## Supplementary Tables

Supplementary table 1: meta table for all experiments

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **sample #** | **Data set** | **Experiment** | **Growth time [hrs]** | **Batch #** | **Carbon source** | **Mg [mM]** | **Na [mM]** | **Growth phase** | **Mg levels** | **Na levels** |
| 16 | MURI\_016 | glucose\_time\_course | 3 | 8 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 17 | MURI\_017 | glucose\_time\_course | 4 | 8 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 18 | MURI\_018 | glucose\_time\_course | 5 | 8 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 19 | MURI\_019 | glucose\_time\_course | 6 | 8 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 20 | MURI\_020 | glucose\_time\_course | 8 | 8 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 21 | MURI\_021 | glucose\_time\_course | 24 | 8 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 22 | MURI\_022 | glucose\_time\_course | 48 | 8 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 23 | MURI\_023 | glucose\_time\_course | 168 | 8 | glucose | 0.8 | 5 | late\_stationary | baseMg | baseNa |
| 24 | MURI\_024 | glucose\_time\_course | 336 | 8 | glucose | 0.8 | 5 | late\_stationary | baseMg | baseNa |
| 25 | MURI\_025 | glucose\_time\_course | 3 | 9 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 26 | MURI\_026 | glucose\_time\_course | 4 | 9 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 27 | MURI\_027 | glucose\_time\_course | 5 | 9 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 28 | MURI\_028 | glucose\_time\_course | 6 | 9 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 29 | MURI\_029 | glucose\_time\_course | 8 | 9 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 30 | MURI\_030 | glucose\_time\_course | 24 | 9 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 31 | MURI\_031 | glucose\_time\_course | 48 | 9 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 32 | MURI\_032 | glucose\_time\_course | 168 | 9 | glucose | 0.8 | 5 | late\_stationary | baseMg | baseNa |
| 33 | MURI\_033 | glucose\_time\_course | 336 | 9 | glucose | 0.8 | 5 | late\_stationary | baseMg | baseNa |
| 34 | MURI\_034 | glycerol\_time\_course | 5 | 10 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 35 | MURI\_035 | glycerol\_time\_course | 7 | 10 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 36 | MURI\_036 | glycerol\_time\_course | 8 | 10 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 37 | MURI\_037 | glycerol\_time\_course | 10 | 10 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 38 | MURI\_038 | glycerol\_time\_course | 14 | 10 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 39 | MURI\_039 | glycerol\_time\_course | 24 | 10 | glycerol | 0.8 | 5 | stationary | baseMg | baseNa |
| 40 | MURI\_040 | glycerol\_time\_course | 48 | 10 | glycerol | 0.8 | 5 | stationary | baseMg | baseNa |
| 41 | MURI\_041 | glycerol\_time\_course | 168 | 10 | glycerol | 0.8 | 5 | late\_stationary | baseMg | baseNa |
| 42 | MURI\_042 | glycerol\_time\_course | 336 | 10 | glycerol | 0.8 | 5 | late\_stationary | baseMg | baseNa |
