Supplementary material for

# Evaluation of Electron Donors for Biological Perchlorate Removal Highlights the Importance of Diverse Perchlorate-Reducing Populations

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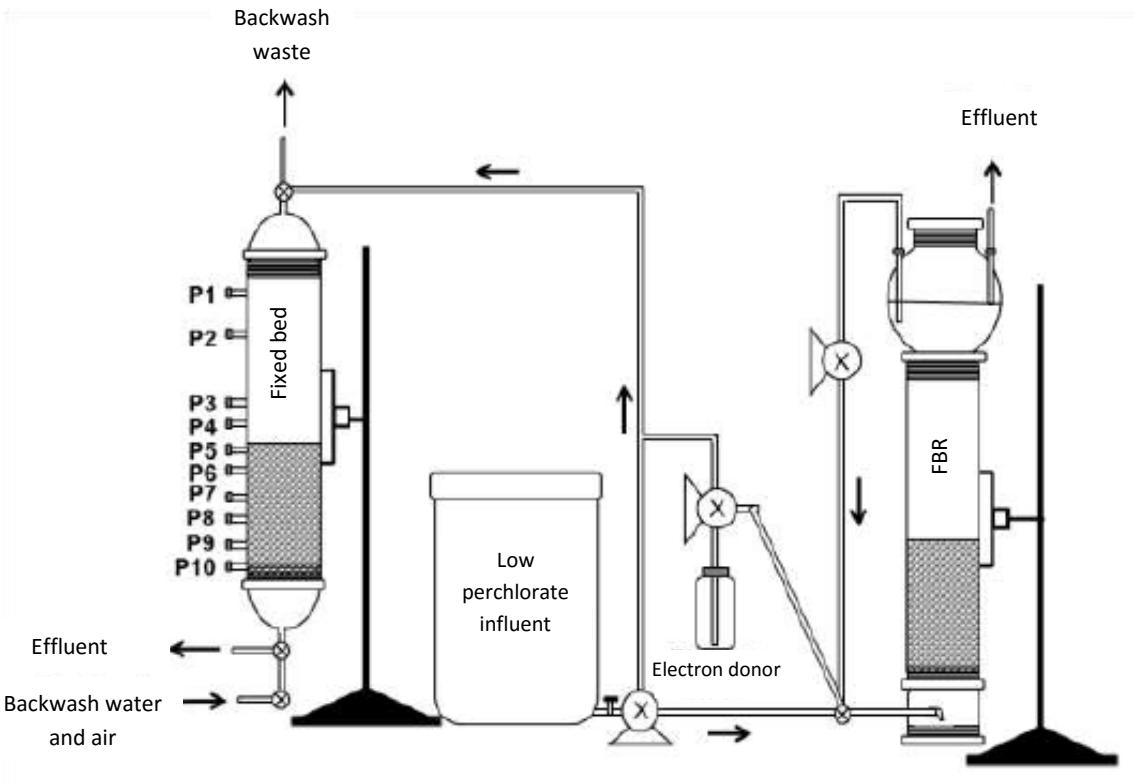


**Figure S1** Setup of the FBR and fixed bed reactors, which were fed 200 µg/L $ClO_4^-$ and 15 mg/L $NO_3^-$-N and operated using acetate for the first 100 days; then acetate was replaced with MicroC4000™, a proprietary, carbohydrate-based electron donor.[28]

