**Supplemental Materials**

**Hazardous effects of Sucralose and its corresponding disinfection by-products based on the** ***E. coli* whole-cell array analysis**

**Yuanxin Zhaia,b, Dan Baia, Heyun Yanga, Xiaoliang Lia , Daiwen Zhua, Xin Caoa, Hao Maa, Xiaolin Lia, Xing Zhenga,\***

aState Key Laboratory of Eco-hydraulics in North west Arid Region, Xi’an University of Technology, Xi’an 710048, China

bBeijing Waterworks Group Co., Ltd, Beijing 100031, China

\*Corresponding author:

E-mail address: zhengxingde@yahoo.de

Tel.: +86-15249256622; fax: +86-29-83239907.

In 2.3 The *E. coli* whole-cell microarray assay

kan

R

gfpmut2

Specific gene promoter

Fig. S1 Schematic diagram of recombinant the *E. coli* gene with pUA66 as low copy plasmid

In 2.3 The *E. coli* whole-cell microarray assay

Tab. S1 110 stress gene function libraries

|  |  |  |
| --- | --- | --- |
| **Category** | **Gene selected** | **Known functions** |
| **DNA stress** | *uvrA, recE, clpB, rnt, recX, ada, dinB, mutT, nfo, ding, ftsk, recN, sbmC, ybfE, dnaQ, mutH, mutM, mutS, mutY, yjiW, mug, yebG, sulA, lexA, polB, recA, ssb, umuD, uvrD, ruvA, uvrC, uvrY, polA* | DNA strand breaks and cross-linking, alter superhelicity, oxidative DNA damage, DNA alkylation, inhibition of DNA synthesis and replication |
| **Oxidtaive stress** | **Oxidative sensor** | *soxS, soxR, oxyR, inaA, dps, ahpF, katG, sodA, ahpC, katE , ytfE, katE, sodB, sodC,trxA* | Increased levels of superoxides, increased levels of peroxides, any other conditions which alter the redox potential of the cell. |
| **Detoxification** | *norR, fpr, tam, yeiG, yafN, yeaE, grxA, gst* |
| **Protein stress** | *clpB, ycgE, cueR, entC, grpE, dnaK, fepB, dnaJ, rpoD, lon,ybgl* | Denaturation, misfolding, cross-linking and alkylation of proteins, oxidation of individual amino acids and protein damage. |
| **Membrane stress** | **Energy stress** | *sdhC, cyoA* |  |
| **Drug resistance** | *yedW, dacA, dacB, marR, sbmA, bacA, yhjX, emrE, sanA, emrA, marC, mdtK, yajR, fsr, cmr, mrcB, pbpG, ssrA, ompC* | Related to compound /chemical induced stress, membrane transporter and efflux pump |
| **Flagella metabolism** | *flgM, motA* | Related with flagellar synthesis and motor function |
| **Cell envelope** | *amiC, clsA,* | Related with cell membrane and envelope, phospholipids synthesis |
| **General****stress** | **Cold shock** | *cspA, cspB* | Temperature downshift |
| **Cell killing** | *dinJ, slyA, yeeV, yfjG, relB* |  |
| **Stress** | *uspA, otsB, ydgL, bolA, rpoE,* | Disturbance of the biochemical and biophysical homeostasis of the cell. |
| **General function** | *phoB, crp, cdaR, ydeO, ybgI, gadX* |

Determination of SUC concentration using LC/MS

The concentration of SUC were quantified using an ultra-high performance liquid chromatography mass spectrometer (LC/MS) equipped with an electrospray ionization (ESI) interface operated in multiple-reaction monitoring (MRM) mode. Separation was accomplished using an C18 column at 30 ℃. For analyzing SUC, the mobile phase consisted of water (A) and acetonitrile (B), both containing 5 mM ammonium acetate and 1 mM TRIS. The initial solvent mixture was 95% of A, then varied to 25% A within 3 min, and back to 95% over additional 1 min. The samples were analyzed three times.

