

**Table S1: Results of the antagonistic effect of various probiotics and other beneficial microbes against clinical skin pathogens using the agar spot assay**

|                     | Mean zone of inhibition (standard deviation) mm* |              |              |              |              |              |              |              |              |              |              |              |              |              |              | AV <sub>ZOIpro</sub> |
|---------------------|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------------|
|                     | Sa1  | Sa2          | Pa3          | Pa4          | Ef5          | Ef6          | Ec7          | Ec8          | Kp9          | Kp10         | Ent11        | Ent12        | Ac13         | Bac14        | Bac15        |                      |
| MS1                 | 27.33 (1.15)                                     | 26.5 (1)     | 26 (0.82)    | 25.5 (1)     | 22.5 (4.12)  | 16.67 (1.15) | 27.33 (1.15) | 19.33 (1.15) | 17.33 (1.15) | 14.67 (2.31) | 14.33 (0.58) | 16.67 (1.15) | 36.67 (1.15) | 22 (2.31)    | 27.33 (2.31) | 22.68                |
| MS2                 | 33.33 (1.15)                                     | 24.5 (1)     | 22.67 (1.15) | 25 (1.41)    | 22.67 (3.06) | 19.33 (1.15) | 26.67 (1.15) | 25.67 (0.58) | 21.33 (1.15) | 26.67 (3.06) | 20.67 (2.31) | 24.67 (4.16) | 30.13 (0.25) | 28.5 (0.71)  | 27.33 (1.15) | 25.28                |
| MS3                 | 29.5 (2.52)                                      | 23.75 (1.26) | 23.33 (1.15) | 29.5 (2.52)  | 24.67 (2.31) | 27.33 (1.15) | 27.0 (1.41)  | 30.0 (3.46)  | 28.5 (3.79)  | 23.33 (3.06) | 24.67 (1.15) | 19.33 (3.06) | 35.33 (3.06) | 29.33 (2.31) | 36.5 (0.71)  | 27.47                |
| MS4                 | 25.33 (1.15)                                     | 20.67 (1.15) | 24.0 (2)     | 28.0 (3.46)  | 24.25 (0.5)  | 22.33 (0.58) | 22.67 (5.03) | 26.0 (2)     | 23.33 (1.15) | 24.0 (2)     | 14.67 (2.31) | 19.33 (1.15) | 18.67 (1.15) | 22.5 (0.71)  | 30 (1.63)    | 23.05                |
| MS5                 | 29.5 (1)   | 18.5 (1)     | 25.33 (1.15) | 32.25 (0.5)  | 21.0 (2)     | 22.67 (3.06) | 24.67 (2.31) | 25.33 (1.15) | 25.33 (1.15) | 28.0 (1)     | 14.67 (1.15) | 22.0 (4)     | 36.67 (1.15) | 28.5 (1.91)  | 26.67 (1.15) | 25.41                |
| MS6                 | 27.33 (1.15)                                     | 24.5 (1)     | 25.0 (1.41)  | 25.0 (2)     | 35.00 (1.41) | 26.25 (0.5)  | 29.0 (1.41)  | 29.0 (1.41)  | 30.0 (2.83)  | 20.67 (3.06) | 15.67 (0.58) | 24.67 (4.16) | 41.0 (1.41)  | 26.5 (0.71)  | 36.0 (1)     | 27.71                |
| MS7                 | 20.5 (1)   | 23.0 (2)     | 16.67 (2.31) | 26.67 (1.15) | 22.0 (5.66)  | 26.67 (2.31) | 17.5 (0.71)  | 26.67 (1.15) | 24.0 (2.83)  | 23.33 (1.15) | 16.67 (1.15) | 25.33 (1.15) | 41.5 (0.71)  | 25.33 (1.15) | 31.67 (0.58) | 24.50                |
| SS01                | 32.0 (2.83)                                      | 20.5 (2.52)  | 26.25 (0.5)  | 29.33 (1.15) | 25.5 (3)     | 26.33 (0.58) | 27.33 (1.15) | 25.0 (1.41)  | 25.67 (0.58) | 27.33 (1.15) | 20.67 (1.15) | 18.67 (3.06) | 35.0 (4.24)  | 26.13 (0.25) | 29.33 (1.15) | 26.34                |
| SS02                | 23.0 (7.07)                                      | 20.67 (1.15) | 26.67 (1.15) | 24.5 (3)     | 24.67 (1.15) | 24.67 (1.15) | 24.5 (1.91)  | 27.0 (1.15)  | 21.0 (2.58)  | 18.67 (1.15) | 14.5 (1.91)  | 13.33 (1.15) | 34.0 (2)     | 27.0 (2)     | 24.67 (1.15) | 23.26                |
