



Research article

Revisiting the classical target cell limited dynamical within-host HIV model - Basic mathematical properties and stability analysis

Benjamin Wacker*

Department of Engineering and Natural Sciences, University of Applied Sciences Merseburg,
Eberhard-Leibnitz-Str. 2, D-06217 Merseburg, Germany

* **Correspondence:** Email: benjamin.wacker@hs-merseburg.de.

Supplementary

Here, our GNU Octave code for reasons of reproducibility can be found.

```
% Numerical Simulation Of Primary HIV-Infection

% Step 1: Initial Conditions And Problem Parameters
% Compare Stafford et al. 2000/ Alizon & Magnus 2012

% Initial Conditions

T_zero    = 10;
T_i_zero  = 0;
V_zero    = 0.000001;

% Problem Parameters

r         = 0.17;
beta      = 0.00065;
d         = 0.01;
delta     = 0.39;
pig       = 850;
c         = 3;
```

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% Step 2: Equilibrium Point

R_null = (beta*pig*r)/(c*delta*d);

if(R_null > 1)
    T_star = (c*delta)/(beta*pig)
    T_i_star = (beta*pig*r-c*d*delta)/(beta*delta*pig)
    V_star = (beta*pig*r-c*d*delta)/(beta*c*delta)
elseif(R_null < 1)
    T_star = (r/d)
    T_i_star = 0
    V_star = 0
endif

% Step 3: Problem Definition

sol = @(t,x) [r-beta*x(1)*x(3)-d*x(1);...
             beta*x(1)*x(3)-delta*x(2);...
             pig*x(2)-c*x(3)];
[t,x] = ode45(sol,[0,200],[T_zero,T_i_zero,V_zero]);

% Step 4: Plotting Of Solutions

figure(1)

subplot(3,1,1);
plot(t(1:15:end),x(:,1)(1:15:end),'linestyle','-',...
     'linewidth',1,'color','blue');
hold on
plot(t(1:15:end),T_star*ones(length(t(1:15:end)),1),...
     'linestyle','--','linewidth',1,...
     'color','blue');
title('Load of Target CD4-cells');
xlabel('t [days]');
ylabel('T(t)','interpreter','tex');
hold off

subplot(3,1,2);
plot(t(1:15:end),x(:,2)(1:15:end),'linestyle','-',...
     'color','red','linewidth',1);
hold on
plot(t(1:15:end),T_i_star*ones(length(t(1:15:end)),1),...

```

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        'linestyle','--','linewidth',1,'color','red');
title('Load of Infected Target CD4-Cells');
xlabel('t [days]');
ylabel('T_{i}(t)', 'interpreter', 'tex');
hold off

subplot(3,1,3);
plot(t(1:15:end),x(:,3)(1:15:end),'linestyle','-','...
        'color','black','linewidth',1);
hold on
plot(t(1:15:end),V_star*ones(length(t(1:15:end)),1),...
        'linestyle','--','linewidth',1,'color','black');
title('Load of Viral Particles');
xlabel('t [days]');
ylabel('V(t)', 'interpreter', 'tex');
ylim([0, 1500]);
hold off

```



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