| 43 | MURI\_043 | glycerol\_time\_course | 5 | 11 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 44 | MURI\_044 | glycerol\_time\_course | 7 | 11 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 45 | MURI\_045 | glycerol\_time\_course | 8 | 11 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 46 | MURI\_046 | glycerol\_time\_course | 10 | 11 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 47 | MURI\_047 | glycerol\_time\_course | 14 | 11 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 48 | MURI\_048 | glycerol\_time\_course | 24 | 11 | glycerol | 0.8 | 5 | stationary | baseMg | baseNa |
| 49 | MURI\_049 | glycerol\_time\_course | 48 | 11 | glycerol | 0.8 | 5 | stationary | baseMg | baseNa |
| 50 | MURI\_050 | glycerol\_time\_course | 168 | 11 | glycerol | 0.8 | 5 | late\_stationary | baseMg | baseNa |
| 52 | MURI\_052 | glycerol\_time\_course | 5 | 12 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 53 | MURI\_053 | glycerol\_time\_course | 7 | 12 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 54 | MURI\_054 | glycerol\_time\_course | 8 | 12 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 55 | MURI\_055 | glycerol\_time\_course | 10 | 12 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 56 | MURI\_056 | glycerol\_time\_course | 14 | 12 | glycerol | 0.8 | 5 | exponential | baseMg | baseNa |
| 57 | MURI\_057 | glycerol\_time\_course | 24 | 12 | glycerol | 0.8 | 5 | stationary | baseMg | baseNa |
| 58 | MURI\_058 | glycerol\_time\_course | 48 | 12 | glycerol | 0.8 | 5 | stationary | baseMg | baseNa |
| 61 | MURI\_061 | NaCl\_stress | 5.5 | 13 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 64 | MURI\_064 | NaCl\_stress | 8 | 13 | glucose | 0.8 | 300 | exponential | baseMg | highNa |
| 65 | MURI\_065 | NaCl\_stress | 28 | 13 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 66 | MURI\_066 | NaCl\_stress | 28 | 13 | glucose | 0.8 | 100 | stationary | baseMg | highNa |
| 67 | MURI\_067 | NaCl\_stress | 28 | 13 | glucose | 0.8 | 200 | stationary | baseMg | highNa |
| 68 | MURI\_068 | NaCl\_stress | 28 | 13 | glucose | 0.8 | 300 | stationary | baseMg | highNa |
| 69 | MURI\_069 | NaCl\_stress | 6 | 14 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 70 | MURI\_070 | NaCl\_stress | 6.5 | 14 | glucose | 0.8 | 100 | exponential | baseMg | highNa |
| 71 | MURI\_071 | NaCl\_stress | 8 | 14 | glucose | 0.8 | 200 | exponential | baseMg | highNa |
| 72 | MURI\_072 | NaCl\_stress | 10 | 14 | glucose | 0.8 | 300 | exponential | baseMg | highNa |
| 73 | MURI\_073 | NaCl\_stress | 29 | 14 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 74 | MURI\_074 | NaCl\_stress | 29 | 14 | glucose | 0.8 | 100 | stationary | baseMg | highNa |
| 75 | MURI\_075 | NaCl\_stress | 29 | 14 | glucose | 0.8 | 200 | stationary | baseMg | highNa |
| 76 | MURI\_076 | NaCl\_stress | 29 | 14 | glucose | 0.8 | 300 | stationary | baseMg | highNa |
| 77 | MURI\_077 | NaCl\_stress | 5.5 | 15 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 79 | MURI\_079 | NaCl\_stress | 8 | 15 | glucose | 0.8 | 200 | exponential | baseMg | highNa |
| 80 | MURI\_080 | NaCl\_stress | 10 | 15 | glucose | 0.8 | 300 | exponential | baseMg | highNa |
| 81 | MURI\_081 | NaCl\_stress | 29 | 15 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 82 | MURI\_082 | NaCl\_stress | 29 | 15 | glucose | 0.8 | 100 | stationary | baseMg | highNa |
