SUMMARY

The disclosure relates to the use of *Lactocaseibacillus rhamnosus* strain HN001 (HN001) and/or *Bifidobacterium animalis* subsp. *lactis* strain HN019 (HN019) or derivatives thereof for any one or more of the following: (i) the prevention or reduction of stress; (ii) the prevention or reduction of anxiety; (iii) the prevention or reduction of one or more symptoms of depression; (iv) decreasing or reversing certain changes caused by stress, anxiety or depression; (v) improving mood; (vi) increasing relaxation; (vii) increasing energy.

In one aspect, the disclosure relates to use of *Lactocaseibacillus rhamnosus* strain HN001 (HN001) and/or *Bifidobacterium animalis* subsp. *lactis* strain HN019 (HN019) or derivatives thereof for any one or more of: (i) the reduction or prevention of stress; (ii) the reduction or prevention of anxiety; (iii) the prevention or reduction of one or more symptoms of depression; (iv) decreasing or reversing certain changes caused by stress, anxiety or depression; (v) improving mood; (vi) increasing relaxation; (vii) increasing energy, with the proviso that use of HN001 is not for the purpose of enhancing calm or reducing occasional anxiety or the treatment or prevention of postnatal depression or postnatal anxiety in a subject.

There is provided a composition comprising:

(i) *Lactocaseibacillus rhamnosus* strain HN001 (HN001) and/or derivatives thereof; and/or

(ii) *Bifidobacterium animalis* subsp. *lactis* strain HN019 (HN019) and/or derivatives thereof; and

(iii) a physiologically acceptable diluent, adjuvant, carrier or excipient,

for use in any one or more of the following: (i) the reduction or prevention of stress; (ii) the reduction or prevention of anxiety; (iii) the prevention or reduction of one or more symptoms of depression; (iv) decreasing or reversing certain changes caused by stress, anxiety or depression; (v) improving mood; (vi) increasing relaxation; (vii) increasing energy.

In another aspect, the disclosure provides a composition comprising:

a. *Lactocaseibacillus rhamnosus* strain HN001 (HN001) or derivatives thereof; and/or

b. *Bifidobacterium animalis* subsp. *lactis* strain Hn019 (HN019) or derivatives thereof; and

c. a physiologically acceptable diluent, adjuvant, carrier or excipient,

for use in any one or more of: (i) the reduction or prevention of stress; (ii) the reduction or prevention of anxiety; (iii) the prevention or reduction of one or more symptoms of depression; (iv) decreasing or reversing certain changes caused by stress, anxiety or depression; (v) improving mood; (vi) increasing relaxation; (vii) increasing energy, with the proviso that use of HN001 is not for the purpose of enhancing calm or reducing occasional anxiety or the treatment or prevention of postnatal depression or postnatal anxiety in a subject.

The disclosure provides a method for any one or more of the following: (i) the reduction or prevention of stress; (ii) the reduction or prevention of anxiety; (iii) the prevention or reduction of one or more symptoms of depression; (iv) decreasing or reversing certain changes caused by stress, anxiety or depression; (v) improving mood; (vi) increasing relaxation; (vii) increasing energy, comprising administering *Lactocaseibacillus rhamnosus* strain HN001 (HN001) and/or *Bifidobacterium animalis* subsp. *lactis* strain HN019 (HN019) and/or derivatives thereof to a subject in need thereof. The method may be a non-therapeutic method.

In another aspect, the disclosure provides a method for any one or more of: (i) the reduction or prevention of stress; (ii) the reduction or prevention of anxiety; (iii) the prevention or reduction of one or more symptoms of depression; (iv) decreasing or reversing certain changes caused by stress, anxiety or depression; (v) improving mood; (vi) increasing relaxation; (vii) increasing energy, comprising administering *Lactocaseibacillus rhamnosus* strain HN001 (HN001) and/or *Bifidobacterium animalis* subsp. *lactis* strain HN019 (HN019) or derivatives thereof to a subject in need thereof, with the proviso that use of HN001 is not for the purpose of treating or preventing postnatal depression, postnatal anxiety or stress in a subject.

Also provided is the use of *Lactocaseibacillus rhamnosus* strain HN001 (HN001) and/or *Bifidobacterium animalis* subsp. *lactis* strain HN019 (HN019) in the manufacture of a formulation for any one or more of the following: (i) the reduction or prevention of stress; (ii) for the reduction or prevention of anxiety; (iii) the prevention or reduction of one or more symptoms of depression; (iv) decreasing or reversing certain changes caused by stress, anxiety or depression; (v) improving mood; (vi) increasing relaxation; (vii) increasing energy.

The disclosure provides a food ingredient, food product or dietary supplement comprising, consisting of or essentially consisting of *Lactocaseibacillus rhamnosus* strain HN001 (HN001) and/or *Bifidobacterium animalis* subsp. *lactis* strain HN019 (HN019) for any one or more of the following: (i) the reduction or prevention of stress; (ii) the reduction or prevention of anxiety; (iii) the prevention or reduction of one or more symptoms of depression; (iv) decreasing or reversing certain changes caused by stress, anxiety or depression; (v) improving mood; (vi) increasing relaxation; (vii) increasing energy.

According to one example, the disclosure relating to HN001 do not include or are not for the purpose of treatment or prevention of postnatal depression or postnatal anxiety.

According to one example, the disclosure relating to HN001 do not include or are not for the purpose of enhancing calm or reducing occasional anxiety.

According to another example, the disclosure relating to HN001, do not include the combination of *Lactobacillus rhamnosus* LPR (ATCC 54193) and *Bifidobacterium longum* BL999 (ATCC BAA-9999) for the purpose of reduction of anxiety and chronic stress.

According to another example, the disclosure relating to HN001, do not include the combination of HN001 and glutamine and/or curcuma.

BRIEF DESCRIPTION OF THE DRAWINGS

One or more embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a schematic representation of the experimental set up using the CUMS (Chronic Unpredictable Mild Stress) model.

Figure 2 shows an image of the open field experiment (left-hand image) and the elevated-plus maze experiment (right-hand image).

Figure 3 shows the change in body weight of rat under CUMS, CUMS-HN001, CUMS-HN019, CUMS-HN019 and CUMS-Flu compared to controls.

Figure 4 shows Western blot analysis of neuroendocrine hormone receptors corticotropin releasing factor type 1 (CRF1) and Glucocorticoid Receptor (GR) in brain tissue. Results shown as ratios of antibody staining intensity of receptor (CFR1, left; GR, right) vs the housekeeping protein GAPDH. * $P<0.05$.