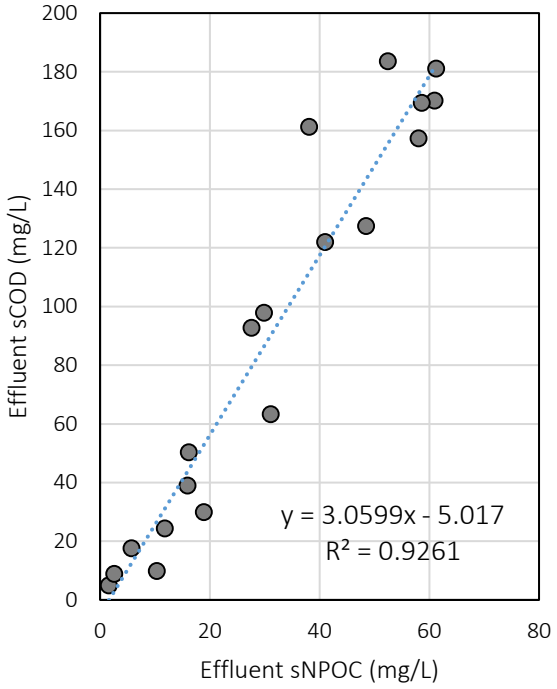


**Figure S2** Correlation between effluent soluble non-purgeable organic carbon (sNPOC) and effluent soluble chemical oxygen demand (sCOD) in the high-perchlorate FBR.