| SS03                | 19.33 (1.15)                                     | 21.5 (1)     | 27.5 (1)     | 27.0 (2)     | 29.0 (1.41)  | 24.33 (0.58) | 28.67 (1.15) | 24.0 (1.63)  | 29.67 (0.58) | 24.0 (2)     | 12.67 (1.15) | 13.33 (1.15) | 39.0 (1.41)  | 25.5 (1)     | 25.33 (1.15) | 24.72                |
| SS04                | 29.5 (1)   | 24.5 (1)     | 20.5 (3.79)  | 29.5 (1.91)  | 23.5 (1)     | 26.0 (2)     | 27.33 (2.31) | 29.0 (1.41)  | 22.5 (0.71)  | 22.67 (1.15) | 17.67 (0.58) | 24.0 (2.83)  | 42.5 (0.71)  | 30.0 (4)     | 32.67 (4.16) | 26.79                |
| SS05                | 16.25 (0.5)                                      | 18.25 (0.5)  | 16.25 (0.5)  | 15.25 (0.96) | 13.8 (0.45)  | 13.25 (0.96) | 11.5 (1)     | 21.25 (0.96) | 20.25 (0.5)  | 18.2 (0.45)  | 21.0 (2.58)  | 20.67 (3.06) | 18.2 (0.45)  | 18.2 (0.45)  | 20.5 (1)     | 17.52                |
| SS06                | 14.75 (0.96)                                     | 16.25 (0.5)  | 17.8 (0.45)  | 17.25 (0.96) | 11.75 (1.26) | 14.25 (2.06) | 16.0 (1.63)  | 22.0 (1.63)  | 21.8 (0.45)  | 23.5 (1)     | 22.0 (1.63)  | 22.0 (2)     | 20.75 (0.96) | 20.25 (0.5)  | 18.2 (0.45)  | 18.57                |
| SS07                | 8.25 (0.5)                                       | 12.0 (1.63)  | 10.5 (1)     | 10.33 (0.58) | 8.25 (0.5)   | 8.2 (0.45)   | 8.6 (0.89)   | 8.2 (0.45)   | 7.67 (0.58)  | 8.5 (0.71)   | 7.33 (0.58)  | 7.67 (0.58)  | 7.33 (0.58)  | 7.67 (0.58)  | 7.67 (0.58)  | 8.54                 |
| SS08                | 7.2 (0.45)                                       | 8.75 (0.5)   | 7 (1)        | 7.5 (1)      | 6.25 (0.5)   | 6.2 (0.45)   | 6.75 (0.5)   | 6.75 (0.5)   | 7.75 (0.5)   | 6.5 (0.58)   | 7.75 (0.5)   | 7.5 (0.58)   | 7.75 (0.5)   | 7.25 (0.5)   | 7.2 (0.45)   | 7.21                 |
| SS09                | 7.4 (0.89)                                       | 6.63 (0.48)  | 6.33 (0.58)  | 6.5 (1)      | 6.25 (0.5)   | 6.25 (0.5)   | 6.88 (0.25)  | 6.88 (0.25)  | 7.13 (0.63)  | 6.63 (0.48)  | 7.8 (0.45)   | 7.75 (0.5)   | 6.8 (0.45)   | 7.4 (0.55)   | 7.33 (0.52)  | 6.93                 |
| SS10                | 7.25 (0.5)                                       | 6.38 (0.48)  | 6.25 (0.5)   | 6.67 (1.15)  | 6.75 (0.5)   | 6.75 (0.5)   | 6.75 (0.5)   | 6.75 (0.5)   | 7.25 (0.5)   | 6.75 (0.5)   | 8.6 (0.89)   | 8.5 (1)      | 7.1 (0.55)   | 8.4 (0.89)   | 8.33 (0.82)  | 7.23                 |
| SS11                | 19.5 (1)   | 20.5 (1)     | 24.25 (0.5)  | 27.6 (0.89)  | 18.5 (1)     | 24.25 (0.5)  | 24.13 (0.25) | 16.5 (1)     | 16.0 (1.63)  | 13.5 (1)     | 8.5 (1)      | 8.25 (0.5)   | 10.5 (1)     | 11.25 (1.5)  | 11.5 (1.91)  | 16.98                |
| AV <sub>ZOIpa</sub> | 20.58  | 18.29        | 19.19        | 21.64        | 19.05        | 19.12        | 19.76        | 20.94        | 19.95        | 18.96        | 15.03        | 16.88        | 25.43        | 20.57        | 22.41        |                      |

\*More than 20 mm was considered **strong inhibition (3+)**, between 11 and 20 mm was considered **intermediate inhibition (2+)** and less than 10 mm was considered **low inhibition (+)**. The diameter of the colony is included. If no zone of inhibition was detected the result was reported as < 6 mm.

