$$P[N_i(t) = k] = \frac{[\int_0^t \lambda_i(y)dy]^k}{k!} \exp\left(- \int_0^t \lambda_i(y)dy \right) \tag{1}$$

$$\lambda_i(t) = x_S(t) b_S \mu \rho_i \frac{r_i}{b_i} \tag{2}$$