# Supplementary file 2. Comparison of the energy metabolism discovered in this study with fermentation in LAB and anaerobic respiration in *Geobacter* spp.

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|  | **Homofermentation in LAB** | **Respiration in LAB** | **Anaerobic EET respiration in *Geobacter* spp.** | **Hybrid metabolism in LAB (this study)** |
| Reduction of insoluble extracellular electron acceptor | No | No | Yes  4-8 mA/mg protein at peak  (Marsili et al., 2010; Rose and Regan, 2015) | Both - soluble and insoluble  1.5 mA/mg- protein  (at peak**a**) |
| NADH:quinone oxidoreductase is required for reduction of electron acceptor | No (Tachon et al., 2010) | Ndh1 (Brooijmans et al., 2009b, 2009b) | Yes  Ndh1 (proton pumping) (Chan et al., 2017) | Yes  Ndh2 (non-proton pumping) |
| Electron acceptor transcriptionally upregulates  NADH dehydrogenase | No (this study) | No [aerobic respiration] (Pedersen et al., 2008) | Yes (Holmes et al., 2006) | Yes (with DHNA) |
| NAD+/NADH ratio | ~1 for glucose (Guo et al., 2017, p. 201)  ~5 for mannitol (this study) | Near-zero for lactose (Johanson et al., 2020) | 10 (Fe3+)  10-100 (anode) (Rose and Regan, 2015; Song et al., 2016) | 260 (Fe3+)  45 (anode) |
| Fraction of electrons on electron acceptor | 40-98% pyruvate (Dirar and Collins, 1972) | 33% (nitrate) (Brooijmans et al., 2009, p. 1) | 75-90% anode (Speers and Reguera, 2012) | 20% anode  48% pyruvate |
| Metabolic flux is primarily through | Fermentative pathway (Bintsis, 2018) | Mixed-acid fermentation [(Brooijmans et al., 2009a)](https://www.zotero.org/google-docs/?kpfm2o) | TCA cycle (Galushko and Schink, 2000; Mahadevan et al., 2006) | Fermentative pathway - Mixed acid |
| ATP yield per substrate | ~2-3 mol ATP/mol glucose for homolactic (Dirar and Collins, 1972)  0.75 mol ATP/mol mannitol (this study) | 3.3-3.9 mol ATP/mol lactose (Johanson et al., 2020) | ~1.5 mol ATP/mol substrate**b** (Mahadevan et al., 2006) | 1.6 mol ATP/mol mannitol |

**a** Calculated assuming that 50% of the dry cell weight is protein. b *G. sulfurreducens* uses acetate as its electron donor. Since acetate is a 2 carbon electron donor, ATP yield is expressed per mol of a 6 carbon substrate.

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