Table 1. Growth parameters for bacteria grown in LB that display bimodal growth. D is the cell diameter, times are in minutes, growth rates are in μm min^{-1} and lengths are in μm.

Parameter	Mean	SD	CV
τ_c	9.721	3.187	32.788
τ_g	17.622	3.111	17.654
$\tau_g - \tau_c$	8.017	1.043	13.006
a_1	0.111	0.018	15.947
a_2	0.190	0.029	15.148
a_h	0.057	0.007	11.768
L_0	2.482	0.274	11.028
$L(\tau_c)$	3.547	0.316	8.914
$L(\tau_g)$	5.034	0.402	7.99
D	0.933	0.043	4.586

Abstract

We monitor the shape dynamics of individual *E. coli* cells using time-lapse microscopy together with accurate image analysis. This allows measuring the dynamics of single-cell parameters throughout the cell cycle. In previous work, we have used this approach to characterize the main features of single-cell morphogenesis between successive divisions. Here, we focus on the behavior of the parameters that are related to cell division and study their variation over a population of 30 cells. In particular, we show that the single-cell data for the constriction width dynamics collapse onto a unique curve following appropriate rescaling of the corresponding variables. This suggests the presence of an underlying time scale that determines the rate at which the cell cycle advances in each individual cell. For the case of cell length dynamics a similar rescaling of variables emphasizes the presence of a breakpoint in the growth rate at the time when division starts, τ_c. We also find that the τ_c of individual cells is correlated with their generation time, τ_g, and inversely correlated with the corresponding length at birth, L_0. Moreover, the extent of the T-period, $\tau_g - \tau_c$, is apparently independent of τ_g. The relations between τ_c, τ_g and L_0 indicate possible compensation mechanisms that maintain cell length variability at about 10%. Similar behavior was observed for both fast-growing cells in a rich medium (LB) and for slower growth in a minimal medium (M9-glucose). To reveal the molecular mechanisms that lead to the observed organization of the cell cycle, we should further extend our approach to monitor the formation of the divisome.