

**Table S1. *In vitro* screening of gastrointestinal tolerance of candidate strains**

| Strain                                      | strain number | Acid tolerance               |                              |                   | Bile tolerance               |                              |                   | Tolerance to artificial gastric juice |                              |                   | Tolerance to artificial intestinal juice |                              |                   |
|---|---------------|------------------------------|------------------------------|-------------------|------------------------------|------------------------------|-------------------|---------------------------------------|------------------------------|-------------------|--|------------------------------|-------------------|
|   |               | 0h viable count (CFU/mL)     | 3h viable count (CFU/mL)     | Survival rate (%) | 0h viable count (CFU/mL)     | 3h viable count (CFU/mL)     | Survival rate (%) | 0h viable count (CFU/mL)              | 3h viable count (CFU/mL)     | Survival rate (%) | 0h viable count (CFU/mL)                 | 4h viable count (CFU/mL)     | Survival rate (%) |
| <i>Lactobacillus rhamnosus</i>              | RH01103       | (1.25±0.08) *10 <sup>9</sup> | (6.9±0.4) *10 <sup>8</sup>   | 55±1.47           | (1.31±0.04) *10 <sup>9</sup> | (1.26±0.03) *10 <sup>9</sup> | <u>96.15±0.73</u> | (1.19±0.04) 10 <sup>9</sup>           | (1.18±0.04) *10 <sup>9</sup> | <u>99.09±0.61</u> | (1.32±0.03) *10 <sup>9</sup>             | (1.31±0.02) *10 <sup>9</sup> | <u>99.23±0.37</u> |
|   | RH01232       | (9.33±0.07) *10 <sup>8</sup> | (3.49±0.15) *10 <sup>8</sup> | 37.36±1.35        | (1.07±0.03) *10 <sup>9</sup> | (9.3±0.3) *10 <sup>8</sup>   | 86.67±1.1         | (9.81±0.04) *10 <sup>8</sup>          | (9.51±0.03) *10 <sup>8</sup> | <u>96.94±0.61</u> | (9.88±0.04) *10 <sup>8</sup>             | (8.42±0.11) *10 <sup>8</sup> | 85.19±0.86        |
|   | RH01475       | (1.18±0.03) *10 <sup>9</sup> | (5.4±0.08) *10 <sup>8</sup>  | 45.45±0.73        | (1.09±0.03) *10 <sup>9</sup> | (1.01±0.03) *10 <sup>9</sup> | 92.73±0.53        | (1.24±0.03) *10 <sup>9</sup>          | (9.9±0.2) *10 <sup>8</sup>   | 80±0.67           | (1.18±0.03) *10 <sup>9</sup>             | (1.09±0.02) *10 <sup>9</sup> | 92.98±0.88        |
| <i>Limosilactobacillus reuteri</i>          | HCS02-001     | (2.02±0.05) *10 <sup>9</sup> | (1.37±0.03) *10 <sup>9</sup> | <u>67.65±0.98</u> | (2.77±0.03) *10 <sup>9</sup> | (2.72±0.04) 10 <sup>9</sup>  | <u>98.18±0.51</u> | (2.29±0.03) *10 <sup>9</sup>          | (2.22±0.01) *10 <sup>9</sup> | <u>96.95±1.38</u> | (2.23±0.02) *10 <sup>9</sup>             | (2.19±0.01) *10 <sup>9</sup> | <u>98.21±0.5</u>  |
|   | RH02197       | (1.29±0.11) *10 <sup>9</sup> | (6.8±0.6) *10 <sup>8</sup>   | 52.42±1.48        | (1.11±0.03) *10 <sup>9</sup> | (9.6±0.2) *10 <sup>8</sup>   | 86.96±0.93        | (1.2±0.02) *10 <sup>9</sup>           | (1.05±0.03) *10 <sup>9</sup> | 87.5±0.69         | (1.35±0.04) *10 <sup>9</sup>             | (1.27±0.03) *10 <sup>9</sup> | 94.16±0.26        |
|   | RH02801       | (2.37±0.04) *10 <sup>9</sup> | (1.51±0) *10 <sup>9</sup>    | 63.75±1.13        | (2.43±0.04) *10 <sup>9</sup> | (2.18±0.01) *10 <sup>9</sup> | 89.8±0.87         | (2.35±0.03) *10 <sup>9</sup>          | (1.87±0.03) *10 <sup>9</sup> | 79.57±0.54        | (2.46±0.03) *10 <sup>9</sup>             | (2.14±0.04) *10 <sup>9</sup> | 86.69±0.69        |