AV<sub>ZOIpa</sub> means average zone of inhibition of all probiotics against the individual pathogen.

AV<sub>ZOIpro</sub> means average zone of inhibition of individual probiotic against all pathogens.

**Table S2: Results of the antagonistic effect of various probiotics and other beneficial microbes against clinical skin pathogens using the co-culturing assay**

|                     | Log step reduction (Percentage of reduction) * |                    |                    |                     |                    |                    |                     |                    |                     |                    |                     |                     |                     |                     |                    | AV <sub>ZOIpro</sub> |
|---------------------|--|--------------------|--------------------|---------------------|--------------------|--------------------|---------------------|--------------------|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|--------------------|----------------------|
|                     | Sa1  | Sa2                | Pa3                | Pa4                 | Ef5                | Ef6                | Ec7                 | Ec8                | Kp9                 | Kp10               | Ent11               | Ent12               | Ac13                | Bac14               | Bac15              |                      |
| MS1                 | 4.37<br>(99.9958%)                             | 3.58<br>(99.9734%) | 7.66 (100%)        | 7.12<br>(99.9999%)  | 3.2<br>(99.9367%)  | 4.09<br>(99.9918%) | 6.8<br>(99.99998%)  | 4.43<br>(99.9963%) | 1.8<br>(98.42487%)  | 5.91<br>(99.9999%) | 7.7 (100%)          | 7.74 (100%)         | 6.62<br>(99.99998%) | 7.71 (100%)         | 7.47 (100%)        | 5.75                 |
| MS2                 | 4.87<br>(99.9986%)                             | 3.89<br>(99.9871%) | 7.66 (100%)        | 7.21<br>(99.99999%) | 3.35<br>(99.9558%) | 4.21<br>(99.9938%) | 4.58<br>(99.9974%)  | 4.98<br>(99.999%)  | 2.66<br>(99.78187%) | 3.86<br>(99.9863%) | 7.65 (100%)         | 7.68 (100%)         | 6.32<br>(99.99995%) | 7.71 (100%)         | 4.49<br>(99.9967%) | 5.41                 |
| MS3                 | 4.37<br>(99.9958%)                             | 4.44<br>(99.9964%) | 3.67<br>(99.9786%) | 2.13<br>(99.26129%) | 3.43<br>(99.9625%) | 4.44<br>(99.9964%) | 6.85<br>(99.99999%) | 7.05 (100%)        | 2.43<br>(99.62591%) | 7.4 (100%)         | 6.31<br>(99.99995%) | 7.79 (100%)         | 6.68<br>(99.99998%) | 7.54 (100%)         | 3.16<br>(99.9304%) | 5.18                 |
| MS4                 | 5.94<br>(99.9999%)                             | 5.83<br>(99.9999%) | 7.66 (100%)        | 7.08<br>(99.99999%) | 4.18<br>(99.9933%) | 5.12<br>(99.9992%) | 6.86<br>(99.99999%) | 6.92 (100%)        | 6.89<br>(99.99999%) | 6.23<br>(99.9999%) | 5.31<br>(99.9995%)  | 7.74 (100%)         | 6.57<br>(99.99997%) | 6.83<br>(99.99999%) | 7.17 (100%)        | 6.42                 |
| MS5                 | 5.86<br>(99.9999%)                             | 4.66<br>(99.9978%) | 7.66 (100%)        | 6.5<br>(99.99997%)  | 2.16<br>(99.3032%) | 5.29<br>(99.9995%) | 6.69<br>(99.99998%) | 6.88 (100%)        | 6.45<br>(99.99996%) | 3.29<br>(99.9486%) | 7.6 (100%)          | 7.49 (100%)         | 9.04 (100%)         | 5.2<br>(99.99936%)  | 7.01 (100%)        | 6.12                 |
| MS6                 | 3.86<br>(99.9861%)                             | 3.64<br>(99.9771%) | 7.66 (100%)        | 3.61<br>(99.97558%) | 2.23<br>(99.4167%) | 3.93<br>(99.9882%) | 5.59<br>(99.99974%) | 1.32<br>(95.1642%) | 2.3<br>(99.50052%)  | 3.22<br>(99.9394%) | 5.65<br>(99.99978%) | 6.13<br>(99.99993%) | 7.91 (100%)         | 4.04<br>(99.99093%) | 1.37<br>(95.7216%) | 4.16                 |
| MS7                 | 4.66<br>(99.9978%)                             | 3.95<br>(99.9889%) | 7.66 (100%)        | 6.94<br>(99.99999%) | 3.51<br>(99.9692%) | 4.78<br>(99.9983%) | 6.81<br>(99.99998%) | 6.98 (100%)        | 7.94 (100%)         | 6.46 (100%)        | 7.76 (100%)         | 7.71 (100%)         | 8.68 (100%)         | 5.94<br>(99.99988%) | 4.9<br>(99.9987%)  | 6.31                 |
| SS01                | 3.5 (99.9685%)                                 | 2.48<br>(99.6707%) | 6.23<br>(99.9999%) | 7.21 (100%)         | 1.89<br>(98.7011%) | 1.44<br>(96.3556%) | 4.29<br>(99.99491%) | 4.12<br>(99.9924%) | 3.61<br>(99.97533%) | 2.6<br>(99.7494%)  | 5.9<br>(99.99988%)  | 7.08<br>(99.99999%) | 1.98<br>(98.9494%)  | 4.6<br>(99.99747%)  | 1.76<br>(98.2615%) | 3.91                 |
