Table S1. Order-specific parameter values for within-host nested model.*

| Order            | $\mu_R$, reservoir host background mortality (days$^{-1}$) | $T_{WR}$, reservoir host tolerance of immunopathology (constant) | $T_{WR}$, reservoir host tolerance of immunopathology (complete) | $\delta_{WR}$, reservoir host magnitude of constitutive immunity (days$^{-1}$) | $T_{ds}$, human tolerance of viral pathology (constant) | $T_{ds}$, human tolerance of viral pathology (complete) | $r^*_H$, optimal virus growth rate (days$^{-1}$) (constant) | $r^*_H$, optimal virus growth rate (days$^{-1}$) (complete) | $\alpha_s$, relative spillover virulence (days$^{-1}$) (constant) | $\alpha_s$, relative spillover virulence (days$^{-1}$) (complete) |
|------------------|----------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| Afrosoricida     | 8.58$x10^4$ [6.56$x10^{-1}$ - 1.06$x10^0$]                | 1.42                                                          | 0.42                                                          | 0.0613                                                              | 0.7                                                        | 0.7                                                        | 0.7                                                        | 0.7                                                        | 0.328                                                       | 0.293                                                       |
| Carnivora        | 1.75$x10^4$ [1.26$x10^{-2}$ - 2.24$x10^0$]                | 1.64                                                          | 0.638                                                         | 0.0484                                                              | 1.45                                                      | 0.451                                                     | 0.451                                                     | 0.451                                                     | 0.192                                                       | 0.17                                                        |
| Cetartiodactyla  | 1.54$x10^4$ [1.09$x10^{-2}$ - 2.00$x10^0$]                | 1.49                                                          | 0.491                                                         | 0.283                                                               | 1.48                                                      | 0.478                                                     | 0.478                                                     | 0.478                                                     | 0.0764                                                      | 0.0696                                                      |
| Chiroptera       | 2.54$x10^4$ [1.83$x10^{-3}$ - 3.24$x10^0$]                | 2.01                                                          | 1.01                                                          | 0.0736                                                              | 0.808                                                     | 0.816                                                     | 0.816                                                     | 0.816                                                     | 0.428                                                       | 0.38                                                        |
| Cingulata        | 1.64$x10^4$ [0.39$x10^{-10}$]                            | 1.74                                                          | 0.737                                                         | 0.0394                                                              | 0.746                                                     | 0.748                                                     | 0.748                                                     | 0.748                                                     | 0.428                                                       | 0.38                                                        |
| Dasyuromorpha    | 8.21$x10^4$ [7.20$x10^{-9}$ - 9.22$x10^4$]                | 1.4                                                           | 0.399                                                         | 0.0293                                                               | 0.346                                                    | 0.347                                                     | 0.347                                                     | 0.347                                                     | 0.127                                                       | 0.14                                                        |
| Dermoptera       | 1.57$x10^4$ [0.60$x10^{-9}$]                             | 1.73                                                          | 0.731                                                         | ---                                                                  | ---                                                      | ---                                                      | ---                                                      | ---                                                      | ---                                                          | ---                                                          |
| Didelphimorpha   | 9.41$x10^4$ [7.81$x10^{-1}$ - 1.10$x10^0$]                | 1.27                                                          | 0.265                                                         | 0.0528                                                               | 0.608                                                    | 0.609                                                     | 0.609                                                     | 0.609                                                     | 0.306                                                       | 0.31                                                        |
| Diprotodontia    | 2.97$x10^4$ [2.18$x10^{-5}$ - 3.75$x10^4$]                | 1.55                                                          | 0.554                                                         | 0.0288                                                               | 0.325                                                    | 0.327                                                     | 0.327                                                     | 0.327                                                     | 0.117                                                       | 0.13                                                        |
| Eulipotyphala    | 1.10$x10^4$ [1.01$x10^{-5}$ - 1.19$x10^9$]                | 1.36                                                          | 0.359                                                         | 0.0648                                                               | 0.746                                                    | 0.748                                                     | 0.748                                                     | 0.748                                                     | 0.366                                                       | 0.321                                                      |
