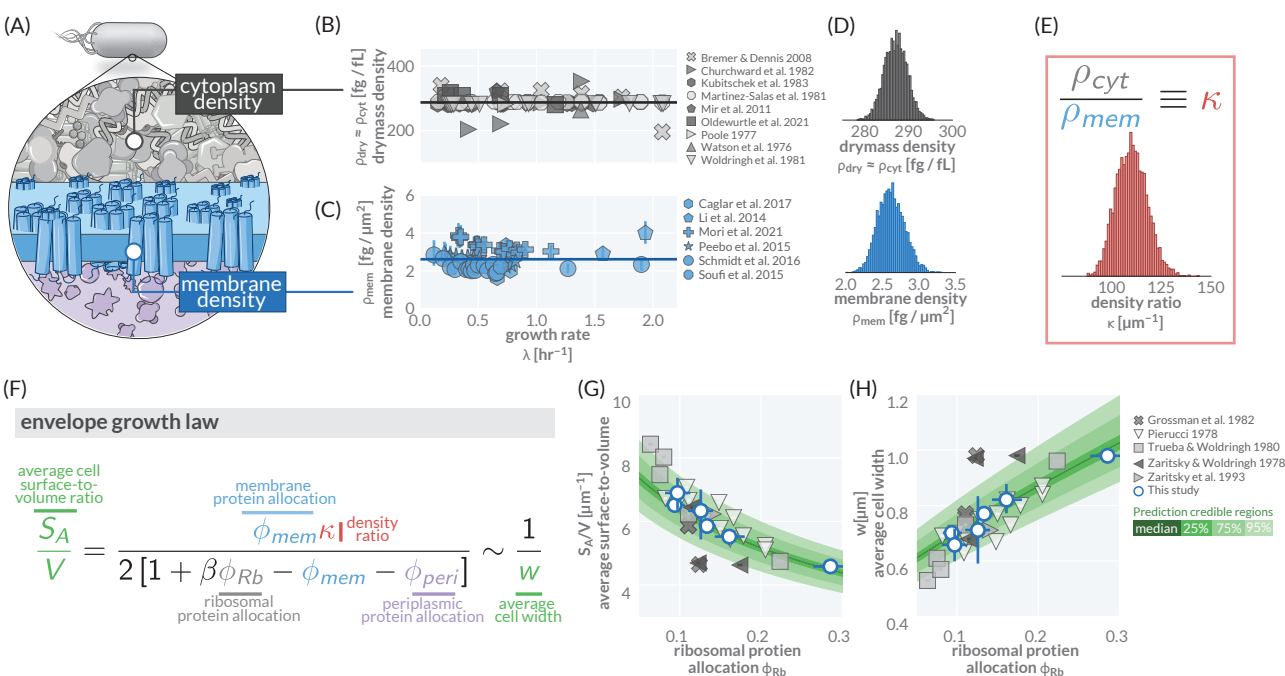
(A)
cytoplasm density
membrane density
(B)
$\rho_{dry} \approx \rho_{cyt}$ [fg / fL]
drymass density
400
200
Bremer & Dennis 2008
Churchward et al. 1982
Kubitschek et al. 1983
Martinez-Salas et al. 1981
Mir et al. 2011
Oldewurtle et al. 2021
Poole 1977
Watson et al. 1976
Woldringh et al. 1981
(C)
ρ_{mem} [fg / μm^2]
membrane density
6
4
2
0
0.0
0.5
1.0
1.5
2.0
growth rate
λ [hr^{-1}]
Caglar et al. 2017
Li et al. 2014
Mori et al. 2021
Peebo et al. 2015
Schmidt et al. 2016
Soufi et al. 2015
(D)
280
290
300
drymass density
$\rho_{dry} \approx \rho_{cyt}$ [fg / fL]
2.0
2.5
3.0
3.5
membrane density
ρ_{mem} [fg / μm^2]
(E)
$\frac{\rho_{cyt}}{\rho_{mem}} \equiv \kappa$
100
125
150
density ratio
κ [μm^{-1}]
(F)
envelope growth law
average cell surface-to-volume ratio
membrane protein allocation
density ratio
$\frac{S_A}{V} = \frac{\phi_{mem}\kappa}{2\left[1 + \beta\phi_{Rb} - \phi_{mem} - \phi_{peri}\right]} \sim \frac{1}{w}$
ribosomal protein allocation
periplasmic protein allocation
average cell width
(G)
10
8
6
4
S_A/V [μm^{-1}]
average surface-to-volume
0.1
0.2
0.3
ribosomal protien allocation ϕ_{Rb}
(H)
1.2
1.0
0.8
0.6
0.4
w[μm]
average cell width
0.1
0.2
0.3
ribosomal protien allocation ϕ_{Rb}
Grossman et al. 1982
Pierucci 1978
Trueba & Woldringh 1980
Zaritsky & Woldringh 1978
Zaritsky et al. 1993
This study
Prediction credible regions
median 25% 75% 95%