|   | RH02409       | (2.48±0.04) *10 <sup>9</sup> | (1.49±0.01) *10 <sup>9</sup> | 60±0.98           | (2.82±0.04) *10 <sup>9</sup> | (2.72±0.06) *10 <sup>9</sup> | <u>96.43±1.08</u> | (2.72±0.02) *10 <sup>9</sup>          | (1.96±0.03) *10 <sup>9</sup> | 72.06±0.62        | (2.62±0.04) *10 <sup>9</sup>             | (2.27±0.03) *10 <sup>9</sup> | 86.69±0.55        |
| <i>Lactiplantibacillus plantarum</i>        | RH03010       | (1.92±0.03) *10 <sup>9</sup> | (1.03±0.03) *10 <sup>9</sup> | 53.68±0.94        | (2.8±0.02) *10 <sup>9</sup>  | (2.65±0.04) *10 <sup>9</sup> | 94.64±0.96        | (1.9±0.02) *10 <sup>9</sup>           | (1.76±0.01) *10 <sup>9</sup> | 92.63±0.61        | (2.34±0.03) *10 <sup>9</sup>             | (2.34±0.04) *10 <sup>9</sup> | <u>100±0.12</u>   |
|   | RH03798       | (1.86±0.03) *10 <sup>9</sup> | (0.99±0.01) *10 <sup>9</sup> | 53.48±1.24        | (1.93±0.02) *10 <sup>9</sup> | (1.48±0.02) *10 <sup>9</sup> | 76.53±1           | (2.12±0.04) *10 <sup>9</sup>          | (1.15±0.03) *10 <sup>9</sup> | 54.46±0.5         | (2.27±0.05) *10 <sup>9</sup>             | (2.2±0.06) *10 <sup>9</sup>  | 96.92±0.44        |
|   | RH03705       | (1.25±0.05) *10 <sup>9</sup> | (5.7±0.1) *10 <sup>8</sup>   | 45.56±0.97        | (1.12±0.03) *10 <sup>9</sup> | (1.05±0.02) *10 <sup>9</sup> | 93.64±0.81        | (1.23±0.02) *10 <sup>9</sup>          | (1.05±0.02) *10 <sup>9</sup> | 85.25±0.56        | (1.32±0.05) *10 <sup>9</sup>             | (1.21±0.05) *10 <sup>9</sup> | 91.6±0.75         |
|   | RH03526       | (2±0.02) *10 <sup>9</sup>    | (7.4±0.2) *10 <sup>8</sup>   | 37.13±0.56        | (2.3±0.02) *10 <sup>9</sup>  | (1.5±0.03) *10 <sup>9</sup>  | 65.22±0.88        | (2.54±0.03) *10 <sup>9</sup>          | (1.84±0.02) *10 <sup>9</sup> | 72.55±0.64        | (2.64±0.03) *10 <sup>9</sup>             | (2.33±0.03) *10 <sup>9</sup> | 88.3±0.7          |
|   | RH03976       | (1.35±0.03) *10 <sup>9</sup> | (5.6±0.1) *10 <sup>8</sup>   | 41.3±0.31         | (1.5±0.03) *10 <sup>9</sup>  | (1.15±0.04) *10 <sup>9</sup> | 76.67±1.24        | (1.5±0.02) *10 <sup>9</sup>           | (1.09±0.01) *10 <sup>9</sup> | 72.67±0.81        | (1.63±0.02) *10 <sup>9</sup>             | (1.63±0.02) *10 <sup>9</sup> | 81.48±0.4         |
| <i>Animal Bifidobacterium subsp. lactis</i> | RH04020       | (1.05±0.04) *10 <sup>9</sup> | (6.8±0.3) *10 <sup>8</sup>   | 65.09±0.55        | (1.44±0.04) *10 <sup>9</sup> | (1.41±0.05) *10 <sup>9</sup> | <u>97.93±0.87</u> | (1.08±0.02) *10 <sup>9</sup>          | (1.07±0.02) *10 <sup>9</sup> | <u>99.07±0.67</u> | (1.71±0.03) *10 <sup>9</sup>             | (1.71±0.04) *10 <sup>9</sup> | <u>100±0.75</u>   |
|   | RH04568       | (1.12±0.03) *10 <sup>9</sup> | (6.5±0.1) *10 <sup>8</sup>   | 57.79±0.83        | (1.24±0.02) *10 <sup>9</sup> | (1.2±0.03) *10 <sup>9</sup>  | <u>96.75±0.66</u> | (1.1±0.02) *10 <sup>9</sup>           | (1±0.02) *10 <sup>9</sup>    | 90.9±1.37         | (1.24±0.03) *10 <sup>9</sup>             | (1.23±0.04) *10 <sup>9</sup> | <u>99.2±0.69</u>  |
