**Equations used to define Dog-to-Dog transmission model**

**Equations used to define Dog-to-Human transmission model**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Symbol** | **Variable** | | **Default value** | **Reference** |
| *T* | | Time | 1 week |  |
| *Sr* | | Susceptible raccoon population per km2 | Urban: 40 raccoons/km2  Peri-urban: 60 raccoons/km2  Rural: 8 raccoons/km2 | Suzanne et al 2003 |
| *Er* | | Exposed raccoon population per km2 | Calculated (raccoons/km2) |  |
| *Ir* | | Infectious (rabid) raccoon population per km2 | Calculated (raccoons/km2) |  |
| *Rr* | | Immune raccoon population per km2 | Calculated (raccoons/km2) |  |
| *Nr* | | Total raccoon population per km2 | Calculated (raccoons/km2) |  |
| *Br* | | Raccoon birth rate | 0.026 (raccoons/week) | Childs et al |
| *λd* | | Loss of rabies vaccine immunity in Raccoon | 0.0036 (week-1) | Appendix S3 |
| *id* | | Raccoon rabies incubation period in weeks | 6.76 (week) | Childs et al |
| *σd* | | Inverse of average incubation period | *1/ id* | Calculated |
| *rd* | | Risk of clinical outcome | 0.30 | Assumed |
| *dog\_life* | | Dog life expectancy | 3 (years) | [4] |
| *md* | | Dog death rate | 0.016 (week-1) | Childs et al |
| *βd* | | Dog-dog transmission coefficient (inverse of time between dog contacts) | (km2/dogs/week) | Derived from Zinsstag et al 2009 |
| *γ* | | Dog density dependent mortality | (km2/dogs/week) | Calculated |
| *K* | | Mean carrying capacity | (dogs/km2) | [3] |
| *vd* | | Dog vaccine efficacy | 0.97 | [7] |
| *vaccine* | | Vaccination coverage |  | User Input |
| *αd* | | Dog vaccination rate  (weeks 1-10) | (week-1) | Calculated |
|  | | Dog vaccination rate  (weeks 11+) | 0 (week-1) | Assumed |
| *infective* | | Dog rabies infective period | 5 (days) | [3] |
| *μd* | | Rabid mortality rate | (week-1) | Calculated |
| *Sh* | | Susceptible human population per km2 | Calculated (humans/ km2) |  |
| *Eh* | | Exposed human population per km2 | Calculated (humans/ km2) |  |
| *Ih* | | Rabid human population per km2 | Calculated (humans/ km2) |  |
| *Rh* | | Immune human population per km2 | Calculated (humans/ km2) |  |
| *Nh* | | Total human population per km2 | Calculated (humans/ km2) | User Input |
| *bh* | | Human birth rate | 18.5/1000/52 (week-1) | [8] |
| *λh* | | Human loss of vaccination immunity rate | 0 (week-1) | [3] |
| *human\_life* | | Human life expectancy | 72 (years) | [9] |
| *mh* | | Human mortality rate | 1/*human\_life*/52 (week-1) | Calculated |
| *βdh* | | Dog human transmission rate | 0.0002054 (km2/dogs/week) | Calculated |
| *P10* | | Human post exposure prophylactic (PEP) vaccination rate | 90% (week-1) | Assumed |
| *vh* | | Human vaccine efficacy | 0.95 | [7] |
| *P2* | | Probability of a bite to the head | 0.070 | [10] |
| *P3* | | Probability of a bite to the arm | 0.384 | [10] |
| *P4* | | Probability of a bite to the trunk | 0.060 | [10] |
| *P5* | | Probability of a bite to the leg | 0.486 | [10] |
| *P6* | | Probability of developing rabies after a bite to the head | 0.450 | [10] |
| *P7* | | Probability of developing rabies after a bite to the arm | 0.275 | [10] |
| *P8* | | Probability of developing rabies after a bite to the trunk | 0.050 | [10] |
| *P9* | | Probability of developing rabies after a bite to the leg | 0.050 | [10] |
| *ihead* | | Human incubation period after bite to the head | 3.14 (weeks) | [11] |
| *iarm* | | Human incubation period after bite to the arm | 8.57 (weeks) | [11] |
| *itrunk* | | Human incubation period after bite to the trunk | 6.43 (weeks) | [11] |
| *ileg* | | Human incubation period after bite to the leg | 10.71 (weeks) | [11] |
|  | | Rates of developing rabies from exposure (bites) | 0.025 | Zinsstag et al 2009 |
|  | | Rates of not developing rabies from exposure (bites) | 0.097 | Zinsstag et al 2009 |
| *infective\_h* | | Average infective period for humans | 7 (days) | [12] |
| *μh* | | Inverse of average infective period, rabid human mortality rate | (week-1) | Calculated |