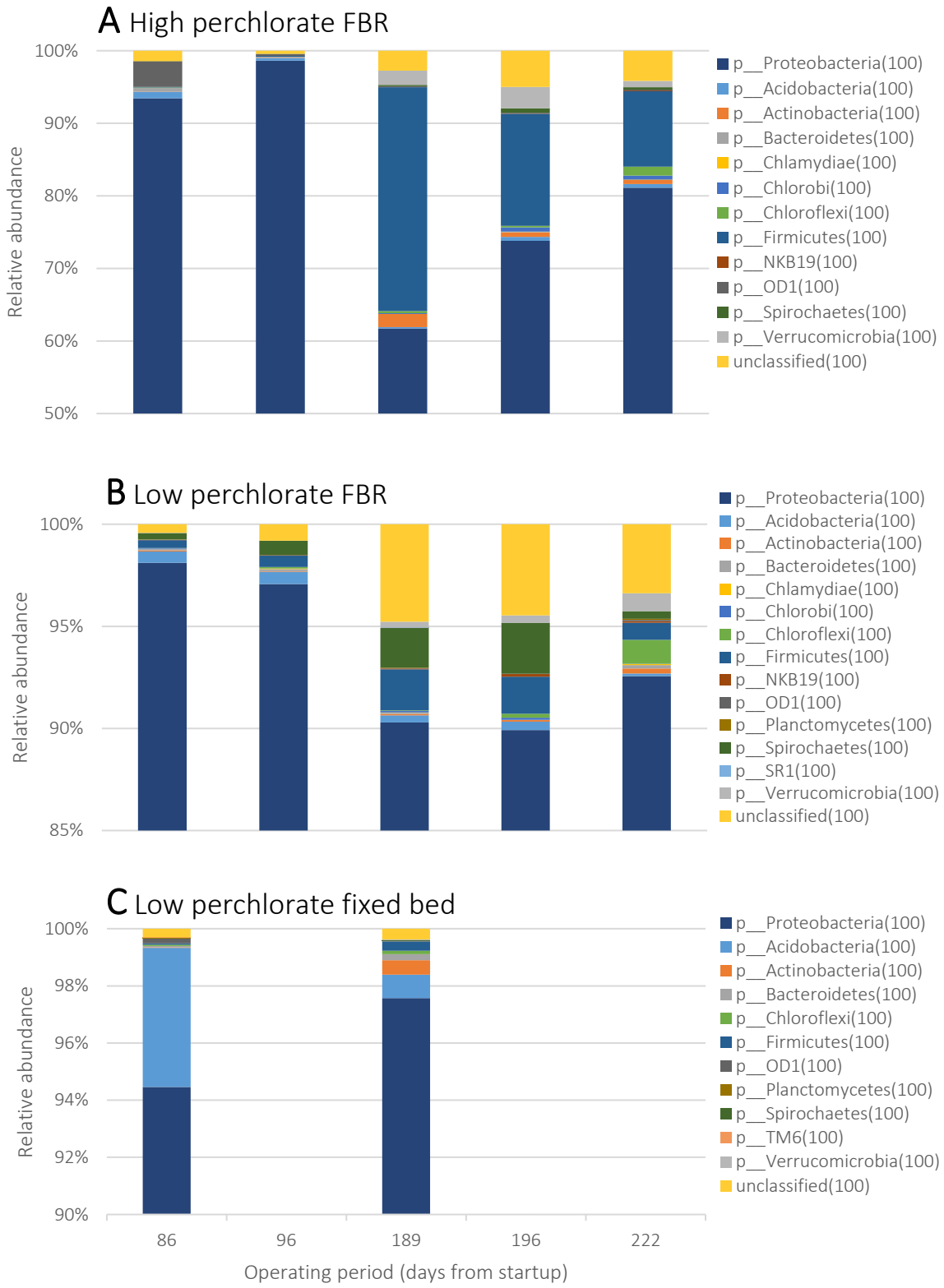


**Figure S3** Relative abundance of phyla in (A) the high-perchlorate FBR, (B) the low-perchlorate FBR and (C) the low-perchlorate fixed bed reactor. Truncated y axes are used to accentuate changes in abundance.

