

Model Matematika Penyebaran Penyakit Kaki Gajah



Apa itu Penyakit Kaki Gajah?

Filariasis (penyakit kaki gajah) adalah penyakit menular menahun yang disebabkan oleh cacing *filaria*.

Penyakit ini ditularkan oleh berbagai jenis nyamuk

Asumsi

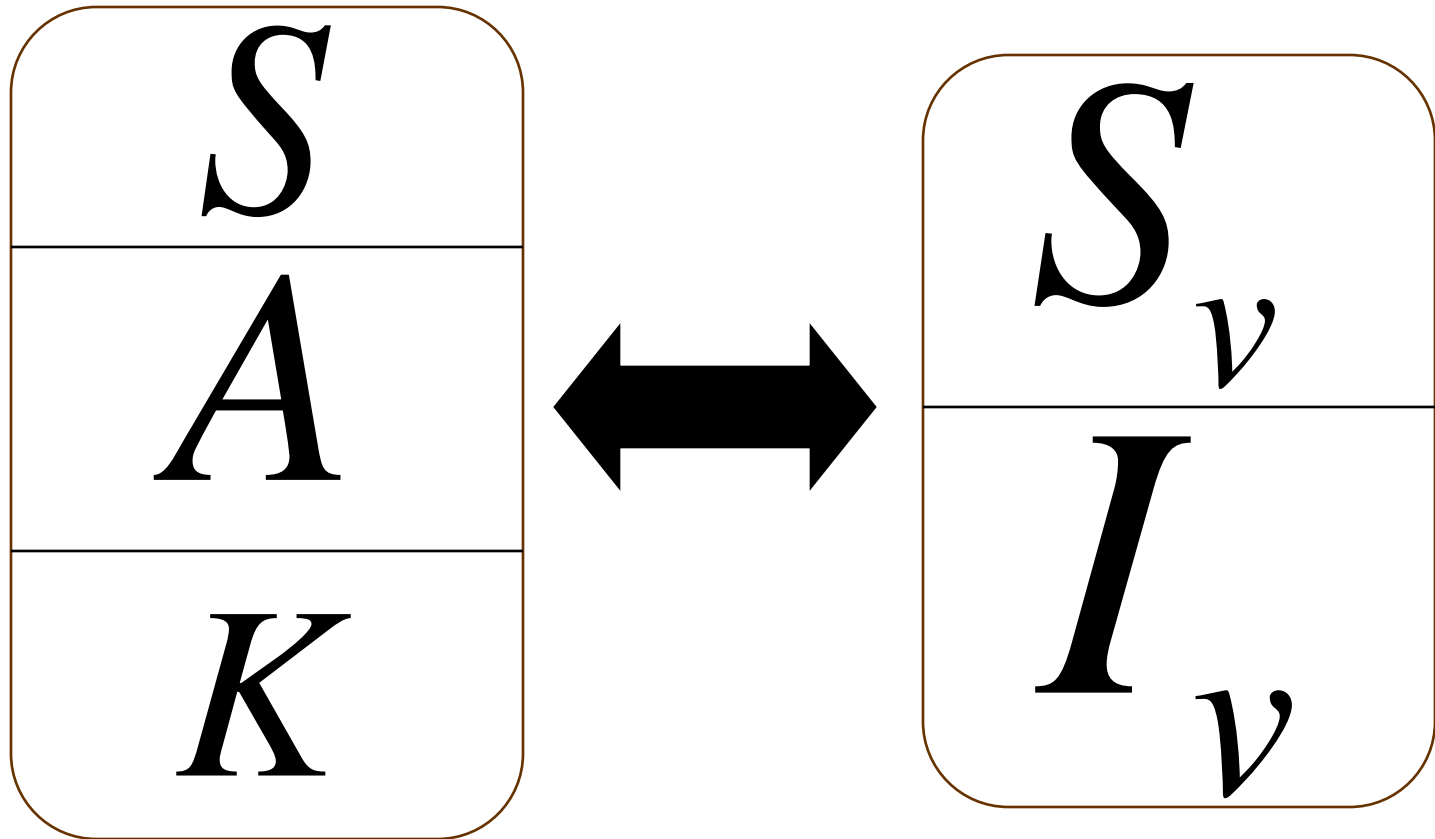
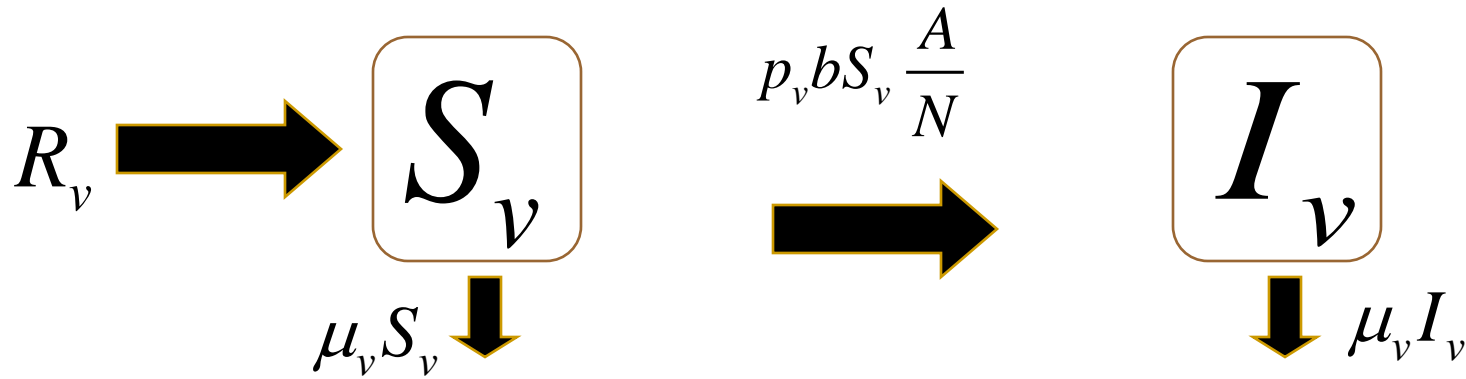
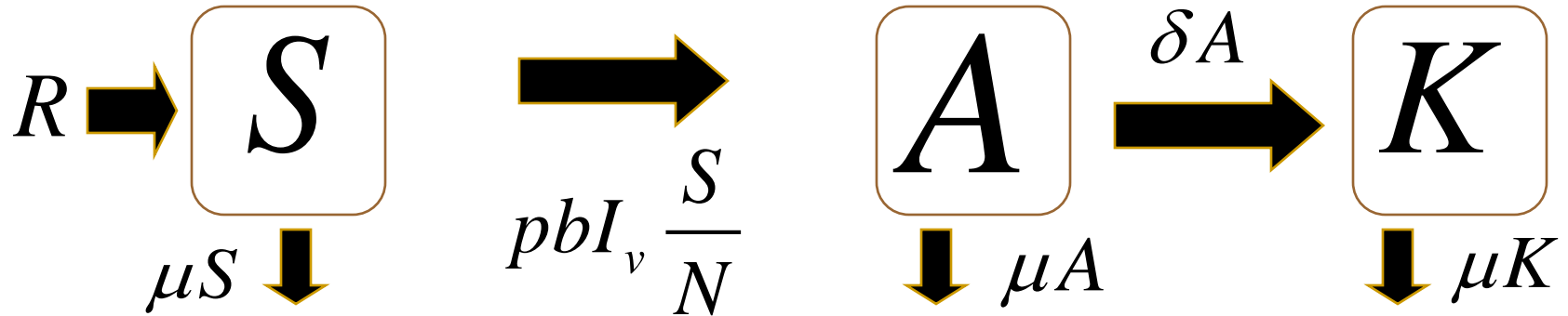


