

Profiling bacterial communities of irrigation water and leafy greens produced by small-scale farms and sold in informal settlements in South Africa

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Additional file

Additional file 1: Table S1. Samples analysed for bacterial community characterisation

| Source | Farm A* | Farm B* | Farm C* | Farm D** | Farm E* |
|------------------------|-----------|-----------|-----------|-----------|-----------|
| Irrigation type | Flooding | Flooding | Flooding | Overhead | Overhead |
| Water | | | | | |
| Total | 3 | 3 | 3 | 5 | 4 |
| Chinensis | 5 | 5 | 5 | 5 | 5 |
| Fresh produce | | | | | |
| Rape | 5 | 5 | 5 | 5 | 5 |
| Total | 10 | 10 | 10 | 10 | 10 |

*Brits, ** Delmas

Additional file 1: Table S2. Taxonomic breakdown of core bacterial taxa present in flooding irrigation water

| OTU identity | Phylum | Class | Order | Family | Genus | Species |
|----------------------------------|----------------|---------------------|-----------------------|-------------------|----------------------------|---------------------|
| 9e369e24d76a7150a2c4ac9aa6b2baf1 | Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | | |
| fcc876a945d7c54639de699aabcbdice | Proteobacteria | Gammaproteobacteria | Betaproteobacteriales | Burkholderiaceae | <i>Limnobacter</i> | uncultured organism |
| 8bec3ac7483b4adf26f15c05fb8bc35e | Proteobacteria | Gammaproteobacteria | Betaproteobacteriales | Burkholderiaceae | | |
| 31b2b9431133072f141717db0250ab02 | Proteobacteria | Gammaproteobacteria | Betaproteobacteriales | Burkholderiaceae | | |
| 5df9c9d3bc1387a384a7304eb76f88f4 | Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | | |
| c3722bc5eff03ae4cadd2549a22db048 | Proteobacteria | Gammaproteobacteria | Betaproteobacteriales | Burkholderiaceae | | |
| e388ab2332c547014892798383fafd7d | Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | | |
| 2d496c699946a37212424a0827d03a9f | Actinobacteria | Actinobacteria | Micrococcales | Microbacteriaceae | | |
| d5df277366ec9a714a3c0c30c48f5c93 | Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | <i>Sphingorhabdus</i> | |
| f3dcd6d150bed5887c5d95ecd800331d | Proteobacteria | Gammaproteobacteria | Betaproteobacteriales | Burkholderiaceae | <i>Hydrogenophaga</i> | |
| 6030182cd34a06d4f4521c8f55fb009e | Bacteroidetes | Bacteroidia | Cytophagales | Spirosomaceae | <i>Pseudarcicella</i> | |
| 0a31500df50604edac4bda336efddb0 | Proteobacteria | Gammaproteobacteria | Pseudomonadales | Pseudomonadaceae | <i>Pseudomonas</i> | |
| e7c4237b0a9a3b8ff023f4ff2ebb641c | Proteobacteria | Gammaproteobacteria | Betaproteobacteriales | Burkholderiaceae | | |
| 5b66940f344f55aad0edb8abdd2e59b0 | Actinobacteria | Actinobacteria | Micrococcales | Microbacteriaceae | <i>Candidatus Aquiluna</i> | |
| b9a7295268ff8cb8f79571e496534575 | Proteobacteria | Gammaproteobacteria | Betaproteobacteriales | Burkholderiaceae | <i>Polynucleobacter</i> | |
| beb0b49ddd5290e781e6db5f4522ea98 | Bacteroidetes | Bacteroidia | Flavobacteriales | Flavobacteriaceae | <i>Flavobacterium</i> | |
| 5697459d903193b1110a676b626e4b82 | Actinobacteria | Actinobacteria | Micrococcales | Micrococcaceae | | |
| 5793229edfbac276fe26c8542cd45a4e | Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | <i>Porphyrobacter</i> | |
| 45503578dfd42462a8a941e71d5b52dd | Actinobacteria | Actinobacteria | Frankiales | Sporichthyaceae | | |

| | | | | | | |
|----------------------------------|----------------|---------------------|-----------------------|---------------------|-------------------------|--|
| 9b3c69cfd5a5a65130e93247e39e8d28 | Bacteroidetes | Bacteroidia | Sphingobacteriales | Sphingobacteriaceae | <i>Solitalea</i> | uncultured <i>Solitalea</i> sp. |
| 94fc87ae6175f154427836dab1299f08 | Proteobacteria | Gammaproteobacteria | Pseudomonadales | Pseudomonadaceae | <i>Pseudomonas</i> | |
| b98807a57df1baf2e870c0f3d99c6961 | Proteobacteria | Gammaproteobacteria | Betaproteobacteriales | Burkholderiaceae | <i>Polynucleobacter</i> | <i>Polynucleobacter</i> <i>cosmopolitanus</i> |
| a40c0c2529b6d8aac5b0e1c508bbae46 | Bacteroidetes | Bacteroidia | Cytophagales | Cyclobacteriaceae | <i>Algoriphagus</i> | uncultured <i>Hongiella</i> sp. |

