

```

h+[p-, θ-, n-] := pn / (pn + θn)
h-[p-, θ-, n-] := 1 - h+[p, θ, n]

```

```
tmax = 200;
```

```

With[{ma = 1., mb = 1., mc = 1.,
      na = 2.2, nb = 2.2, nc = 2.2,
      θa = 0.28, θb = 0.28, θc = 0.28,
      ka = 1., kb = 1., kc = 1.,
      γa = 1., γb = 1., γc = 1.,
      δa = 1., δb = 1., δc = 1.},

```

```

sol = NDSolve[{ra'[t] == ma * (h+[pc[t], θc, nc] + h-[pb[t], θb, nb]) - γa * ra[t],
               rb'[t] == mb * (h+[pa[t], θa, na]) - γb * rb[t],
               rc'[t] == mc * (h-[pb[t], θb, nb]) - γc * rc[t],
               pa'[t] == ka * ra[t] - δa * pa[t],
               pb'[t] == kb * rb[t] - δb * pb[t],
               pc'[t] == kc * rc[t] - δc * pc[t],
               ra[0] == 0,
               rb[0] == 0, rc[0] == 0, pa[0] == 0, pb[0] == 0, pc[0] == 0},
             {ra, rb, rc, pa, pb, pc}, {t, 0, tmax}]]];

```

```

ParametricPlot[Evaluate[{pa[t], pb[t]} /. First[sol]], {t, 0, tmax},
  AxesLabel → {pa, pb}, ColorFunction → "Rainbow", PlotRange → Full]
Plot[Evaluate[{pa[t], pb[t], pc[t]} /. First[sol]],
  {t, 0, tmax}, PlotLegends → {"pa", "pb", "pc"}]

```