| SS02                | 3.76<br>(99.9827%)                             | 3.18<br>(99.9346%) | 6.32 (100%)        | 6.95<br>(99.99999%) | 3.24<br>(99.9419%) | 2.62<br>(99.7611%) | 4.48<br>(99.99671%) | 3.94<br>(99.9884%) | 4.92<br>(99.99881%) | 2.03<br>(99.0694%) | 6.97<br>(99.99999%) | 7.63 (100%)         | 3.92<br>(99.98795%) | 4.48<br>(99.99672%) | 1.54<br>(97.1341%) | 4.40                 |
| SS03                | 4.77<br>(99.9983%)                             | 4.45<br>(99.9964%) | 6.18<br>(99.9999%) | 6.87<br>(99.99999%) | 3.68<br>(99.9792%) | 4.97<br>(99.9989%) | 5.49<br>(99.99968%) | 6.87 (100%)        | 1.27<br>(94.57254%) | 4.76<br>(99.9983%) | 6.07<br>(99.99992%) | 6.24<br>(99.99994%) | 5.98<br>(99.9998%)  | 0.59 (74%)          | 2.74<br>(99.8183%) | 4.73                 |
| SS04                | 6.41<br>(99.99996%)                            | 6.09<br>(99.9999%) | 6.4 (100%)         | 4.39<br>(99.99588%) | 4.73<br>(99.9981%) | 3.35<br>(99.9555%) | 6.16<br>(99.99993%) | 7.08 (100%)        | 6.49<br>(99.99997%) | 5.59<br>(99.9997%) | 7.32 (100%)         | 6.73<br>(99.99998%) | 5.52<br>(99.9997%)  | 7.35 (100%)         | 4.82<br>(99.9985%) | 5.90                 |
| SS05                | 4.79<br>(99.9984%)                             | 4.36<br>(99.9956%) | 6.36 (100%)        | 5.93<br>(99.99988%) | 3.53<br>(99.9704%) | 4.34<br>(99.9955%) | 6.5<br>(99.99997%)  | 6.98 (100%)        | 1.36<br>(95.66062%) | 6.54 (100%)        | 7.79 (100%)         | 6.05<br>(99.99991%) | 5.52<br>(99.9997%)  | 7.71 (100%)         | 5.93<br>(99.9999%) | 5.58                 |
| SS06                | 6.82<br>(99.9999848%)                          | 6.07<br>(99.9999%) | 7.17 (100%)        | 6.91<br>(99.99999%) | 2.08<br>(99.1667%) | 4.69<br>(99.998%)  | 5.23<br>(99.99942%) | 6.82 (100%)        | 5.88<br>(99.99987%) | 6.08<br>(99.9999%) | 7.38 (100%)         | 7.43 (100%)         | 4.98<br>(99.99895%) | 2.61<br>(99.7529%)  | 1.37<br>(95.7555%) | 5.43                 |
| SS07                | 5.1 (99.9992%)                                 | 2.82<br>(99.849%)  | 7.87 (100%)        | 6.85<br>(99.99999%) | 3.31<br>(99.9505%) | 2.29<br>(99.4889%) | 4.56<br>(99.99727%) | 4.85<br>(99.9986%) | 5.81<br>(99.99985%) | 5.11<br>(99.9992%) | 5.3<br>(99.9995%)   | 5.44<br>(99.99964%) | 5.04<br>(99.9991%)  | 1.4 (96%)           | 1.07<br>(91.511%)  | 4.45                 |
| SS08                | 2.22<br>(99.3922%)                             | 1.43<br>(96.2764%) | 0.81<br>(84.64%)   | 1.1<br>(92.0202%)   | 0.87<br>(86.5789%) | 1.06<br>(91.2258%) | 1.89 (98.7%)        | 1.91<br>(98.7812%) | 1.77<br>(98.29545%) | 1.55<br>(97.1833%) | 1.94<br>(98.84932%) | 2.01<br>(99.02056%) | 3.59<br>(99.9741%)  | 3.98<br>(99.98942%) | 0.31<br>(51.1036%) | 1.76                 |
| SS09                | 1.95<br>(98.8816%)                             | 1.79<br>(98.3927%) | 2.26<br>(99.4533%) | 2.11<br>(99.22828%) | 0.66<br>(78.0263%) | 1.08<br>(91.6903%) | 1.6<br>(97.4625%)   | 1.68<br>(97.8918%) | 2.29<br>(99.48864%) | 1.63<br>(97.6667%) | 2.05<br>(99.11233%) | 2.23<br>(99.40935%) | 1.78<br>(98.3494%)  | 1.75<br>(98.22394%) | 0.67<br>(78.7776%) | 1.70                 |
| SS10                | 3.6 (99.9748%)                                 | 2.24<br>(99.4273%) | 4.78<br>(99.9983%) | 2.15<br>(99.29293%) | 0.19<br>(35.5263%) | 1.25<br>(94.3484%) | 1.96<br>(98.90625%) | 3.07<br>(99.9158%) | 5.69<br>(99.9998%)  | 3.46<br>(99.9654%) | 4.99<br>(99.99897%) | 4.11<br>(99.99224%) | 5.5<br>(99.99968%)  | 0.54 (71.4%)        | 4.29<br>(99.9949%) | 3.19                 |
| SS11                | 4.44<br>(99.9964%)                             | 3.22<br>(99.94%)   | 2.76<br>(99.8277%) | 1.55<br>(97.16117%) | 1.72<br>(98.0917%) | 1.26<br>(94.5152%) | 4.43<br>(99.99626%) | 1.31<br>(95.0896%) | 0.47<br>(66.11399%) | 1.33<br>(95.3613%) | 2.77<br>(99.82921%) | 5.04<br>(99.99908%) | 1.59<br>(97.40361%) | 1.4<br>(95.98456%)  | 0.48<br>(66.7233%) | 2.25                 |
| AV <sub>ZOIpa</sub> | 4.52   | 3.78               | 5.93               | 5.15                | 2.66               | 3.35               | 5.04                | 4.84               | 3.89                | 4.28               | 5.91                | 6.24                | 5.40                | 4.52                | 3.48               |                      |

