

1. CHEMOSTAT

$$\begin{aligned}\frac{dN}{dt} &= r(c)N - qN \\ \frac{dc}{dt} &= q(c_0 - c) - \frac{r(c)N}{y} \\ r(c) &= \frac{Rc}{K_m + c} \text{ (Michaelis-Menten)}\end{aligned}$$

Where q is the dilution rate in the unit per hour. c is the concentration of limiting nutrient. N is the mass of the bacteria. r is the growth rate. y is the yield parameter.

Analyze this model and the fixed point. Pay attention to what things mean in terms of the parameters. You can also look at various other growth rates as well.