Additional file 1: Table S3. Bacterial families that are associated with isolation and outbreaks in South Africa

| Family | Genus | Outbreaks/ Isolations reported in SA | Reference | WHO listing | Putative foodborne pathogen |
|------------------------------|------------------------|--|--|-------------|-----------------------------|
| <i>Burkholderiaceae</i> | <i>Ralstonia</i> | 2020 by <i>Ralstonia mannitolilytica</i> | Said et al., 2020 | no | no |
| | <i>Duganella</i> | 2015: Isolation | Sholeye, 2020 | no | no |
| <i>Enterobacteriaceae</i> | <i>Escherichia</i> | M* by <i>E. coli</i> | Shonhiwa et al., 2019 | no | yes |
| | <i>Shigella</i> | M* <i>Shigella</i> | Ntshoe et al., 2014, Pillay et al., 1997, Ramalwa et al., 2020, Shonhiwa et al., 2019 | yes | yes |
| | <i>Salmonella</i> | M* by <i>Salmonella</i> spp. | Ramalwa et al., 2020, Shonhiwa et al., 2019 | yes | yes |
| | <i>Pantoea</i> | 2006: Isolated <i>P. ananatis</i> | Goszczyńska et al., 2006 | no | no |
| | <i>Serratia</i> | 2012 and 2015 by <i>S. marcescens</i> | Dramowski et al., 2017 | no | no |
| | <i>Cedecea</i> | NO | | no | no |
| | <i>Proteus</i> | 2022 by <i>P. mirabilis</i> | Aron et al., 2022 | no | yes |
| | <i>Citrobacter</i> | 2020 isolation of <i>C. freundii</i> | Ramsamy et al., 2020 | no | no |
| | <i>Klebsiella</i> | 2020 by <i>K. pneumonia</i> | Essel et al., 2020 | no | no |
| | <i>Buchnera</i> | NO | - | no | no |
| | <i>Enterobacter</i> | 1998 by <i>E. cloacae</i> | van Nierop et al., 1998 | no | no |
| | <i>Erwinia</i> | NO | - | no | no |
| <i>Bacillales Family XII</i> | <i>Exiguobacterium</i> | NO | - | no | no |
| <i>Rhodobacteraceae</i> | <i>Rhodobacter</i> | NO | - | no | no |

| | | | | | |
|---------------------------------|-------------------------|---|--|-----|-----|
| | <i>Paracoccus</i> | NO | - | no | no |
| | <i>Rubellimicrobium</i> | NO | - | no | no |
| <i>Micrococcaceae</i> | <i>Kocuria</i> | 2014 isolation of <i>K. rosea</i> | Setlhare et al., 2014 | no | no |
| | <i>Rothia</i> | NO | - | no | no |
| <i>Pseudomonadaceae</i> | <i>Pseudomonas</i> | 2016-2017 by <i>P. aurogenesa</i> | Opperman et al., 2022 | yes | no |
| <i>Bacillaceae</i> | <i>Bacillus</i> | M* <i>B. cereus</i> | Setlhare et al., 2014, Shonhiwa et al., 2019 | yes | yes |
| <i>Moraxellaceae</i> | <i>Acinetobacter</i> | 2014 and 2019 by <i>Acinetobacter baumannii</i> | Dramowski et al., 2017, Lowe et al., 2022 | no | yes |
| <i>Clostridiaceae</i> | <i>Clostridium</i> | M* by <i>Clostridium perfringens</i> | Bamford et al., 2019, Shonhiwa et al., 2019 | no | yes |
| <i>Enterococcaceae</i> | <i>Enterococcus</i> | 1999-2000 by <i>Enterococcus faecium</i> | McCarthy et al., 2000 | yes | yes |
| <i>Staphylococcaceae</i> | <i>Staphylococcus</i> | M* by <i>Staphylococcus aureus</i> | Dramowski et al., 2017, Ismail et al., 2020 | yes | yes |

M*: Multiple outbreaks, NO: No outbreak or isolation in SA, WHO: World Health Organisation