\*a log step reduction of more than 6 was considered **strong inhibition**, between 3 and 6 was considered **intermediate inhibition** and less than 3 was considered **low inhibition**. AV<sub>ZOIpa</sub> means average log step reduction of all probiotics against the individual pathogen. AV<sub>ZOIpro</sub> means average log step reduction of individual probiotic against all pathogens.

**Table S3: Results of the antagonistic effect of various cell-free supernatants of probiotics and other beneficial microbes against clinical skin pathogens using the agar well diffusion assay**

|                     | Mean zone of inhibition (standard deviation) mm* |              |             |              |              |              |              |              |              |              |              |              |             |               |             | AV <sub>ZOIpro</sub> |
|---------------------|--|--------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|---------------|-------------|----------------------|
|                     | Sa1  | Sa2          | Pa3         | Pa4          | Ef5          | Ef6          | Ec7          | Ec8          | Kp9          | Kp10         | Ent11        | Ent12        | Ac13        | Bac14         | Bac15       |                      |
| MS1                 | 13.67 (5.96)                                     | 10.33 (2.06) | 12.5 (1)    | 12 (3.27)    | 12.67 (4.13) | 10.33 (3.67) | 12.6 (3.27)  | 10 (1.85)    | 10 (1.41)    | 14.25 (1.28) | 10.75 (3.2)  | 9.43 (2.51)  | 12 (3.21)   | 15 (6.26)     | 7.25 (0.5)  | 11.52                |
| MS2                 | 14 (6.03)  | 13.82 (2.6)  | 7.25 (0.5)  | 7.22 (0.83)  | 9.2 (3.03)   | 6.83 (0.75)  | 10.44 (2.6)  | 12 (4.73)    | 11 (3.95)    | 12.86 (4.88) | 15 (5.76)    | 9.33 (2.73)  | 9 (2.65)    | < 6           | 7 (0)       | 10.06                |
| MS3                 | 10.83 (4.04)                                     | 7.27 (0.65)  | 7.38 (0.92) | 16.83 (4.55) | 18.8 (8.07)  | 8 (1.79)     | 11.43 (3.78) | 14.67 (6.77) | 6.5 (0.58)   | 11.71 (4.07) | 17.78 (8.39) | 9.67 (2.94)  | 9.71 (3.45) | 20.33 (10.52) | 6.5 (0.58)  | 11.83                |
| MS4                 | 11.83 (4.47)                                     | 9.33 (1.3)   | 9.71 (3.55) | 10 (2.31)    | 14 (5.57)    | < 6          | 12.22 (3.67) | 13.71 (0.76) | 9.43 (2.99)  | 12 (2.62)    | 14.67 (2)    | 13.11 (2.03) | 9.75 (3.2)  | 6.5 (0.58)    | 17 (1.15)   | 11.28                |
| MS5                 | 11.83 (5.01)                                     | 9.83 (3.01)  | < 6         | 12.8 (3.79)  | 9.67 (3.2)   | < 6          | 11.5 (2.56)  | 10.33 (3.44) | 9.67 (2.94)  | 15.5 (4.87)  | 9.5 (2.56)   | 10 (3.02)    | 9.22 (1.86) | 6.5 (0.58)    | 19 (1.15)   | 10.49                |
| MS6                 | 8.55 (3.8)                                       | 8.67 (2.42)  | 16 (1.63)   | < 6          | 7.33 (1.03)  | 6.67 (0.52)  | 7 (0)        | 21 (3.38)    | 7 (1.15)     | 6.33 (0.58)  | 18.67 (9.85) | 18 (9.38)    | 8 (1.1)     | 6.5 (0.58)    | 18.5 (1.91) | 10.95                |
| MS7                 | 14.6 (5.97)                                      | 10.5 (1.24)  | 8.5 (2.78)  | 13.67 (2.06) | < 6          | 15.2 (9.34)  | 13.09 (3.51) | 7.33 (1.03)  | 11.33 (4.32) | 7.25 (0.46)  | 8.5 (1.6)    | 8.67 (2.07)  | 7.67 (1.51) | 6.5 (0.58)    | 8 (0)       | 9.79                 |