In 3.1.2 Transcriptional Effect Level Index (TELI) assay

Tab. S2 Each gene response TELI under various stress concentration upon exposure to SUC

|  |
| --- |
| Transcriptional Effect Level Index (TELI) |
| Stress Category | Genes | Concentration(mg/L) |
| Oxidative Stress |  | 0 | 0.282 | 2.82 | 28.2 | 282 | 2820 | 28200 |
| *katE* | 1 | 1.12 | 1.28 | 1.14 | 1.12 | 1.06 | 1.05 |
| *ahpC* | 1 | 1.12 | 1.09 | 1.12 | 1.11 | 1.09 | 1.11 |
| *ahpF* | 1 | 1.12 | 1.05 | 1.14 | 1.06 | 1.03 | 1.05 |
| *dps* | 1 | 1.62 | 1.91 | 1.31 | 1.65 | 1.13 | 3.98 |
| *soxS* | 1 | 1.05 | 1.11 | 1.15 | 1.13 | 1.03 | 1.13 |
| *soxR* | 1 | 1.07 | 1.1 | 1.07 | 1.03 | 1.17 | 1.03 |
| *sodB* | 1 | 1.99 | 1.5 | 1.58 | 1.55 | 1.49 | 1.77 |
| *sodC* | 1 | 1.07 | 1.03 | 1.04 | 1.05 | 1.07 | 1.05 |
| *sodA* | 1 | 1.41 | 1.34 | 1.52 | 1.38 | 1.2 | 1.41 |
| *katG* | 1 | 1.17 | 1.37 | 1.11 | 1.16 | 1.14 | 2.57 |
| *oxyR* | 1 | 1.04 | 1.05 | 1.06 | 1.03 | 1.09 | 1.04 |
| *yaaA* | 1 | 1.17 | 1.11 | 1.06 | 1.04 | 1.09 | 1.06 |
| *yeiG* | 1 | 1.28 | 1.13 | 1.12 | 1.36 | 1.32 | 1.22 |
| *grxB* | 1 | 1.26 | 1.17 | 1.28 | 1.51 | 1.17 | 1.12 |
| *cyoA* | 1 | 1.04 | 1.05 | 1.05 | 1.06 | 1.02 | 1.04 |
| *norR* | 1 | 1.57 | 1.19 | 1.18 | 1.42 | 1.06 | 1.22 |
| *fpr* | 1 | 1.15 | 1.08 | 1.11 | 1.17 | 1.04 | 1.09 |
| *gst* | 1 | 1.42 | 1.34 | 1.09 | 1.23 | 1.26 | 1.53 |
| *trxC* | 1 | 1.78 | 1.24 | 1.28 | 1.25 | 1.5 | 1.22 |
| *trxA* | 1 | 4.33 | 3.11 | 2.56 | 2.83 | 2.18 | 1.99 |
| *grxA* | 1 | 1.13 | 1.1 | 1.09 | 1.03 | 1.02 | 1.03 |
| *yeaE* | 1 | 1.11 | 1.18 | 1.04 | 1.02 | 1.14 | 1.07 |
| *tam* | 1 | 1.08 | 1.07 | 1.07 | 1.04 | 1.14 | 1.09 |
| Protein Stress | *ibpB* | 1 | 1.7 | 1.41 | 1.32 | 1.28 | 1.03 | 1.04 |
| *htpX* | 1 | 3.45 | 1.38 | 1.88 | 1.31 | 1.26 | 1.54 |
| *degQ* | 1 | 1.04 | 1.07 | 1.1 | 1.07 | 1.03 | 1.04 |
| *ytfE* | 1 | 2.44 | 1.68 | 1.57 | 1.58 | 1.32 | 1.49 |
| *clpB* | 1 | 1.14 | 1.19 | 1.06 | 1.06 | 1.09 | 1.09 |
| *dnaK* | 1 | 1.37 | 1.21 | 1.13 | 1.12 | 1.16 | 1.1 |
| Transcriptional Effect Level Index (TELI) |
| Stress Category | Genes | Concentration(mg/L) |
|  |  | 0 | 0.282 | 2.82 | 28.2 | 282 | 2820 | 28200 |
| Protein Stress | *rpoD* | 1 | 1.49 | 1.32 | 1.3 | 1.4 | 1.06 | 1.07 |
| *lon* | 1 | 5.54 | 2.22 | 1.78 | 1.69 | 2.14 | 3.91 |
| *grpE* | 1 | 1.12 | 1.09 | 1.03 | 1.06 | 1.1 | 1.16 |
| *dnaJ* | 1 | 1.86 | 1.27 | 1.2 | 1.18 | 1.19 | 1.32 |