| <i>Limosilactobacillus fermentum</i>        | RH08050       | (1.81±0.03) *10 <sup>9</sup> | (9.8±0.2) *10 <sup>8</sup>   | 53.89±1.09        | (2.04±0.06) *10 <sup>9</sup> | (2.02±0.05) *10 <sup>9</sup> | <u>99±0.67</u>    | (1.99±0.04) *10 <sup>9</sup>          | (1.95±0.05) *10 <sup>9</sup> | <u>98±0.92</u>    | (1.86±0.04) *10 <sup>9</sup>             | (1.72±0.04) *10 <sup>9</sup> | 92.59±1.09        |
|   | RH08836       | (1.5±0.02) *10 <sup>9</sup>  | (5.3±0.1) *10 <sup>8</sup>   | 35.67±0.42        | (1.42±0.02) *10 <sup>9</sup> | (1.03±0.01) *10 <sup>9</sup> | 72.86±0.82        | (1.75±0.03) *10 <sup>9</sup>          | (1.56±0.05) *10 <sup>9</sup> | 89.14±1.6         | (1.64±0.03) *10 <sup>9</sup>             | (1.5±0.04) *10 <sup>9</sup>  | 91.57±1.49        |
| <i>Lacticaseibacillus paracasei</i>         | HCS17-040     | (1.26±0.03) *10 <sup>9</sup> | (9.6±0.1) *10 <sup>8</sup>   | <u>76.17±1.51</u> | (1.3±0.02) *10 <sup>9</sup>  | (1.26±0.03) *10 <sup>9</sup> | <u>96.92±0.55</u> | (1.27±0.03) *10 <sup>9</sup>          | (1.2±0.03) *10 <sup>9</sup>  | <u>94.53±0.55</u> | (1.22±0.04) *10 <sup>9</sup>             | (1.22±0.04) *10 <sup>9</sup> | <u>100±0.21</u>   |
|   | RH17964       | (1.62±0.02) *10 <sup>9</sup> | (8±0.2) *10 <sup>8</sup>     | 49.69±1.59        | (1.8±0.02) *10 <sup>9</sup>  | (1.45±0.03) *10 <sup>9</sup> | 80.56±1.52        | (1.98±0.03) *10 <sup>9</sup>          | (1.85±0.04) *10 <sup>9</sup> | 93.36±1.2         | (1.9±0.02) *10 <sup>9</sup>              | (1.7±0.03) *10 <sup>9</sup>  | 89.47±0.62        |
|   | RH17965       | (1.41±0.02) *10 <sup>9</sup> | (9.3±0.1) *10 <sup>8</sup>   | <u>65.71±1.09</u> | (1.45±0.02) *10 <sup>9</sup> | (1.3±0.02) *10 <sup>9</sup>  | 89.66±1.36        | (1.2±0.03) *10 <sup>9</sup>           | (1.01±0.02) *10 <sup>9</sup> | 84.3±1.47         | (1.5±0.04) *10 <sup>9</sup>              | (1.39±0.05) *10 <sup>9</sup> | 92.72±1.27        |
| <i>Pediococcus acidilactici</i>             | RH27102       | (1.68±0.03) *10 <sup>9</sup> | (8.30±0.4) *10 <sup>8</sup>  | 49.4±1.35         | (2.16±0.03) *10 <sup>9</sup> | (2.16±0.04) *10 <sup>9</sup> | <u>100±1.09</u>   | (2.32±0.02) *10 <sup>9</sup>          | (1.77±0.02) *10 <sup>9</sup> | 76.17±0.96        | (2.6±0.02) *10 <sup>9</sup>              | (2.3±0.04) *10 <sup>9</sup>  | 88.46±1.14        |
|   | RH27865       | (1.5±0.02) *10 <sup>9</sup>  | (5.70±0.2) *10 <sup>8</sup>  | 38±1.37           | (1.65±0.04) *10 <sup>9</sup> | (1.6±0.05) *10 <sup>9</sup>  | <u>96.97±1.08</u> | (1.36±0.03) *10 <sup>9</sup>          | (1.02±0.03) *10 <sup>9</sup> | 74.81±0.82        | (1.63±0.03) *10 <sup>9</sup>             | (1.59±0.03) *10 <sup>9</sup> | 97.53±0.82        |
| <i>Pediococcus pentosaceus</i>              | RH34011       | (2.34±0.04) *10 <sup>9</sup> | (1.43±0.03) *10 <sup>9</sup> | <u>60.87±0.96</u> | (2.06±0.04) *10 <sup>9</sup> | (2.04±0.03) *10 <sup>9</sup> | <u>99.02±0.87</u> | (2.45±0.04) *10 <sup>9</sup>          | (2.15±0.04) *10 <sup>9</sup> | 87.76±1.29        | (2.02±0.04) *10 <sup>9</sup>             | (1.91±0.03) *10 <sup>9</sup> | 94.5±1.29         |
|   | RH34985       | (2.17±0.03) *10 <sup>9</sup> | (1.14±0.02) *10 <sup>9</sup> | 52.31±0.66        | (1.91±0.03) *10 <sup>9</sup> | (1.64±0.03) *10 <sup>9</sup> | 85.86±0.78        | (2.15±0.04) *10 <sup>9</sup>          | (1.67±0.02) *10 <sup>9</sup> | 77.46±1.21        | (2.24±0.03) *10 <sup>9</sup>             | (1.68±0.01) *10 <sup>9</sup> | 75±0.96           |