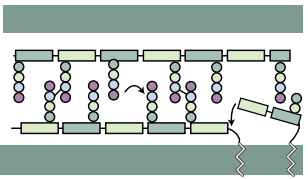
peptidoglycan crosslinking



$m_{amino\ acid} \approx 110$ Da — BNID: 104877 — average amino acid molecular weight

$m_{murein\ sugar} \approx 250$ Da — average molecular weight GlcNac and NAMA

$m_{subunit} \approx 5 \times m_{amino\ acid} + 2 \times m_{murein\ sugar} \approx 10^3$ Da $\approx 2 \times 10^{-6}$ fg

$m_{pg} \approx 0.03 \times m_{dry} \approx 10$ fg — BNID: 101936 — PG mass per cell

$$N_{subunits} \approx \frac{m_{pg}}{m_{subunit}} \approx \frac{10\ fg}{cell} \times \frac{subunit}{2 \times 10^{-6}\ fg} \approx 5 \times 10^6\ subunits / cell$$

$\Phi_{crosslinked} \approx 20\%$ — Vollmer et al. 2008; Rogers et al. 1980 — fraction of crosslinked PG

$r_{transpeptidase} \approx 2$ crosslinks / sec — Catherwood et al. 2020 — crosslinking rate

$$N_{transpeptidases} \approx \frac{N_{subunits} \times \Phi_{crosslinked}}{r_{transpeptidase} \times t_{division}} \approx \frac{5 \times 10^6 \frac{subunits}{cell} \times 0.2}{2 \frac{crosslinks}{sec} \times 5000 \frac{sec}{cell}}$$

≈ 100 transpeptidases

number of transpeptidase complexes