| *ybgI* | 1 | 1.67 | 1.33 | 1.72 | 1.81 | 1.33 | 1.35 |
| General Stress | *uspA* | 1 | 1.08 | 1.21 | 1.06 | 1.54 | 1.11 | 1.29 |
| *cspB* | 1 | 1.2 | 1.25 | 1.05 | 1.04 | 1.03 | 1.04 |
| *uspB* | 1 | 1.15 | 1.15 | 1.17 | 1.2 | 1.16 | 1.47 |
| *otsB* | 1 | 1.07 | 1.14 | 1.05 | 1.03 | 1.04 | 1.05 |
| *osmC* | 1 | 1.4 | 1.19 | 1.41 | 1.19 | 1.18 | 2.48 |
| *crp* | 1 | 1.19 | 1.17 | 1.33 | 1.12 | 1.25 | 1.28 |
| *cspA* | 1 | 1.04 | 1.12 | 1.03 | 1.12 | 1.08 | 1.1 |
| *gadX* | 1 | 1.06 | 1.15 | 1.24 | 1.13 | 1.13 | 1.31 |
| *ydeO* | 1 | 1.17 | 1.26 | 1.07 | 1.04 | 1.15 | 1.05 |
| *dinJ* | 1 | 1.14 | 1.15 | 1.16 | 1.16 | 1.15 | 1.34 |
| *naA* | 1 | 1.06 | 1.05 | 1.06 | 1.09 | 1.08 | 1.04 |
| *osmB* | 1 | 1.02 | 1.03 | 1.08 | 1.14 | 1.08 | 1.08 |
| *ydgL* | 1 | 1.35 | 1.1 | 1.07 | 1.1 | 2.17 | 2.34 |
| *bolA* | 1 | 1.07 | 1.39 | 1.24 | 1.18 | 1.37 | 2.18 |
| *slyA* | 1 | 1.13 | 1.24 | 1.1 | 1.19 | 1.2 | 1.08 |
| *yeeV* | 1 | 1.16 | 1.05 | 1.16 | 1.03 | 1.1 | 1.09 |
| *osmE* | 1 | 1.01 | 1.05 | 1.05 | 1.2 | 1.15 | 1.17 |
| *yfjG* | 1 | 1.15 | 1.3 | 1.04 | 1.35 | 2.33 | 2.31 |
| *ssrA* | 1 | 1.13 | 1.08 | 1.2 | 1.07 | 1.14 | 1.06 |
| *rpoE* | 1 | 1.22 | 1.18 | 1.09 | 1.68 | 1.19 | 1.19 |
| Membrane Stress | *emrA* | 1 | 1.05 | 1.04 | 1.06 | 1.1 | 1.08 | 1.05 |
| *emrE* | 1 | 1.78 | 1.6 | 1.87 | 1.62 | 1.51 | 1.87 |
| *amiC* | 1 | 1.13 | 1.06 | 1.02 | 1.17 | 1.04 | 1.03 |
| *cueR* | 1 | 1.4 | 1.18 | 1.11 | 1.17 | 1.06 | 1.12 |
| *ycgE* | 1 | 2.78 | 2.39 | 3.97 | 3.55 | 2.03 | 2.87 |
| *yedW* | 1 | 1.38 | 1.05 | 1.03 | 1.97 | 1.05 | 1.26 |
| *bacA* | 1 | 1.1 | 1.11 | 1.08 | 1.08 | 1.07 | 1.14 |
| *dacB* | 1 | 1.05 | 1.02 | 1.16 | 1.11 | 1.15 | 3.57 |
| Transcriptional Effect Level Index (TELI) |
| Stress Category | Genes | Concentration(mg/L) |
|  |  | 0 | 0.282 | 2.82 | 28.2 | 282 | 2820 | 28200 |
| Membrane Stress | *dacA* | 1 | 1.05 | 1.04 | 1.16 | 1.12 | 1.06 | 1.66 |
| *cls* | 1 | 2.64 | 2.63 | 2.06 | 1.96 | 1.7 | 1.75 |
| *sbmA* | 1 | 1.17 | 1.12 | 1.03 | 1.04 | 1.09 | 1.08 |
| *cusR* | 1 | 1.08 | 1.08 | 1.05 | 1.04 | 1.09 | 1.08 |
| *marC* | 1 | 1.12 | 1.08 | 1.29 | 1.18 | 1.2 | 1.14 |
| *marR* | 1 | 1.04 | 1.11 | 1.05 | 1.1 | 1.1 | 1.06 |
| *sanA* | 1 | 1.08 | 1.06 | 1.07 | 1.03 | 1.02 | 1.06 |
| *cmr* | 1 | 1.04 | 1.03 | 1.05 | 1.12 | 1.07 | 1.07 |
| *fsr* | 1 | 1.08 | 1.13 | 1.06 | 1.07 | 1.06 | 1.04 |
