Two strain dengue

by   R. Adenane, F. Avram

ABSTRACT (original article):
Keywords:

In[18]:=
```
(*Latex dictionary*)
Format[mu]:=μ;
Format[ga]:=γ;Format[ga1]:=Subscript[γ,1];Format[ga2]:=Subscript[γ,2];
Format[t1]:=Subscript[θ,1];Format[t2]:=Subscript[θ,2];Format[th]:=θ;
Format[La]:=Λ;Format[be1]:=Subscript[β,1];Format[be2]:=Subscript[β,2];
Format[si1]:=Subscript[σ,1];Format[si2]:=Subscript[σ,2];
Format[et1]:=Subscript[η,1];Format[et2]:=Subscript[η,2];
Format[i1]:=Subscript[i,1];Format[i2]:=Subscript[i,2];
Format[y1]:=Subscript[y,1];Format[y2]:=Subscript[y,2];
Format[r1]:=Subscript[r,1];Format[r2]:=Subscript[r,2];
(*entering the closed model, packages*)
ClearAll["Global`*"];
SetDirectory[NotebookDirectory[]];SetOptions[$FrontEndSession, NotebookAutoSave → True];
NotebookSave[];
AppendTo[$Path,"C:\\Users\\flori\\Dropbox\\EpidCRNmodels"];<<EpidCRN`;
(*Needs["RobertNachbar`CompartmentalModeling`"]*)

(*particular cases, key formulas
cDFE={i1→0,i2→0,y1→0,y2→0};cE2={i1→0,r1→0,y2→0};cE1={i2→0,r2→0,y1→0};cLa=La→mu;
csd=s→La/mu;
csym={ga1→ga,ga2→ga,t1→th,t2→th,(*La→0,mu→0,*)et1→1,et2→1};
csymG={ga1→ga,ga2→ga,t1→th,t2→th,La→0,mu→0,et1→1,et2→1};
cet={et1→1,et2→1};cChu={t1→0,t2→0,th→0,La→mu,et1→1,et2→1};
sd=La/mu;mR1=be1/(ga1+mu);mR2=be2/(ga2+mu);R1=mR1 sd;R2=mR2 sd;S2=1/mR2;S1=1/mR1;
k1=ga1/(ga1+mu+t1);a2c=1/k1;R12=mR2 (S1+ si2 r11);r11=k1(sd-S1);
R2c=R2/R12;*)

(*enter closed model, as first step*)
RNc={"S"+"I1"→2 "I1", "S"+"Y1" → "Y1"+ "I1", "I1"→ "R1",
"S"+"I2" →2 "I2","S"+"Y2" → "Y2"+ "I2", "I2"→ "R2",
 "R1"+ "I2"→ "I2"+ "Y2","R1"+ "Y2"→2 "Y2","Y2"→"R",
 "R2"+"I1"→"I1"+"Y1", "R2"+ "Y1"→2"Y1","Y1"→"R",
  "R1"→"S","R2"→"S","R"→"S"};
  (*enter open model, adding in and out 9 reactions *)
RN=Join[{0→"S"},RNc,{"S"→0,"I1" →0,"Y1" →0,"R1" →0,"I2" →0,"Y2" →0,"R2" →0,"R"→0}]
var={S,I1,Y1,R1,I2,Y2,R2,R};
minSiph[ToString/@var,asoRea[RN]]
```

Out[32]=

$\{0 \to S,\ I1 + S \to 2\,I1,\ S + Y1 \to I1 + Y1,\ I1 \to R1,\ I2 + S \to 2\,I2,\ S + Y2 \to I2 + Y2,\ I2 \to R2,$
$I2 + R1 \to I2 + Y2,\ R1 + Y2 \to 2\,Y2,\ Y2 \to R,\ I1 + R2 \to I1 + Y1,\ R2 + Y1 \to 2\,Y1,\ Y1 \to R,$
$R1 \to S,\ R2 \to S,\ R \to S,\ S \to 0,\ I1 \to 0,\ Y1 \to 0,\ R1 \to 0,\ I2 \to 0,\ Y2 \to 0,\ R2 \to 0,\ R \to 0\}$

Constraints generated: 17

Sample constraints:

{s1 || s2 || s3 || s4 || s5 || s6 || s7 || s8, ! s1, s2 ⇒ s1 || s3, s3 ⇒ s1 || s3, s4 ⇒ s2}

All found siphons: {{2, 3, 4, 5, 6, 7, 8}, {2, 3, 4, 5, 6, 7}, {2, 3, 4, 5, 6, 8},
    {2, 3, 4, 5, 6}, {2, 3, 4, 6, 8}, {2, 3, 4, 6}, {2, 3, 4}, {2, 3, 5, 6, 7, 8}, {2, 3, 5, 6, 7},
    {2, 3, 5, 6, 8}, {2, 3, 5, 6}, {2, 3}, {3, 5, 6, 7, 8}, {3, 5, 6, 7}, {5, 6, 7}, {5, 6}}

After minimality filter: {{2, 3}, {5, 6}}

Out[34]=

{{2, 3}, {5, 6}}