| SS01                | 11.08 (5.2)                                      | 10 (4.37)    | 17 (2.58)   | 8.8 (1.69)   | < 6          | < 6          | 16.6 (2.84)  | 21.71 (4.96) | 6.33 (0.58)  | 7 (0)        | 8.67 (2.07)  | < 6          | 7 (1)       | < 6           | 7 (0)       | 9.68                 |
| SS02                | 13.8 (1.99)                                      | 8.58 (2.81)  | 7.75 (0.5)  | 10.2 (2.39)  | 8 (1.79)     | 7.17 (0.98)  | 13.67 (4.8)  | 12 (4.87)    | 6.8 (0.84)   | 11.25 (4.1)  | 8.67 (1)     | 10.25 (1.28) | 7.67 (0.52) | < 6           | < 6         | 9.19                 |
| SS03                | < 6  | 14 (4.69)    | 9.5 (3.08)  | 6.78 (0.44)  | < 6          | < 6          | 19.09 (2.07) | 17 (8.56)    | 6.33 (0.58)  | < 6          | 12.67 (5.16) | 15 (6.22)    | 6.5 (0.58)  | < 6           | 7 (0)       | 9.59                 |
| SS04                | 10 (2.49)  | 6.89 (0.33)  | < 6         | 9 (1.7)      | 7 (0)        | < 6          | 6.5 (0.58)   | 10 (2.83)    | 6.5 (0.58)   | 6.67 (0.52)  | 10 (2.83)    | 8.67 (2.07)  | 8.75 (2.12) | < 6           | < 6         | 7.60                 |
| SS05                | 11.83 (4.86)                                     | 11.56 (2.6)  | 11.2 (4.82) | 6.8 (0.42)   | < 6          | < 6          | 14.4 (3.24)  | 10 (3.1)     | 10.29 (3.15) | 10.86 (3.63) | 8.33 (2.34)  | < 6          | 7.6 (1.67)  | < 6           | < 6         | 8.86                 |
| SS06                | 8.18 (3.16)                                      | < 6          | 9 (1.15)    | 9 (2.45)     | 6.67 (0.52)  | 6.67 (1.03)  | 13 (5.23)    | 14 (5.95)    | 11.75 (4.65) | 11 (1.15)    | 10 (1.63)    | 11.6 (1.67)  | 11.5 (1.91) | < 6           | < 6         | 9.36                 |
| SS07                | < 6  | 7.5 (1)      | 14.5 (6.61) | 10.17 (4.78) | < 6          | < 6          | < 6          | < 6          | < 6          | < 6          | 9.5 (3.42)   | < 6          | 6.6 (0.55)  | 15 (2.58)     | < 6         | 7.82                 |
| SS08                | 7.75 (1.98)                                      | 8 (1.63)     | < 6         | < 6          | < 6          | < 6          | 7.33 (1.03)  | < 6          | < 6          | < 6          | 16.5 (1.91)  | < 6          | < 6         | < 6           | < 6         | 7.04                 |
| SS09                | 7.71 (2.43)                                      | 11.6 (3.29)  | < 6         | < 6          | < 6          | < 6          | 7.33 (1.03)  | < 6          | < 6          | < 6          | < 6          | < 6          | < 6         | < 6           | < 6         | 6.58                 |
| SS10                | 9.38 (1.92)                                      | 8 (1.95)     | 10 (1.63)   | 9.2 (2.28)   | < 6          | 14 (6.32)    | 9.1 (1.2)    | 7.33 (0.5)   | 8 (2)        | 7.43 (1.4)   | < 6          | 7.5 (0.53)   | < 6         | 8 (1.63)      | < 6         | 8.13                 |
| SS11                | 6.33 (0.82)                                      | < 6          | 17 (1.15)   | 13 (6.03)    | 6.67 (0.52)  | < 6          | < 6          | 12.33 (4.97) | < 6          | < 6          | 8.67 (2.07)  | < 6          | 8.17 (2.04) | < 6           | < 6         | 8.01                 |
| AV <sub>ZOIpa</sub> | 10.19  | 9.33         | 10.07       | 9.64         | 8.22         | 7.49         | 10.96        | 11.75        | 8.05         | 9.12         | 11.10        | 9.29         | 8.17        | 8.02          | 8.40        |                      |