| *yajR* | 1 | 1.04 | 1.1 | 1.16 | 1.14 | 1.04 | 1.02 |
| *mdtK* | 1 | 1.03 | 1.13 | 1.08 | 1.2 | 1.05 | 1.04 |
| *motA* | 1 | 1.07 | 1.17 | 1.14 | 1.04 | 1.04 | 1.04 |
| *flgM* | 1 | 1.11 | 1.14 | 1.12 | 1.1 | 1.1 | 1.75 |
| *mrcB* | 1 | 1.1 | 1.03 | 1.02 | 1.07 | 1.05 | 1.04 |
| *pbpG* | 1 | 1.1 | 1.13 | 1.07 | 1.25 | 1.07 | 1.08 |
| *ompC* | 1 | 1.06 | 1.06 | 1.07 | 1.05 | 1.09 | 1.13 |
| *zntA* | 1 | 1.17 | 1.25 | 1.29 | 1.21 | 1.22 | 1.86 |
| DNA Stress | *uvrA* | 1 | 1.06 | 1.12 | 1.13 | 1.07 | 1.1 | 1.12 |
| *rnt* | 1 | 1.5 | 1.1 | 1.2 | 1.1 | 1.3 | 1.29 |
| *recX* | 1 | 1.18 | 1.17 | 1.09 | 1.13 | 1.11 | 1.16 |
| *polA* | 1 | 1.14 | 1.08 | 1.11 | 1.13 | 1.18 | 1.14 |
| *ykfG* | 1 | 1.04 | 1.1 | 1.15 | 1.28 | 1.18 | 1.2 |
| *recE* | 1 | 1.06 | 1.04 | 1.08 | 1.33 | 1.08 | 1.05 |
| *nfo* | 1 | 1.04 | 1.15 | 1.05 | 1.03 | 1.26 | 1.1 |
| *dinG* | 1 | 1.12 | 1.14 | 1.17 | 1.1 | 1.17 | 1.44 |
| *ftsK* | 1 | 1.11 | 1.2 | 1.16 | 1.12 | 1.88 | 2.19 |
| *ada* | 1 | 1.27 | 1.2 | 1.22 | 1.42 | 1.37 | 1.41 |
| *dinB* | 1 | 1.15 | 1.1 | 1.28 | 1.43 | 1.32 | 1.24 |
| *mutT* | 1 | 1.17 | 1.14 | 1.14 | 1.17 | 1.21 | 1.49 |
| *ybfE* | 1 | 1.26 | 1.8 | 1.15 | 1.11 | 1.17 | 1.26 |
| *mutH* | 1 | 1.21 | 1.09 | 1.17 | 1.12 | 1.22 | 3.36 |
| *recN* | 1 | 1.04 | 1.18 | 1.28 | 1.31 | 1.21 | 1.12 |
| *sbmC* | 1 | 1.17 | 1.61 | 1.7 | 1.06 | 1.09 | 2.09 |
| Transcriptional Effect Level Index (TELI) |
| Stress Category | Genes | Concentration(mg/L) |
|  |  | 0 | 0.282 | 2.82 | 28.2 | 282 | 2820 | 28200 |
| DNA Stress | *mug* | 1 | 1.26 | 1.42 | 2.48 | 1.86 | 2.43 | 5.87 |
| *yebG* | 1 | 1.08 | 1.25 | 1.06 | 1.34 | 1.4 | 2.43 |
| *lexA* | 1 | 1.36 | 1.1 | 1.2 | 1.09 | 1.22 | 1.18 |
| *uvrD* | 1 | 1.45 | 1.46 | 1.6 | 1.15 | 1.74 | 1.36 |
| *mutM* | 1 | 1.04 | 1.21 | 1.09 | 1.29 | 1.08 | 1.11 |
| *mutS* | 1 | 1.22 | 1.19 | 1.02 | 1.2 | 1.1 | 1.08 |
| *mutY* | 1 | 1.16 | 1.2 | 1.18 | 1.08 | 1.6 | 1.39 |
| *recA* | 1 | 1.16 | 1.17 | 1.43 | 1.18 | 2.36 | 2.53 |
| *ssb* | 1 | 1.4 | 1.22 | 1.18 | 1.2 | 1.4 | 1.63 |
| *umuD* | 1 | 1.1 | 1.14 | 1.13 | 1.33 | 1.15 | 1.07 |
| *sulA* | 1 | 1.1 | 1.16 | 1.08 | 1.14 | 1.08 | 1.16 |
| *uvrY* | 1 | 1.28 | 1.21 | 1.49 | 1.14 | 1.12 | 1.75 |
| *polB* | 1 | 1.19 | 1.2 | 1.21 | 1.12 | 1.18 | 2.38 |
| *ruvA* | 1 | 1.15 | 1.66 | 1.44 | 1.12 | 1.31 | 3.15 |
| *uvrC* | 1 | 1.21 | 1.14 | 1.18 | 1.19 | 1.12 | 1.07 |

