Supporting Information for:

Bioaugmentation of an anaerobic biotrickling filter for enhanced conversion of trichloroethene to ethene

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Statistical Analysis:

The uncertainty in TCE elimination capacity (TCE EC) was determined as follows:

Three inlet and outlet samples were analyzed for each time point, and standard deviations were determined.

TCE EC is defined as,

$$TCE\ EC = \frac{gas\ flow\ rate \times (C_{in} - C_{out})}{bed\ volume}$$

We assumed no uncertainty in gas flow rate and bed volume.

To determine the uncertainty in TCE EC, we first computed the uncertainty in ($C_{in} - C_{out}$) as,

$$\delta(C_{in} - C_{out}) = \sqrt{(\delta C_{in})^2 + (\delta C_{out})^2}$$

The uncertainty in TCE EC was then be determined as,

$$\frac{\delta(TCE\ EC)}{|TCE\ EC|} = \sqrt{\left(\frac{\delta(C_{in} - C_{out})}{|C_{in} - C_{out}|}\right)^2}$$

The uncertainty in TCE conversion was determined as follows:

TCE conversion is defined as,

$$TCE\ Conversion\ (for\ e.g.\ to\ cis - DCE) = \frac{C_{out,cis-DCE}}{C_{in,TCE} - C_{out,TCE}}$$

The uncertainty in TCE conversion was determined as,

$$\frac{\delta(TCE\ Conversion)}{|TCE\ Conversion|} = \sqrt{\left(\frac{\delta(C_{out,cis-DCE})}{|C_{out,cis-DCE}|}\right)^2 + \left(\frac{\delta(C_{in,TCE} - C_{out,TCE})}{|C_{in,TCE} - C_{out,TCE}|}\right)^2}$$

The uncertainty in DNA concentrations was determined as standard deviation of measurements from two qPCRs on two DNA extractions per sample. In some cases, the quality of the DNA was not adequate, and thus the reported uncertainty is standard deviation from only two qPCRs.

The uncertainty in expression ratios was determined as follows:

The expression ratio is defined as (taking an example of vcrA/tceA),

$$R = \frac{\left(\frac{cDNA\ concentration\ of\ vcrA}{DNA\ concentration\ of\ vcrA}\right)}{\left(\frac{cDNA\ concentration\ of\ tceA}{DNA\ concentration\ of\ tceA}\right)}$$

The uncertainty in the numerator and denominator terms was determined as (taking an example of just the numerator),

$$\frac{\delta\left(\frac{cDNA\ concentration\ of\ vcrA}{DNA\ concentration\ of\ vcrA}\right)}{\left|\left(\frac{cDNA\ concentration\ of\ vcrA}{DNA\ concentration\ of\ vcrA}\right)\right|}$$
$$= \sqrt{\left(\frac{\delta(cDNA\ concentration\ of\ vcrA)}{|cDNA\ concentration\ of\ vcrA|}\right)^2 + \left(\frac{\delta(DNA\ concentration\ of\ vcrA)}{|DNA\ concentration\ of\ vcrA|}\right)^2}$$

The uncertainty in expression ratios was then determined as,

$$\frac{\delta R}{|R|} = \sqrt{\left(\frac{\delta\left(\frac{cDNA\ concentration\ of\ vcrA}{DNA\ concentration\ of\ vcrA}\right)}{\left|\left(\frac{cDNA\ concentration\ of\ vcrA}{DNA\ concentration\ of\ vcrA}\right)\right|}\right)^2 + \left(\frac{\delta\left(\frac{cDNA\ concentration\ of\ tceA}{DNA\ concentration\ of\ tceA}\right)}{\left|\left(\frac{cDNA\ concentration\ of\ tceA}{DNA\ concentration\ of\ tceA}\right)\right|}\right)^2}$$

Figure S1. Abundance of *tceA*, *vcrA* and *bvcA* cDNA with respect to time during operation of the biotrickling filter in (a) top and (b) bottom of the biotrickling filter bed. The dotted line represents the time point of bioaugmentation with strain BAV1. Recall that the biotrickling filter is operated with gas in down-flow mode, in co-current with the trickling liquid.