Supplemental Materials

Molecular Biology of the Cell

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Supplementary Materials:

To test whether the slow-down of the cell cycle could affect our conclusion, we refitted the heat dissipation curves with a modified model where T is now a function of time. We assume that the change in period over time has the functional form:

$$T(t) = at^2 + bt + c$$

We obtained a, b and c for each biological replicate by curve-fitting and modified our heat dissipation model the following:

$$\dot{Q}(t) = A + B \cdot 2^{\frac{t}{3(at^2+bt+c)}}$$

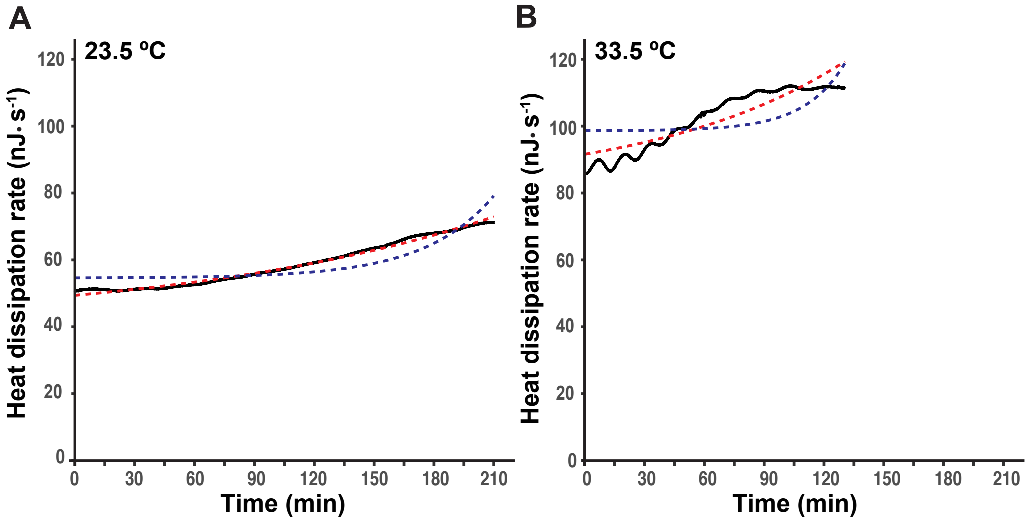
Where A, B are free parameters. The curve fits to the mean trend heat dissipation curve are the shown in Supplementary Figure 2. Correcting for the change in period over time does not improve or worsen the curve-fitting, indicating that a constant cell cycle time is a reasonable assumption. Furthermore, the obtained mean values for $A = 58 \pm 14\ \mathrm{nJ} \cdot \mathrm{s}^{-1}$ and $B = 6.8 \pm 2.9\ \ \mathrm{nJ} \cdot \mathrm{s}^{-1}$are statically not different from obtained values from the original model (see Table 1), $p = 0.288$ and $p = 0.299$, students *t*-test. In summary, there may be deviations from our assumptions that could in principle influence the kinetics of the increasing trend, especially at early stages before cellularization. However, we have argued that these effects must be modest and are not likely to alter our conclusions.