| 84 | MURI\_084 | NaCl\_stress | 29 | 15 | glucose | 0.8 | 300 | stationary | baseMg | highNa |
| 85 | MURI\_085 | lactate\_growth | 9 | 16 | lactate | 0.8 | 5 | exponential | baseMg | baseNa |
| 86 | MURI\_086 | lactate\_growth | 29 | 16 | lactate | 0.8 | 5 | stationary | baseMg | baseNa |
| 87 | MURI\_087 | lactate\_growth | 8 | 17 | lactate | 0.8 | 5 | exponential | baseMg | baseNa |
| 88 | MURI\_088 | lactate\_growth | 29 | 17 | lactate | 0.8 | 5 | stationary | baseMg | baseNa |
| 89 | MURI\_089 | lactate\_growth | 9 | 18 | lactate | 0.8 | 5 | exponential | baseMg | baseNa |
| 90 | MURI\_090 | lactate\_growth | 29 | 18 | lactate | 0.8 | 5 | stationary | baseMg | baseNa |
| 91 | MURI\_091 | gluconate\_growth | 6 | 19 | gluconate | 0.8 | 5 | exponential | baseMg | baseNa |
| 92 | MURI\_092 | gluconate\_growth | 27 | 19 | gluconate | 0.8 | 5 | stationary | baseMg | baseNa |
| 93 | MURI\_093 | gluconate\_growth | 5 | 20 | gluconate | 0.8 | 5 | exponential | baseMg | baseNa |
| 94 | MURI\_094 | gluconate\_growth | 27 | 20 | gluconate | 0.8 | 5 | stationary | baseMg | baseNa |
| 95 | MURI\_095 | gluconate\_growth | 6 | 21 | gluconate | 0.8 | 5 | exponential | baseMg | baseNa |
| 96 | MURI\_096 | gluconate\_growth | 27 | 21 | gluconate | 0.8 | 5 | stationary | baseMg | baseNa |
| 97 | MURI\_097 | glucose\_time\_course | 3 | 7 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 98 | MURI\_098 | glucose\_time\_course | 4 | 7 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 99 | MURI\_099 | glucose\_time\_course | 5 | 7 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 100 | MURI\_100 | glucose\_time\_course | 6 | 7 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 101 | MURI\_101 | glucose\_time\_course | 8 | 7 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 102 | MURI\_102 | glucose\_time\_course | 24 | 7 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 103 | MURI\_103 | glucose\_time\_course | 48 | 7 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 104 | MURI\_104 | glucose\_time\_course | 168 | 7 | glucose | 0.8 | 5 | late\_stationary | baseMg | baseNa |
| 105 | MURI\_105 | glucose\_time\_course | 336 | 7 | glucose | 0.8 | 5 | late\_stationary | baseMg | baseNa |
| 106 | MURI\_106 | MgSO4\_stress\_high | 5.5 | 22 | glucose | 0.08 | 5 | exponential | lowMg | baseNa |
| 107 | MURI\_107 | MgSO4\_stress\_high | 5.5 | 22 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 108 | MURI\_108 | MgSO4\_stress\_high | 5.5 | 22 | glucose | 8 | 5 | exponential | highMg | baseNa |
| 109 | MURI\_109 | MgSO4\_stress\_high | 5 | 22 | glucose | 50 | 5 | exponential | highMg | baseNa |
| 110 | MURI\_110 | MgSO4\_stress\_high | 5 | 22 | glucose | 200 | 5 | exponential | highMg | baseNa |
| 111 | MURI\_111 | MgSO4\_stress\_high | 7 | 22 | glucose | 400 | 5 | exponential | highMg | baseNa |
| 112 | MURI\_112 | MgSO4\_stress\_high | 28 | 22 | glucose | 0.08 | 5 | stationary | lowMg | baseNa |
| 113 | MURI\_113 | MgSO4\_stress\_high | 28 | 22 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 114 | MURI\_114 | MgSO4\_stress\_high | 28 | 22 | glucose | 8 | 5 | stationary | highMg | baseNa |
| 115 | MURI\_115 | MgSO4\_stress\_high | 28 | 22 | glucose | 50 | 5 | stationary | highMg | baseNa |
