ENERGY PRODUCTION (A) (B) ATP synthesis maintenance of proton gradient BNID: 115702 BNID: 108986 BNID: 114701 BNID: 103390 300 peptide bonds $r_{proton \text{ use}} \approx N_{ATP \text{ synthases}} \times \frac{300 \text{ ATP}}{1 \text{ s}} \times \frac{4 \text{ protons}}{1 \text{ ATP}}$ $I_{\text{peptide bonds}} \approx 3 \times 10^6 \, \text{proteins} \times$ protein ≈109 peptide bonds $\approx 4 \times 10^6$ protons / s BNID: 107782 $\frac{5 \text{ ATP}}{\text{peptide bond}} \times 10^9 \text{ peptide bonds} \approx 5 \times 10^9 \text{ ATP}$ $r_{transport} \approx 5000 \frac{protons / s}{electron transport complex} \frac{BNID: 114704}{BNID: 114687}$ (prot.) BNID: 114701 BNID: 111918 $N_{ATP}^{(total)} \approx \frac{N_{ATP}}{0.8} \approx \frac{6 \times 10^9 \text{ ATP}}{0.8} \quad r_{ATP \text{ synthesis}} \approx \frac{300 \text{ ATP / sec}}{\text{synthase}}$ $N_{\text{synthase}} \approx \frac{6 \times 10^9 \, \text{ATP}}{1 \, \text{cell}} \times \frac{1 \, \text{sec}}{300 \, \text{ATP}} \times \frac{1 \, \text{cell}}{6000 \, \text{sec}} \approx 3000 \, \text{synthases}$ ≈ 1000 electron transport complexes electron transport complexes per cell 0 ATP synthase per cell 10^{4} Li et al. 2014 Li et al. 2014 Peebo et al. 2015 Peebo et al. 2015 Schmidt et al. 2016 Schmidt et al. 2016 Valgepea et al. 2013 Valgepea et al. 2013 estimated value estimated value 10^{2} 10^{2} 0.00 0.25 0.50 1.00 1.25 1.50 1.75 2.00 0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00

growth rate [hr-1]

growth rate [hr-1]