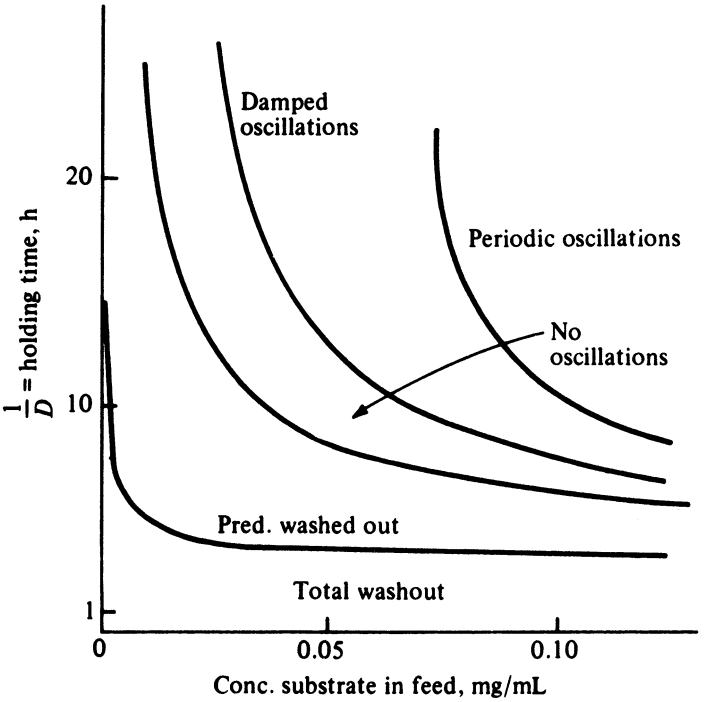

Figure 16.2. Dynamic behavior that can result from the model developed in Example 16.3. (With permission, from H. M. Tsuchiya and others, Predator-Prey Interactions of *Dictyostelium discoideum* and *Escherichia coli* in Continuous Culture, *J. Bacteriol.,* vol. 110, p. 1147, 1972.)

By defining dimensionless variables such as

$$\overline{X}_b = \frac{X_b}{X_{bF}}, \quad \overline{X}_p = \frac{X_p}{X_{pF}} \tag{16.20}$$

we can express eqs. 16.18 and 16.19 in terms of X_b and $X_{p.}$

$$\frac{d\overline{X}_b}{dt} = \mu_b'(1-\overline{X}_p)\overline{X}_b \tag{16.21}$$

$$\frac{d\overline{X}_p}{dt} = -k_d'(1-\overline{X}_b)\overline{X}_p \tag{16.22}$$

Equations 16.21 and 16.22 can be solved with the initial conditions of $\overline{X}_b(0) = \overline{X}_{b_0}$ and $\overline{X}_p(0) = \overline{X}_{p0}$.

The relationship between $\overline{X}_b$ and $\overline{X}_p$ can be determined by dividing eq. 16.21 by eq. 16.22.