In 3.1.2 Transcriptional Effect Level Index (TELI) assay

Tab. S3 Overall stress response TELI versus various stress concentration upon exposure to SUC

|  |
| --- |
| Transcriptional Effect Level Index (TELI) |
| Concentration(mg/L) | Oxidative Stress  | Protein StressI | Membrane Stress | General Stress  | DNAStress | TotalStress |
| 0 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 0.282 | 1.39 | 2.08 | 1.26 | 1.14 | 1.19 | 1.41 |
| 2.82 | 1.29 | 1.38 | 1.23 | 1.17 | 1.23 | 1.26 |
| 28.2 | 1.22 | 1.38 | 1.29 | 1.14 | 1.26 | 1.26 |
| 282 | 1.27 | 1.33 | 1.31 | 1.19 | 1.21 | 1.26 |
| 2820 | 1.19 | 1.25 | 1.16 | 1.26 | 1.33 | 1.24 |
| 28200 | 1.39 | 1.47 | 1.40 | 1.40 | 1.71 | 1.47 |

In 3.1.3 Long-term (24 h) stress and recovery after 2 h stress

Fig. S2 The *E.coli*'s growth curve including *lon* reporter in 24 h long-term exposure and recovery after 2 h exposure



Fig. S3 The *E.coli*'s growth curve including *emrE* reporter in 24 h long-term exposure and recovery after 2 h exposure



Fig. S4 The *E.coli*'s growth curve including *ycgE* reporter in 24 h long-term exposure and recovery after 2 h exposure



Fig. S5 The *E.coli*'s growth curve including *cls* reporter in 24 h long-term exposure and recovery after 2 h exposure



In 3.2 Toxicity changes of SUC under different disinfection processes

Tab. S4 Overall response TELI of SUC in different disinfection processes

|  |
| --- |
| Transcriptional Effect Level Index (TELI) |
| Disinfectant | Oxidative Stress | Protein Stress | Membrane Stress | General Stress  | DNAStress | TotalStress |
| SUC(28200 mg/L) | 1.39 | 1.47 | 1.40 | 1.40 | 1.71 | 1.47 |
| Chlorine | 1.27 | 1.21 | 1.71 | 3.30 | 1.76 | 1.85 |
| Chloramine | 1.96 | 1.95 | 1.76 | 2.34 | 1.75 | 1.95 |
| UV | 1.36 | 1.21 | 1.29 | 1.17 | 4.53 | 2.02 |
| UV/Chlorine | 1.17 | 1.21 | 1.21 | 1.58 | 1.88 | 1.41 |
| UV/Chloramine | 1.45 | 1.28 | 1.42 | 1.41 | 1.71 | 1.45 |