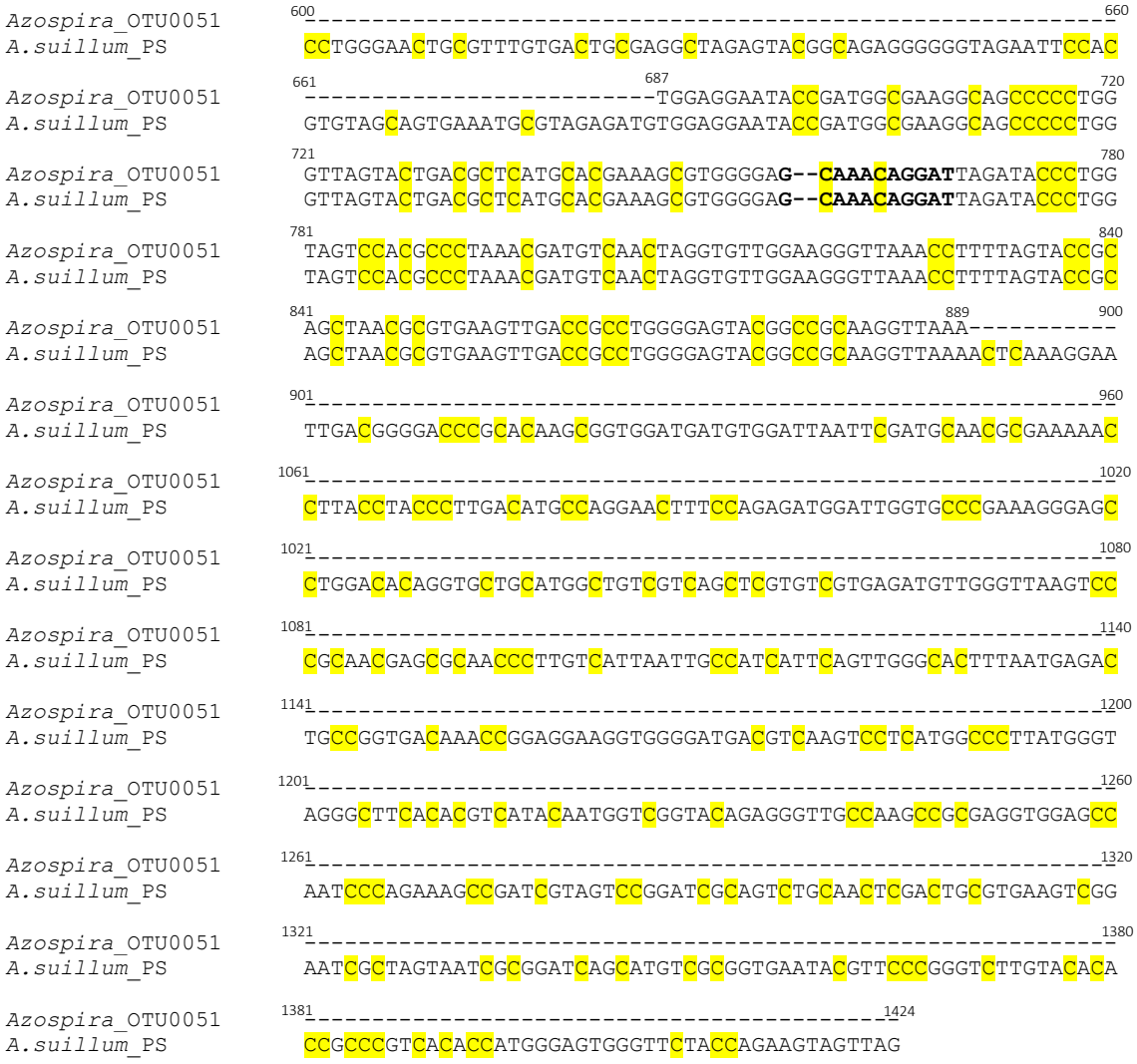


**Figure S4** Alignment of partial 16S rRNA gene sequences from *Azospira* OTU0051 and *Azospira suillum* PS. The full 16S rRNA gene sequence for *Azospira suillum* PS was downloaded from the Integrated Microbial Genome database.[80]

**Table S1** Composition of Trace Element Solution SL-10

| Chemical | Amount to prepare 1 L of trace metal mix in distilled water | | Influent Chemical Concentration (mg/L) | Influent Metal Concentration (mg/L) | |
|---|---|---|---|---|---|
| HCl (25%; 7.7 M) | 10 | mL | | | |
| $FeCl_2 \times 4H_20$ | 1.5 | g | 1.5 | 0.421 | as $Fe^{2+}$ |
| $ZnCl_2$ | 70 | mg | 0.07 | 0.034 | as $Zn^{2+}$ |
| $MnCl_2$ X $4H_20$ | 100 | mg | 0.1 | 0.028 | as $Mn^{2+}$ |
| $H_3BO_3$ | 6 | mg | 0.006 | 0.001 | as $B^{3+}$ |
| $CoCl_2$ X $6H_20$ | 190 | mg | 0.19 | 0.047 | as $Co^{2+}$ |
| $CuCl_2$ X $2H_20$ | 2 | mg | 0.002 | 0.001 | as $Cu^{2+}$ |
| $NiCl_2$ X 6 $H_20$ | 24 | mg | 0.024 | 0.006 | as $Ni^{2+}$ |
| $Na_2MoO_4$ X 2 $H_20$ | 36 | mg | 0.036 | 0.014 | as $Mo^{6+}$ |

**Table S2** Estimated biomass yields for different electron donor operating conditions distinguished by composition or influent COD concentration. The first 80 days of reactor operation (data not shown) were for startup and optimization of reactor operating conditions. Yield estimates were determined for periods until day 210, the last day for which sCOD or sNPOC measurements were available.

| **Operating condition** | **Period (days) reported** | **Electron donor** | **Measured influent COD (mg/L)** | **Period (days) included for yield calculations** | **COD requirement for observed reduction of electron acceptors (mg/L)** | **COD used (mg/L)** | **COD used for biomass (mg/L)** | **Estimated yield (mg $COD_{biomass}$/mg $COD_{electron\ donor}$)¥** |
|---|---|---|---|---|---|---|---|---|
| **1** | 81-114 | Acetate | 200 | 102-114 | 118 | 180 | 62 | 0.34 |
| **1** | 81-114 | Acetate | 200 | 81-114 | 119 | 182 | 64 | 0.35 |
| **2** | 115-142 | Glycerol product | 216 | 120-142 | 98 | 205 | 107 | 0.52 |
| **2** | 115-142 | Glycerol product | 216 | 130-142 | 95 | 211 | 116 | 0.55 |
| **3** | 143-197 | Glycerol product | 484 | 178-189 | 125 | 322 | 197 | 0.62 |
| **3** | 143-197 | Glycerol product | 484 | 186-196 | 129 | 325 | 195 | 0.60 |
| **4** | 198-222 | Glycerol product | 442 | 200-210 | 124 | 401 | 276 | 0.69 |