| 116 | MURI\_116 | MgSO4\_stress\_high | 28 | 22 | glucose | 200 | 5 | stationary | highMg | baseNa |
| 117 | MURI\_117 | MgSO4\_stress\_high | 28 | 22 | glucose | 400 | 5 | stationary | highMg | baseNa |
| 118 | MURI\_118 | MgSO4\_stress\_high | 5.5 | 23 | glucose | 0.08 | 5 | exponential | lowMg | baseNa |
| 119 | MURI\_119 | MgSO4\_stress\_high | 5.5 | 23 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 120 | MURI\_120 | MgSO4\_stress\_high | 5.5 | 23 | glucose | 8 | 5 | exponential | highMg | baseNa |
| 121 | MURI\_121 | MgSO4\_stress\_high | 5 | 23 | glucose | 50 | 5 | exponential | highMg | baseNa |
| 122 | MURI\_122 | MgSO4\_stress\_high | 5 | 23 | glucose | 200 | 5 | exponential | highMg | baseNa |
| 123 | MURI\_123 | MgSO4\_stress\_high | 7 | 23 | glucose | 400 | 5 | exponential | highMg | baseNa |
| 124 | MURI\_124 | MgSO4\_stress\_high | 28 | 23 | glucose | 0.08 | 5 | stationary | lowMg | baseNa |
| 125 | MURI\_125 | MgSO4\_stress\_high | 28 | 23 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 126 | MURI\_126 | MgSO4\_stress\_high | 28 | 23 | glucose | 8 | 5 | stationary | highMg | baseNa |
| 127 | MURI\_127 | MgSO4\_stress\_high | 28 | 23 | glucose | 50 | 5 | stationary | highMg | baseNa |
| 128 | MURI\_128 | MgSO4\_stress\_high | 28 | 23 | glucose | 200 | 5 | stationary | highMg | baseNa |
| 129 | MURI\_129 | MgSO4\_stress\_high | 28 | 23 | glucose | 400 | 5 | stationary | highMg | baseNa |
| 130 | MURI\_130 | MgSO4\_stress\_high | 5.5 | 24 | glucose | 0.08 | 5 | exponential | lowMg | baseNa |
| 131 | MURI\_131 | MgSO4\_stress\_high | 5.5 | 24 | glucose | 0.8 | 5 | exponential | baseMg | baseNa |
| 132 | MURI\_132 | MgSO4\_stress\_high | 5.5 | 24 | glucose | 8 | 5 | exponential | highMg | baseNa |
| 133 | MURI\_133 | MgSO4\_stress\_high | 5 | 24 | glucose | 50 | 5 | exponential | highMg | baseNa |
| 134 | MURI\_134 | MgSO4\_stress\_high | 5 | 24 | glucose | 200 | 5 | exponential | highMg | baseNa |
| 135 | MURI\_135 | MgSO4\_stress\_high | 7 | 24 | glucose | 400 | 5 | exponential | highMg | baseNa |
| 136 | MURI\_136 | MgSO4\_stress\_high | 28 | 24 | glucose | 0.08 | 5 | stationary | lowMg | baseNa |
| 137 | MURI\_137 | MgSO4\_stress\_high | 28 | 24 | glucose | 0.8 | 5 | stationary | baseMg | baseNa |
| 138 | MURI\_138 | MgSO4\_stress\_high | 28 | 24 | glucose | 8 | 5 | stationary | highMg | baseNa |
| 139 | MURI\_139 | MgSO4\_stress\_high | 28 | 24 | glucose | 50 | 5 | stationary | highMg | baseNa |
| 140 | MURI\_140 | MgSO4\_stress\_high | 28 | 24 | glucose | 200 | 5 | stationary | highMg | baseNa |
| 141 | MURI\_141 | MgSO4\_stress\_high | 28 | 24 | glucose | 400 | 5 | stationary | highMg | baseNa |
| 142 | MURI\_142 | MgSO4\_stress\_low | 5 | 25 | glucose | 0.005 | 5 | exponential | lowMg | baseNa |
| 143 | MURI\_143 | MgSO4\_stress\_low | 5.5 | 25 | glucose | 0.01 | 5 | exponential | lowMg | baseNa |
| 144 | MURI\_144 | MgSO4\_stress\_low | 5.5 | 25 | glucose | 0.02 | 5 | exponential | lowMg | baseNa |
| 145 | MURI\_145 | MgSO4\_stress\_low | 5.5 | 25 | glucose | 0.04 | 5 | exponential | lowMg | baseNa |
| 146 | MURI\_146 | MgSO4\_stress\_low | 5.5 | 25 | glucose | 0.08 | 5 | exponential | lowMg | baseNa |
