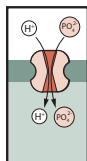


(A)

phosphorus transport



$$m_{\text{phosphorus}} \approx 0.03 \times m_{\text{dry}} \approx 10 \text{ fg} \quad \text{BNID: 100653}$$

atomic weight

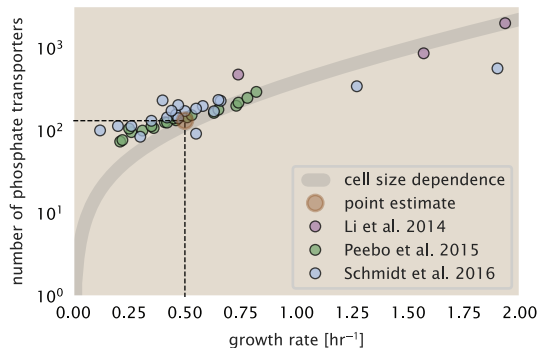
$$N_{\text{phosphorus}} \approx \frac{10 \text{ fg}}{\text{cell}} \times \frac{1 \text{ phosphorus}}{30 \text{ Da}} \times \frac{5 \times 10^8 \text{ Da}}{1 \text{ fg}}$$

$$\approx 2 \times 10^8 \text{ phosphorus atoms / cell}$$

$$r_{\text{transport}} \approx \frac{300 \text{ phosphate / sec}}{\text{transporter}}$$

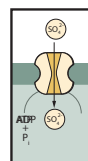
$$N_{\text{transporters}} \approx \frac{2 \times 10^8 \text{ P}}{\text{cell}} \times \frac{1 \text{ phosphate}}{1 \text{ P}} \times \frac{1 \text{ sec} \times \text{transporter}}{300 \text{ phosphate}} \times \frac{1 \text{ cell}}{5000 \text{ sec}}$$

$$\approx 150 \text{ transporters}$$



(B)

sulfur transport



$$m_{\text{sulfur}} \approx 0.01 \times m_{\text{dry}} \approx 3 \text{ fg} \quad \text{BNID: 109665}$$

atomic weight

$$N_{\text{sulfur}} \approx \frac{3 \text{ fg}}{\text{cell}} \times \frac{1 \text{ sulfur}}{32 \text{ Da}} \times \frac{6 \times 10^8 \text{ Da}}{1 \text{ fg}}$$

$$\approx 5 \times 10^7 \text{ sulfur atoms / cell}$$

$$r_{\text{transport}} \approx \frac{10 \text{ sulfate / sec}}{\text{transporter}} \quad \text{BNID: 109035}$$

$$N_{\text{transporters}} \approx \frac{5 \times 10^7 \text{ S}}{\text{cell}} \times \frac{1 \text{ sulfate}}{1 \text{ S}} \times \frac{1 \text{ sec}}{10 \text{ sulfate}} \times \frac{1 \text{ cell}}{5000 \text{ sec}}$$

$$\approx 1000 \text{ transporters}$$

