, cellulitis, rosacea, psoriasis, diaper rash, impetigo or wounds.