In 3.2 Toxicity changes of SUC under different disinfection processes

Tab. S5 Each gene response TELI of SUC in different disinfection processe

|  |
| --- |
| Transcriptional Effect Level Index (TELI) |
| Stress Category | Genes | Disinfectant process |
|  |  | SUC (28200 mg/L) | Chlorine | Chloramine | UV | UV/Chlorine | UV/Chloramine |
| Oxidative Stress | *katE* | 1.05 | 10.34 | 1.46 | 1.25 | 9.84 | 1.27 |
| *ahpC* | 1.11 | 1.31 | 1.45 | 1.11 | 1.32 | 3.12 |
| *ahpF* | 1.05 | 1.19 | 2.53 | 1.04 | 1.16 | 1.16 |
| *dps* | 3.98 | 1.00 | 3.88 | 1.81 | 1.33 | 1.92 |
| *soxS* | 1.13 | 1.00 | 1.10 | 1.07 | 1.61 | 1.56  |
| *soxR* | 1.03 | 2.32 | 1.41 | 1.13 | 2.28 | 1.10 |
| *sodB* | 1.77 | 1.00 | 3.99 | 2.88 | 1.50 | 2.09 |
| *sodC* | 1.05 | 1.00 | 1.07 | 1.04 | 1.23 | 1.21 |
| *sodA* | 1.41 | 1.05 | 1.13 | 1.10 | 1.86 | 1.11 |
| *katG* | 2.57 | 1.00 | 1.75 | 1.20 | 1.69 | 1.41 |
| *oxyR* | 1.04 | 1.22 | 1.11 | 1.08 | 1.73 | 1.54 |
| *yaaA* | 1.06 | 1.02 | 1.43 | 1.11 | 2.02 | 1.11 |
| *yeiG* | 1.22 | 1.15 | 3.10 | 2.54 | 1.29 | 2.21 |
| *grxB* | 1.12 | 1.01 | 1.16 | 1.21 | 2.57 | 1.08 |
| *cyoA* | 1.04 | 1.15 | 2.20 | 1.10 | 1.53 | 1.29 |
| *norR* | 1.22 | 1.00 | 1.29 | 1.08 | 1.49 | 1.10 |
| *fpr* | 1.09 | 1.00 | 1.79 | 1.14 | 2.20 | 1.07 |
| *gst* | 1.53 | 1.09 | 2.72 | 1.15 | 1.69 | 1.28 |
| *trxC* | 1.22 | 1.44 | 1.41 | 1.31 | 1.95 | 1.10 |
| *trxA* | 1.99 | 1.00 | 4.17 | 2.58 | 1.94 | 1.58 |
| *grxA* | 1.03 | 1.52 | 1.08 | 1.06 | 1.40 | 1.83 |
| *yeaE* | 1.07 | 1.00 | 1.32 | 1.14 | 1.26 | 1.11 |
| *tam* | 1.09 | 2.44 | 2.58 | 1.13 | 1.37 | 1.11 |
| Protein Stress | *ibpB* | 1.04 | 3.8 | 1.43 | 1.08 | 2.36 | 1.5 |
| *htpX* | 1.54 | 1.08 | 3.1 | 1.41 | 2.46 | 1.29 |
| *degQ* | 1.04 | 1.02 | 1.16 | 1.13 | 1.73 | 1.24 |
| *ytfE* | 1.49 | 1.11 | 2.2 | 1.38 | 2.21 | 1.28 |
| *clpB* | 1.09 | 1.04 | 1.29 | 1.03 | 2.02 | 1.1 |
| *dnaK* | 1.1 | 1.09 | 1.79 | 1.08 | 1.97 | 1.55 |
| *rpoD* | 1.07 | 1.06 | 2.72 | 1.6 | 1.52 | 1.62 |
| Transcriptional Effect Level Index (TELI) |
| Stress Category | Genes | Disinfectant process |
|  |  | SUC (28200 mg/L) | Chlorine | Chloramine | UV | UV/Chlorine | UV/Chloramine |
| Protein Stress | *lon* | 3.91 | 1.18 | 1.41 | 1.07 | 1.92 | 1.19 |
| *grpE* | 1.16 | 2.32 | 4.17 | 1.1 | 1.99 | 1.07 |
| *dnaJ* | 1.32 | 1 | 1.08 | 1.22 | 1.61 | 1.09 |
| *ybgI* | 1.35 | 1.04 | 1.13 | 1.21 | 1.2 | 1.17 |
| General Stress | *uspA* | 1.29  | 1.11  | 1.90  | 1.26  | 1.37  | 1.46  |