| 147 | MURI\_147 | MgSO4\_stress\_low | 26 | 25 | glucose | 0.005 | 5 | stationary | lowMg | baseNa |
| 148 | MURI\_148 | MgSO4\_stress\_low | 26 | 25 | glucose | 0.01 | 5 | stationary | lowMg | baseNa |
| 149 | MURI\_149 | MgSO4\_stress\_low | 26 | 25 | glucose | 0.02 | 5 | stationary | lowMg | baseNa |
| 150 | MURI\_150 | MgSO4\_stress\_low | 26 | 25 | glucose | 0.04 | 5 | stationary | lowMg | baseNa |
| 151 | MURI\_151 | MgSO4\_stress\_low | 26 | 25 | glucose | 0.08 | 5 | stationary | lowMg | baseNa |
| 152 | MURI\_152 | MgSO4\_stress\_low | 5 | 26 | glucose | 0.005 | 5 | exponential | lowMg | baseNa |
| 153 | MURI\_153 | MgSO4\_stress\_low | 5.5 | 26 | glucose | 0.01 | 5 | exponential | lowMg | baseNa |
| 154 | MURI\_154 | MgSO4\_stress\_low | 5.5 | 26 | glucose | 0.02 | 5 | exponential | lowMg | baseNa |
| 155 | MURI\_155 | MgSO4\_stress\_low | 5.5 | 26 | glucose | 0.04 | 5 | exponential | lowMg | baseNa |
| 156 | MURI\_156 | MgSO4\_stress\_low | 5.5 | 26 | glucose | 0.08 | 5 | exponential | lowMg | baseNa |
| 157 | MURI\_157 | MgSO4\_stress\_low | 26 | 26 | glucose | 0.005 | 5 | stationary | lowMg | baseNa |
| 158 | MURI\_158 | MgSO4\_stress\_low | 26 | 26 | glucose | 0.01 | 5 | stationary | lowMg | baseNa |
| 159 | MURI\_159 | MgSO4\_stress\_low | 26 | 26 | glucose | 0.02 | 5 | stationary | lowMg | baseNa |
| 160 | MURI\_160 | MgSO4\_stress\_low | 26 | 26 | glucose | 0.04 | 5 | stationary | lowMg | baseNa |
| 161 | MURI\_161 | MgSO4\_stress\_low | 26 | 26 | glucose | 0.08 | 5 | stationary | lowMg | baseNa |
| 162 | MURI\_162 | MgSO4\_stress\_low | 5 | 27 | glucose | 0.005 | 5 | exponential | lowMg | baseNa |
| 163 | MURI\_163 | MgSO4\_stress\_low | 5.5 | 27 | glucose | 0.01 | 5 | exponential | lowMg | baseNa |
| 164 | MURI\_164 | MgSO4\_stress\_low | 5.5 | 27 | glucose | 0.02 | 5 | exponential | lowMg | baseNa |
| 165 | MURI\_165 | MgSO4\_stress\_low | 5.5 | 27 | glucose | 0.04 | 5 | exponential | lowMg | baseNa |
| 166 | MURI\_166 | MgSO4\_stress\_low | 5.5 | 27 | glucose | 0.08 | 5 | exponential | lowMg | baseNa |
| 167 | MURI\_167 | MgSO4\_stress\_low | 26 | 27 | glucose | 0.005 | 5 | stationary | lowMg | baseNa |
| 168 | MURI\_168 | MgSO4\_stress\_low | 26 | 27 | glucose | 0.01 | 5 | stationary | lowMg | baseNa |
| 169 | MURI\_169 | MgSO4\_stress\_low | 26 | 27 | glucose | 0.02 | 5 | stationary | lowMg | baseNa |
| 170 | MURI\_170 | MgSO4\_stress\_low | 26 | 27 | glucose | 0.04 | 5 | stationary | lowMg | baseNa |
| 171 | MURI\_171 | MgSO4\_stress\_low | 26 | 27 | glucose | 0.08 | 5 | stationary | lowMg | baseNa |

Supplementary Table 2 represents detailed z scores of dendogram clustering for all conditions and all categories.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category** | **Overall z-score** | **Condition** | **Z-score** | **# elements** |
|  |  | exponential | -14.15 | 77 |
| Growth Phase | -2.82 | stationary | 3.14 | 57 |
|  |  | Late-stationary | -2.34 | 9 |
|  |  | lowMg | 1.52 | 35 |
| Mg Levels | -0.70 | baseMg | -2.33 | 85 |
|  |  | highMg | -0.80 | 23 |
| Na Levels | -0.05 | baseNa | -0.76 | 132 |
|  |  | highNa | 0.83 | 11 |
|  |  | glucose | 1.68 | 107 |
| Carbon Source | 0.19 | glycerol | -1.39 | 24 |
|  |  | lactate | -2.49 | 6 |
|  |  | gluconate | -0.28 | 6 |