\*Cell-free supernatant after filtration; More than 20 mm was considered **strong inhibition (3+)**, between 11 and 20 mm was considered **intermediate inhibition (2+)** and less than 10 mm was considered **low inhibition (+)**. The diameter of the colony is included. If no zone of inhibition was detected the result was reported as **< 6 mm**.

AV<sub>ZOIpa</sub> means average zone of inhibition of all probiotics against the individual pathogen.

AV<sub>ZOIpro</sub> means average zone of inhibition of individual probiotic against all pathogens.

**Table S4: Results of the antagonistic effect of various neutralised cell-free supernatants of probiotics and other beneficial microbes against clinical skin pathogens using the agar well diffusion assay**

|      | Mean zone of inhibition (standard deviation) mm* |              |             |             |              |             |              |              |              |              |             |             |             |           |              | AV <sub>ZOIpro</sub> |
|------|--|--------------|-------------|-------------|--------------|-------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-----------|--------------|----------------------|
|      | Sa1  | Sa2          | Pa3         | Pa4         | Ef5          | Ef6         | Ec7          | Ec8          | Kp9          | Kp10         | Ent11       | Ent12       | Ac13        | Bac14     | Bac15        |                      |
| MS1  | < 6  | 7.14 (1.07)  | 17 (1.15)   | < 6         | < 6          | < 6         | < 6          | 12 (4.9)     | < 6          | < 6          | < 6         | < 6         | 7 (1)       | < 6       | < 6          | 7.28                 |
| MS2  | < 6  | 8.86 (2.79)  | 7.67 (0.58) | 6.6 (0.55)  | 9 (2.45)     | < 6         | 15.5 (1)     | 13 (1.15)    | < 6          | 12.67 (1.15) | < 6         | < 6         | 7.14 (0.69) | 1< 6      | 7.75 (0.5)   | 8.95                 |
| MS3  | < 6  | 8.29 (2.14)  | 9.14 (2.91) | 8.4 (1.67)  | 10.67 (4.13) | 6.25 (0.5)  | 12 (1.63)    | 9 (1.15)     | 12.67 (1.15) | 14.67 (2.31) | < 6         | < 6         | 7.33 (0.52) | < 6       | 8 (0)        | 8.69                 |
| MS4  | < 6  | 7.43 (1.51)  | < 6         | < 6         | 6.67 (0.52)  | 6.33 (0.58) | < 6          | 14.5 (3)     | < 6          | 16 (2)       | 16 (1.63)   | 15 (3.46)   | < 6         | < 6       | 15.5 (1.91)  | 9.30                 |
| MS5  | < 6  | < 6          | < 6         | < 6         | < 6          | < 6         | < 6          | < 6          | < 6          | 14 (3.65)    | < 6         | 8.5 (3)     | < 6         | < 6       | 18.67 (6.11) | 7.54                 |
| MS6  | 8.55 (3.8)                                       | < 6          | < 6         | < 6         | < 6          | < 6         | < 6          | < 6          | < 6          | < 6          | < 6         | < 6         | 7 (0)       | < 6       | 19.33 (1.15) | 7.13                 |
| MS7  | 6.25 (0.5)                                       | 11 (3.83)    | < 6         | < 6         | 18 (11.05)   | 13.2 (6.57) | 13 (3.46)    | < 6          | < 6          | < 6          | 7 (0)       | 10.5 (5.26) | < 6         | < 6       | < 6          | 8.46                 |
| SS01 | < 6  | 11.2 (3.35)  | 7.75 (0.5)  | 14.8 (7.29) | < 6          | < 6         | 16 (1.79)    | 14 (6.2)     | < 6          | < 6          | 12 (5.48)   | < 6         | < 6         | < 6       | < 6          | 8.65                 |
