0.1 Metabolic and coinfection models

0.1.1 Full coinfection model

$$
\begin{aligned}
\frac{dB}{dt} &= r\big(1 - \frac{N}{K}\big)B - dBP + sL \\
\frac{dP}{dt} &= c\mu_p(B,L)I_p - dBP - dI_nP - mP - \chi dPL \\
\frac{dI_n}{dt} &= dBP - dI_nP - \mu_{ld}(S,L)I_n \\
\frac{dI_p}{dt} &= \mu_{ld}(S,L)I_n - \mu_p(B,L)I_p + \mu_i L \\
\frac{dL}{dt} &= r\big(1 - \frac{N}{K}\big)L + dI_nP - \mu_i L - sL
\end{aligned}
$$

0.1.2 Basic coinfection model

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\begin{aligned}
\frac{dB}{dt} &= r\big(1 - \frac{N}{K}\big)B - dBP \\
\frac{dP}{dt} &= c\mu_p(B,L)I_p - dBP - dI_nP - mP \\
\frac{dI_n}{dt} &= dBP - dI_nP - \mu_{ld}(S,L)I_n \\
\frac{dI_p}{dt} &= \mu_{ld}(S,L)I_n - \mu_p(B,L)I_p + \mu_i L \\
\frac{dL}{dt} &= r\big(1 - \frac{N}{K}\big)L + dI_nP - \mu_i L
\end{aligned}
$$

0.1.3 Metabolic model

$$
\begin{aligned}
\frac{dB}{dt} &= r_{max}H_{O_2}H_{DOC}H_{eDAR}B - dBP \\
\frac{dP}{dt} &= c\mu_p\big[1 - \mathcal{P}(L)\big]I - dBP - mP + c\mu_i L \\
\frac{dI_n}{dt} &= dBP - \big[1 - \mathcal{P}(L)\big]I - \mathcal{P}(L)I \\
\frac{dL}{dt} &= rH_{O_2}H_{DOC}H_{eDAR}L + dI_nP - \mu_i L
\end{aligned}
$$