Diagram Skematik Tanpa Pengobatan



Model Penyebaran Filariasis tanpa Pengobatan

$$\frac{dS}{dt} = R - pbI_v \frac{S}{N} - \mu S$$

$$\frac{dA}{dt} = pbI_v \frac{S}{N} - \delta A - \mu A$$

$$\frac{dK}{dt} = \delta A - \mu K$$

$$\frac{dS_v}{dt} = R_v - p_v b S_v \frac{A}{N} - \mu_v S_v$$

$$\frac{dI_v}{dt} = p_v b S_v \frac{A}{N} - \mu_v I_v$$

Titik Kesetimbangan

$$T1: I_v = 0, K = 0, A = 0$$

$$T2: I_v = \frac{R_o}{b(p_v b \mu + \mu \mu_v + \mu_v \delta) \mu_v p}$$

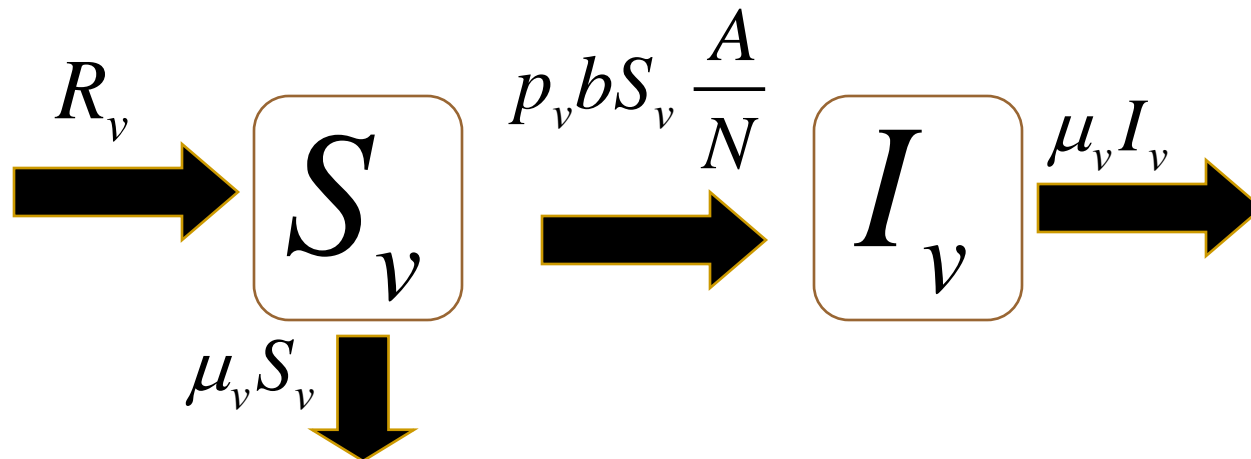
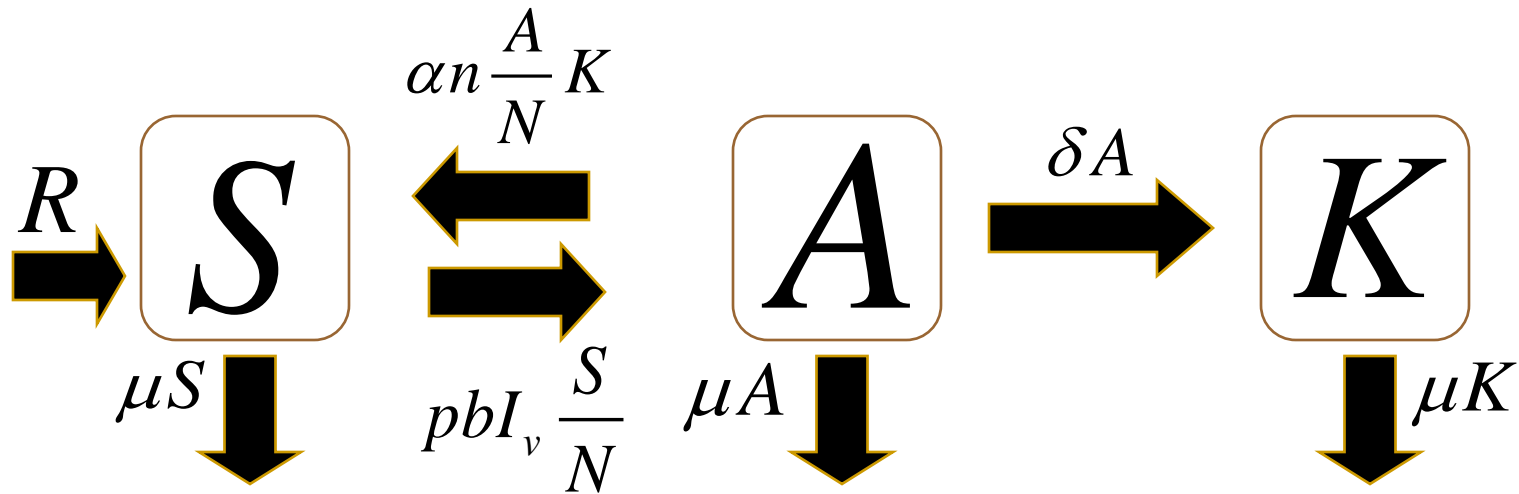
$$K = \frac{\delta R R_o}{p_v b \mu^2 (\mu_v R \delta + b R_v \delta p + \mu_v R \mu + b \mu R_v p) \mu}$$

$$A = \frac{R R_o}{p_v b \mu (\mu_v R \delta + b R_v \delta p + \mu_v R \mu + b \mu R_v p)}$$

Basic Reproduction Number

$$R_0 = b^2 \frac{R_v \mu}{R (\delta + \mu) \mu_v^2} p_v p$$

Diagram Skematik dengan Pengobatan



Model Penyebaran Filariasis dengan Pengobatan

$$\frac{dS}{dt} = R + \alpha n \frac{A}{N} K - pbI_v \frac{S}{N} - \mu S$$

$$\frac{dA}{dt} = pbI_v \frac{S}{N} - \delta A - \alpha n \frac{A}{N} K - \mu A$$

$$\frac{dK}{dt} = \delta A - \mu K$$

$$\frac{dS_v}{dt} = R_v - p_v b S_v \frac{A}{N} - \mu_v S_v$$

$$\frac{dI_v}{dt} = p_v b S_v \frac{A}{N} - \mu_v I_v$$

Titik Kesetimbangan

$$T1: A = 0, K = 0, I_v = 0$$

Titik Eksistensi Endemi

$$R_0 = \frac{R_v \mu_h p_v b^2 p}{R_h \delta \mu_v^2 + R_h \mu_h \mu_v^2}$$