| Hyracoida        | 2.21$x10^4$ [0.54$x10^{-10}$]                            | 1.58                                                          | 0.58                                                          | 0.0619                                                               | 0.68                                                      | 0.682                                                     | 0.682                                                     | 0.682                                                     | 0.31                                                        | 0.277                                                      |
| Lagomorpha       | 4.04$x10^4$ [2.33$x10^{-5}$ - 5.75$x10^4$]                | 1.48                                                          | 0.485                                                         | ---                                                                  | ---                                                      | ---                                                      | ---                                                      | ---                                                      | ---                                                          | ---                                                          |
| Macroscelidea    | 7.87$x10^4$ [5.26$x10^{-1}$ - 1.05$x10^0$]                | 1.5                                                           | 0.496                                                         | ---                                                                  | 1.45                                                      | 0.451                                                     | 0.451                                                     | 0.451                                                     | ---                                                          | ---                                                          |
| Microbiotheria   | 8.56$x10^4$ [2.16$x10^{-1}$ - 1.50$x10^0$]                | 1.48                                                          | 0.456                                                         | ---                                                                  | ---                                                      | ---                                                      | ---                                                      | ---                                                      | ---                                                          | ---                                                          |
| Monotremata      | 8.88$x10^5$ [0.45$x10^{-7}$]                             | 1.88                                                          | 0.882                                                         | 0.0815                                                               | 0.878                                                    | 0.881                                                     | 0.881                                                     | 0.881                                                     | 0.643                                                       | 0.639                                                      |
| Notoryctemorpha  | 1.83$x10^3$ [1.19$x10^{-3}$ - 2.47$x10^0$]                | 1.27                                                          | 0.274                                                         | 0.0548                                                               | 1.11                                                      | 0.111                                                     | 0.111                                                     | 0.111                                                     | ---                                                          | ---                                                          |
| Peramelemorpha   | 5.83$x10^4$ [3.41$x10^{-1}$ - 8.24$x10^4$]                | 1.31                                                          | 0.311                                                         | 0.0603                                                               | 0.678                                                    | 0.679                                                     | 0.679                                                     | 0.679                                                     | 0.372                                                       | 0.373                                                      |
| Perissodactyla   | 7.74$x10^5$ [0.24$x10^{-5}$]                             | 1.61                                                          | 0.606                                                         | 0.0331                                                               | 0.361                                                    | 0.362                                                     | 0.362                                                     | 0.362                                                     | 0.0963                                                      | 0.0868                                                     |
| Order      | $\mu$ [Mean] | $\sigma$ [SD] | $\beta$ [SE] | $\alpha$ [SE] | $r^*_R$ | $\alpha_s$ |
|------------|--------------|---------------|--------------|--------------|---------|------------|
| Pholidota  | 3.17x10^4   | 1.45          | 0.453        | ---          | 1.48    | 0.478      |
|            | [0.637x10^4] | [1.28-1.62]   | [0.282-0.624] | ---          |         |            |
| Pilosa     | 3.11x10^4   | 1.59          | 0.592        | 0.0477       | 1.45    | 0.451      |
|            | [6.93x10^4] | [1.46-1.73]   | [0.457-0.727] | [0.0319-0.0635] | [0.347-0.714] | [0.348-0.719] |
| Primates   | 1.20x10^4   | 1.89          | 0.888        | 0.0545       | 0.593   | 0.597      |
|            | [6.27x10^4] | [1.85-1.92]   | [0.855-0.922] | [0.0482-0.0608] | [0.52-0.665] | [0.522-0.67] |
| Proboscidea| 3.70x10^5   | 1.69          | 0.694        | 0.0553       | 1.45    | 0.451      |
|            | [0.406x10^4] | [1.5-1.89]    | [0.503-0.886] | [0.0318-0.0789] | [0.333-0.875] | [0.4-0.882] |
| Rodentia   | 6.21x10^4   | 1.5           | 0.496        | 0.0452       | 0.516   | 0.518      |
|            | [5.79x10^4] | [1.47-1.52]   | [0.47-0.621] | [0.0376-0.0528] | [0.431-0.661] | [0.433-0.663] |
| Scandentia | 3.92x10^4   | 1.66          | 0.662        | 0.0185       | 0.529   | 0.216      |
|            | [1.06x10^4] | [1.51-1.82]   | [0.507-0.818] | [1x107-0.037] | [2.68x105-0.43] | [2.81x105-0.435] |
| Sirenia    | 7.39x10^4   | 1.64          | 0.64         | ---          | 1.45    | 0.451      |
|            | [0.43x10^4] | [1.45-1.83]   | [0.449-0.832] | ---          |         |            |
| Tubulidenta| 1.02x10^4   | 1.61          | 0.614        | 0.0382       | 0.417   | 0.419      |
|            | [0.74x10^4] | [1.34-1.89]   | [0.34-0.888] | [0.0147-0.0618] | [0.155-0.704] | [0.029-0.429] |

*Derived parameter values (depicted as mean [lower confidence interval – upper confidence interval]) computed from linear regression and mixed effects models are shown across all 26 mammalian orders ($\mu_R, g_{BR}, T_{WR}, T_{VS}$), in addition to the $r^*_R$ and $\alpha_s$ values computed from their inputs. Confidence intervals are 95% derived via standard error. All other parameters involved in the calculation of $r^*_R$ and $\alpha_s$ are listed in main text Table 1.*