| SS02 | < 6  | 10.67 (4.16) | < 6         | < 6         | < 6          | < 6         | 11.6 (5.18)  | 12.33 (4.97) | < 6          | < 6          | 10.8 (4.38) | < 6         | < 6         | 24 (2)    | < 6          | 8.63                 |
| SS03 | < 6  | 13.5 (5.26)  | < 6         | 18.8 (7.29) | < 6          | < 6         | 15.78 (2.11) | 12 (4.73)    | < 6          | < 6          | 14 (2)      | 13.5 (6.61) | < 6         | < 6       | < 6          | 9.44                 |
| SS04 | 8.57 (4.43)                                      | 10.5 (3.42)  | < 6         | < 6         | < 6          | < 6         | 6.6 (0.55)   | 12 (0)       | < 6          | 11 (1.15)    | 11 (1.15)   | < 6         | 9.75 (1.67) | < 6       | < 6          | 7.83                 |
| SS05 | 7.09 (1.87)                                      | 8.4 (1.67)   | < 6         | < 6         | < 6          | < 6         | < 6          | 12.33 (4.97) | < 6          | < 6          | 13 (1.15)   | < 6         | 8 (0)       | 17 (1.15) | < 6          | 7.99                 |
| SS06 | 8.17 (1.8)                                       | < 6          | < 6         | < 6         | 11.33 (4.32) | < 6         | 12.57 (4.58) | 9.33 (2.73)  | 11 (3.95)    | 13.75 (2.25) | 7.2 (1.1)   | 8.4 (2.19)  | 7.67 (1.51) | < 6       | 11.5 (6.4)   | 8.73                 |
| SS07 | 8.5 (2.78)                                       | 9.2 (2.28)   | < 6         | < 6         | < 6          | < 6         | < 6          | < 6          | < 6          | < 6          | < 6         | < 6         | 8 (0)       | < 6       | < 6          | 6.51                 |
| SS08 | 10.86 (6.09)                                     | 9.6 (2.19)   | < 6         | < 6         | < 6          | < 6         | < 6          | < 6          | < 6          | < 6          | 17 (3.46)   | < 6         | < 6         | < 6       | < 6          | 7.30                 |
| SS09 | 6.5 (0.53)                                       | 10.5 (3.42)  | < 6         | < 6         | < 6          | < 6         | 7.2 (1.1)    | 8 (0)        | < 6          | < 6          | 16 (1.41)   | < 6         | < 6         | < 6       | < 6          | 7.55                 |
| SS10 | < 6  | 9.6 (2.19)   | < 6         | < 6         | < 6          | < 6         | 7.13 (0.83)  | 7 (0)        | 12.5 (1.91)  | < 6          | < 6         | < 6         | < 6         | < 6       | < 6          | 6.82                 |
| SS11 | 6.88 (0.99)                                      | < 6          | 16.5 (3.79) | < 6         | < 6          | < 6         | < 6          | < 6          | < 6          | < 6          | < 6         | < 6         | 7 (1)       | < 6       | < 6          | 6.79                 |
|      | 6.97   | 8.88         | 7.56        | 7.37        | 7.43         | 6.43        | 9.19         | 9.53         | 7.01         | 8.56         | 9.83        | 7.44        | 6.80        | 8.17      | 8.49         |                      |

\*Neutralised cell-free supernatant after filtration with pH = 7 by addition of NaOH. More than 20 mm was considered **strong inhibition (3+)**, between 11 and 20 mm was considered **intermediate inhibition (2+)** and less than 10 mm was considered **low inhibition (+)**. The diameter of the colony is included. If no zone of inhibition was detected the result was reported as < 6 mm.

AV<sub>ZOIpa</sub> means average zone of inhibition of all probiotics against the individual pathogen.

AV<sub>ZOIpro</sub> means average zone of inhibition of individual probiotic against all pathogens.