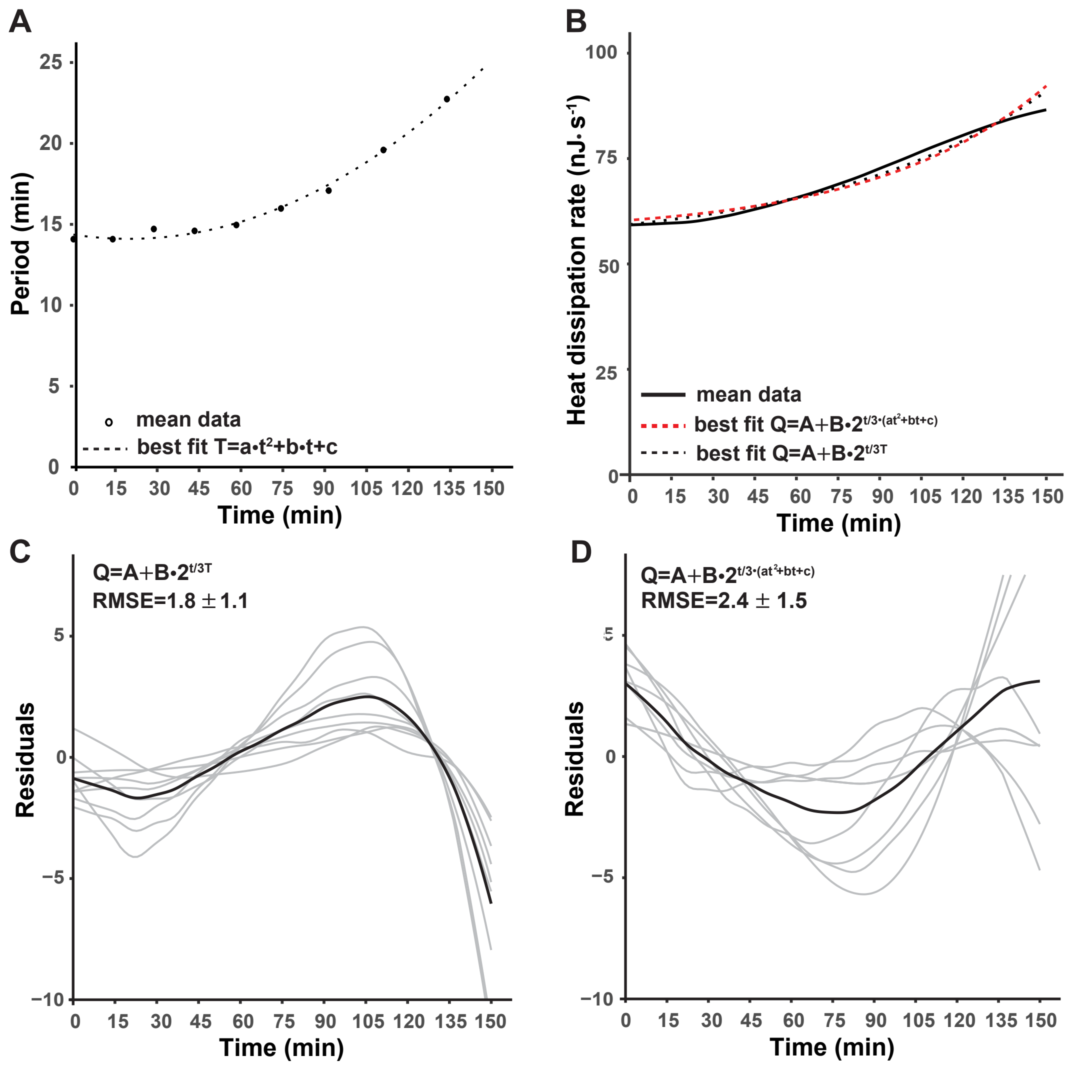
Supplementary Figure Legends

Supplementary Figure 1. The heat dissipation increase accords with a slow exponential with half time approximately three times the cell cycle period at different temperatures A Least-squares fit of the heat dissipation curves at 23.5 ºC to an exponential plus a constant, ($\dot{Q}(t) = A + B \cdot 2^{t/\tau}$). A, B and τ are free parameters. The fits were done on the individual experimental curves (gray lines in Figure 1C) and averaged (the red dotted line). The mean of the experimental heat dissipation curves is shown in black. The blue dotted curve is the least-squares fit with τ constrained to be equal the average cell cycle time of 24.2 min with A and B free parameters. **B** Least-squares fit of the heat dissipation curves at 33.5 ºC to an exponential plus a constant, ($\dot{Q}(t) = A + B \cdot 2^{t/\tau}$). A, B and τ are free parameters. The fits were done on the mean experimental curve. The mean of the experimental heat dissipation curves is shown in black and the fit is shown as the red dotted curve. The blue dotted curve is the least-squares fit with τ constrained to be equal the average cell cycle time of 14.2 min with A and B free parameters.

Supplementary Figure 2. Accounting for an increase in cell cycle time
A Least-squares fit of the mean periods at 28.5 ºC to $T(t) = at^2 + bt + c$, black dotted line where a, b and c are free parameters. **B** Least-squares fits of the mean trend heat dissipation curve at 28.5 ºC to $\dot{Q}(t) = A + B \cdot 2^{t/3T}$, black dotted line and $\dot{Q}(t) = A + B \cdot$

$2^{t/3(at^2+bt+c)}$, red dotted line, where A, B free parameters and a, b and c where constrained by the best fits of the individual experiments by the equation shown in A. **C & D** Residuals of the fits of the least square fits show in B to individual experiments, gray lines and their average (black line). Comparison of the root mean square error (RMSE) of the residuals of the individual experiments shows that neither model fits better or worse.


A
23.5 ºC
Heat dissipation rate (nJ·s-1)
120
100
80
60
40
20
0
0
30
60
90
120
150
180
210
Time (min)
B
33.5 ºC
Heat dissipation rate (nJ·s-1)
120
100
80
60
40
20
0
0
30
60
90
120
150
180
210
Time (min)



A
Period (min)
mean data
best fit T=a•t²+b•t+c
Time (min)
B
Heat dissipation rate (nJ·s⁻¹)
mean data
best fit Q=A+B•2^t/3•(at²+bt+c)
best fit Q=A+B•2^t/3T
Time (min)
C
Q=A+B•2^t/3T
RMSE=1.8 ± 1.1
Residuals
Time (min)
D
Q=A+B•2^t/3•(at²+bt+c)
RMSE=2.4 ± 1.5
Residuals
Time (min)