| *cspB* | 1.04  | 1.10  | 1.13  | 1.07  | 1.90  | 1.13  |
| *uspB* | 1.48  | 1.08  | 1.52  | 1.07  | 1.38  | 1.18  |
| *otsB* | 1.05  | 1.00  | 2.37  | 1.15  | 1.58  | 1.28  |
| *osmC* | 2.49  | 1.03  | 9.27  | 1.24  | 1.42  | 1.13  |
| *crp* | 1.28  | 1.38  | 1.27  | 1.18  | 1.22  | 1.24  |
| *cspA* | 1.10  | 7.12  | 1.40  | 1.37  | 2.45  | 1.47  |
| *gadX* | 1.31  | 1.00  | 1.29  | 1.54  | 13.36  | 1.56  |
| *ydeO* | 1.06  | 1.51  | 3.65  | 1.33  | 1.51  | 1.44  |
| *dinJ* | 1.35  | 2.41  | 1.34  | 1.08  | 1.23  | 1.09  |
| *naA* | 1.05  | 1.02  | 1.21  | 1.14  | 1.34  | 1.25  |
| *osmB* | 1.08  | 1.00  | 1.34  | 1.15  | 1.38  | 1.12  |
| *ydgL* | 2.35  | 1.25  | 2.49  | 1.05  | 1.36  | 1.13  |
| *bolA* | 2.19  | 1.00  | 1.87  | 1.13  | 1.32  | 1.22  |
| *slyA* | 1.09  | 1.39  | 6.93  | 1.16  | 2.71  | 1.15  |
| *yeeV* | 1.09  | 1.38  | 1.19  | 1.31  | 1.32  | 1.09  |
| *osmE* | 1.17  | 1.00  | 1.87  | 1.04  | 1.21  | 1.11  |
| *yfjG* | 2.31  | 1.00  | 1.33  | 1.41  | 1.28  | 1.47  |
| *ssrA* | 1.07  | 2.32  | 1.87  | 10.95  | 1.40  | 1.21  |
| *rpoE* | 1.20  | 1.65  | 1.58  | 1.49  | 9.58  | 4.41  |
| Membrane Stress | *emrA* | 1.06  | 1.01  | 1.35  | 1.08  | 2.61  | 1.75  |
| *emrE* | 1.88  | 1.00  | 2.34  | 2.89  | 2.17  | 2.32  |
| *amiC* | 1.04  | 1.35  | 2.11  | 1.07  | 1.21  | 1.95  |
| *cueR* | 1.13  | 1.28  | 1.35  | 1.62  | 2.08  | 1.38  |
| *ycgE* | 2.88  | 1.20  | 2.56  | 1.09  | 2.28  | 1.28  |
| *yedW* | 1.26  | 1.03  | 3.64  | 2.33  | 1.21  | 2.98  |
| *bacA* | 1.14  | 2.32  | 1.16  | 1.33  | 1.22  | 1.09  |
| *dacB* | 3.58  | 1.01  | 2.38  | 1.06  | 1.14  | 1.23  |
| *dacA* | 1.67  | 1.21  | 1.89  | 1.06  | 1.09  | 1.17  |
| Transcriptional Effect Level Index (TELI) |
| Stress Category | Genes | Disinfectant process |
|  |  | SUC (28200 mg/L) | Chlorine | Chloramine | UV | UV/Chlorine | UV/Chloramine |
| Membrane Stress | *cls* | 1.75  | 1.00  | 1.09  | 1.09  | 1.19  | 1.14  |
| *sbmA* | 1.09  | 1.00  | 1.18  | 1.12  | 1.19  | 1.16  |
| *cusR* | 1.06  | 1.00  | 1.91  | 1.20  | 1.26  | 1.14  |
| *marC* | 1.15  | 1.00  | 1.56  | 1.06  | 1.17  | 1.08  |
| *marR* | 1.07  | 1.00  | 1.92  | 1.09  | 1.12  | 1.23  |
| *sanA* | 1.06  | 1.00  | 1.44  | 1.12  | 1.39  | 1.10  |
| *cmr* | 1.08  | 1.00  | 1.08  | 1.22  | 1.32  | 1.31  |
| *fsr* | 1.05  | 1.01  | 1.09  | 1.14  | 1.27  | 1.09  |
| *yajR* | 1.03  | 1.00  | 1.06  | 1.09  | 1.18  | 1.08  |
| *mdtK* | 1.04  | 1.00  | 1.61  | 1.03  | 1.21  | 1.41  |
| *motA* | 1.05  | 1.18  | 2.08  | 1.28  | 1.51  | 1.17  |
| *flgM* | 1.76  | 1.09  | 1.31  | 1.14  | 1.22  | 1.15  |
| *mrcB* | 1.04  | 1.00  | 1.14  | 1.37  | 1.42  | 1.34  |
| *pbpG* | 1.08  | 1.04  | 1.41  | 1.21  | 2.04  | 1.16  |
| *ompC* | 1.13  | 1.00  | 1.39  | 1.37  | 7.29  | 2.64  |
| *zntA* | 1.86  | 1.02  | 3.94  | 1.12  | 1.33  | 1.14  |
| DNA Stress | *uvrA* | 1.13  | 1.39  | 1.24  | 16.03  | 1.33  | 1.41  |
| *rnt* | 1.29  | 1.20  | 1.88  | 4.43  | 1.23  | 1.89  |
| *recX* | 1.16  | 1.44  | 2.09  | 8.79  | 1.17  | 1.14  |
| *polA* | 1.14  | 1.00  | 1.66  | 2.23  | 1.13  | 1.31  |
| *ykfG* | 1.21  | 2.32  | 2.76  | 1.21  | 1.34  | 1.18  |
| *recE* | 1.05  | 1.42  | 1.72  | 1.24  | 1.19  | 1.11  |
| *nfo* | 1.11  | 1.77  | 1.48  | 2.26  | 1.41  | 1.19  |
| *dinG* | 1.44  | 1.19  | 1.57  | 7.89  | 1.17  | 1.13  |
| *ftsK* | 2.20  | 1.03  | 2.67  | 2.36  | 1.39  | 2.89  |
| *ada* | 1.42  | 1.03  | 1.26  | 3.11  | 1.16  | 1.18  |
| *dinB* | 1.25  | 1.00  | 1.67  | 2.47  | 1.32  | 1.16  |
| *mutT* | 1.50  | 1.12  | 2.11  | 4.89  | 1.30  | 1.12  |
| *ybfE* | 1.26  | 1.02  | 1.18  | 8.30  | 1.25  | 1.48  |
| *mutH* | 3.37  | 1.06  | 1.72  | 1.61  | 1.70  | 3.19  |
| *recN* | 1.12  | 1.07  | 1.10  | 2.35  | 1.33  | 1.19  |
| *sbmC* | 2.10  | 1.00  | 1.22  | 2.43  | 1.96  | 1.36  |
| *mug* | 5.88  | 2.41  | 3.80  | 3.71  | 1.32  | 3.41  |
| Transcriptional Effect Level Index (TELI) |
| Stress Category | Genes | Disinfectant process |
|  |  | SUC (28200 mg/L) | Chlorine | Chloramine | UV | UV/Chlorine | UV/Chloramine |
| DNA Stress | *yebG* | 2.43  | 1.00  | 1.64  | 15.27  | 1.78  | 2.35  |
| *lexA* | 1.19  | 1.16  | 1.15  | 2.37  | 1.51  | 1.48  |
| *uvrD* | 1.37  | 2.37  | 2.34  | 3.54  | 1.85  | 1.14  |
| *mutM* | 1.12  | 1.08  | 1.14  | 1.05  | 1.52  | 1.13  |
| *mutS* | 1.08  | 1.06  | 1.20  | 3.89  | 1.81  | 1.42  |
| *mutY* | 1.39  | 2.55  | 1.55  | 5.45  | 1.39  | 2.35  |
| *recA* | 2.54  | 2.32  | 1.47  | 1.47  | 1.49  | 3.98  |
| *ssb* | 1.64  | 1.33  | 1.37  | 3.33  | 5.13  | 1.24  |
| *umuD* | 1.07  | 1.29  | 1.61  | 1.21  | 1.62  | 1.19  |
| *sulA* | 1.16  | 1.13  | 1.31  | 1.88  | 25.01  | 1.69  |
| *uvrY* | 1.76  | 1.16  | 2.51  | 3.66  | 1.60  | 3.70  |
| *polB* | 2.38  | 1.22  | 1.36  | 12.15  | 1.44  | 1.32  |
| *ruvA* | 3.16  | 1.12  | 3.26  | 7.42  | 2.15  | 1.51  |
| *uvrC* | 1.08  | 1.00  | 1.24  | 2.43  | 1.61  | 1.13  |