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BME501 FINAL PROJECT

PLOT FACO2, VC, AND VP FROM 0-25 MINUTES FOR Q=6, FICO2=.05 AND FICO2 =0 FOR 25<T<35 MIN. VC+VP VERSUS TIME COMPARISON WITH THE RESULTS OF THE ORIGINAL GRODINS MODEL.

SOLUTION

DDE FUNCTION

```
function yp = ddex1(t,y,z)
Faco2=y(1);
Ctco2=y(2);
Vc=y(3);
Vp=y(4);
Gc= 1.5;
Gp= 1.5;
Tc= 3;
Tp=0.25;
B=36.1493;
Q=6;
Vl=3;
Vt=42;
dc=23/60;
dp=23/60;
b=760;
Paco2=(b-47)*y(1);
ydelay=z(1,1);
Va=y(3)+y(4)-2.07;
if(t<25)
   Fico2= 0.05;
else
   Fico2=0;
end
Caco2= 48+(6*(Paco2-40)/7);
yp(1)=(Fico2*Va+((8.63*Q*(y(2)-Caco2)/(b-47)))-(y(1)*Va));
yp(3)= ((Gc*(((b-47)*ydelay)-B))-y(3))/Tc;
yp(4)= ((Gp*(((b-47)*ydelay)-B))-y(4))/Tp;
yp=yp';
end
```

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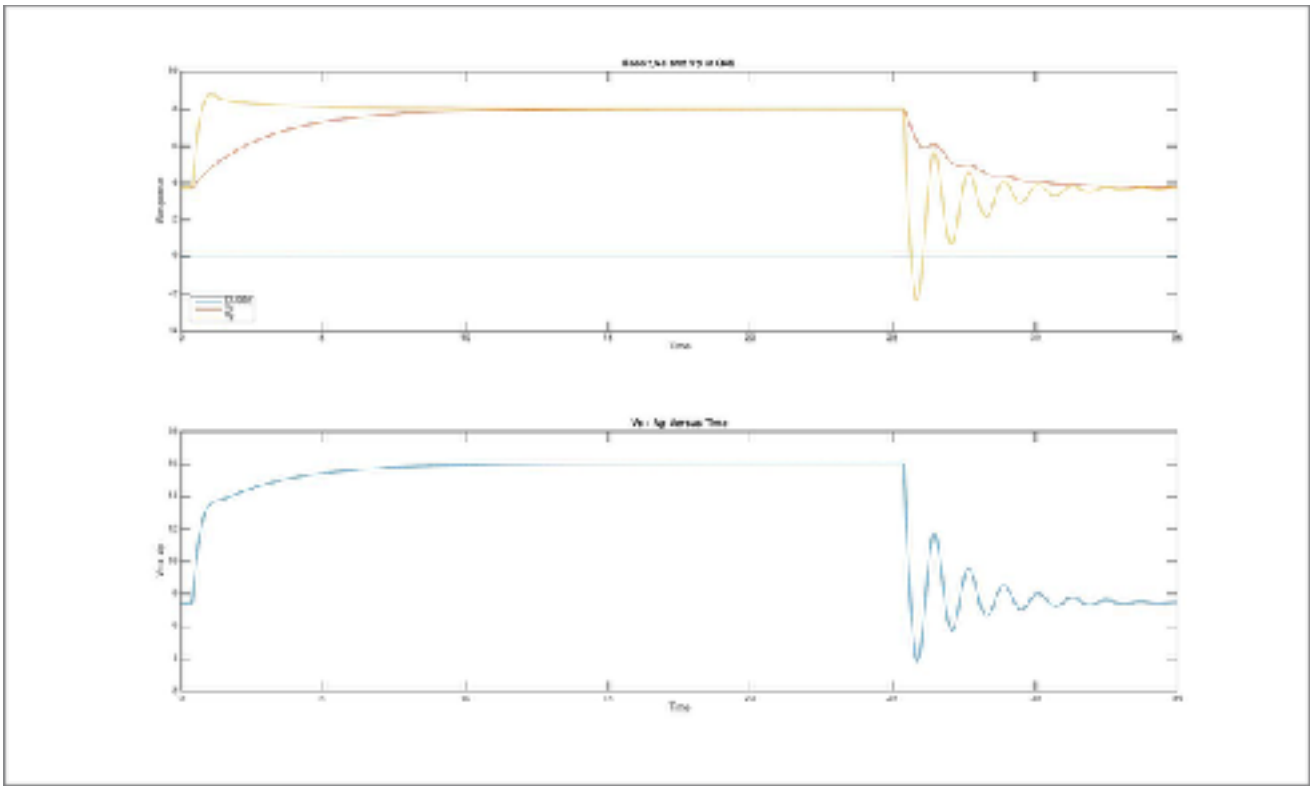
HISTORY FUNCTION

```
function S = ddex1hist(t)
    S=[0.0542,50.8714,3.7345,3.7217];
end
```

MAIN PROGRAM

```
lags=23/60;
sol = dde23(@ddex1,lags,@ddex1hist,[0,35]);
time= sol.x;
subplot(211);
plot(time,sol.y(1,:));
xlabel('Time');
ylabel('Response');
hold on
plot(time,sol.y(3,:));
plot(time,sol.y(4,:));
title('Faco2,Vc and Vp at Q=6');
legend('FACO2','Vc','Vp','Location','SouthWest');
hold off
subplot(212);
plot(time,sol.y(3,:)+sol.y(4,:));
xlabel('Time');
ylabel('Vc + Vp');
title('Vc + Vp Versus Time');
```



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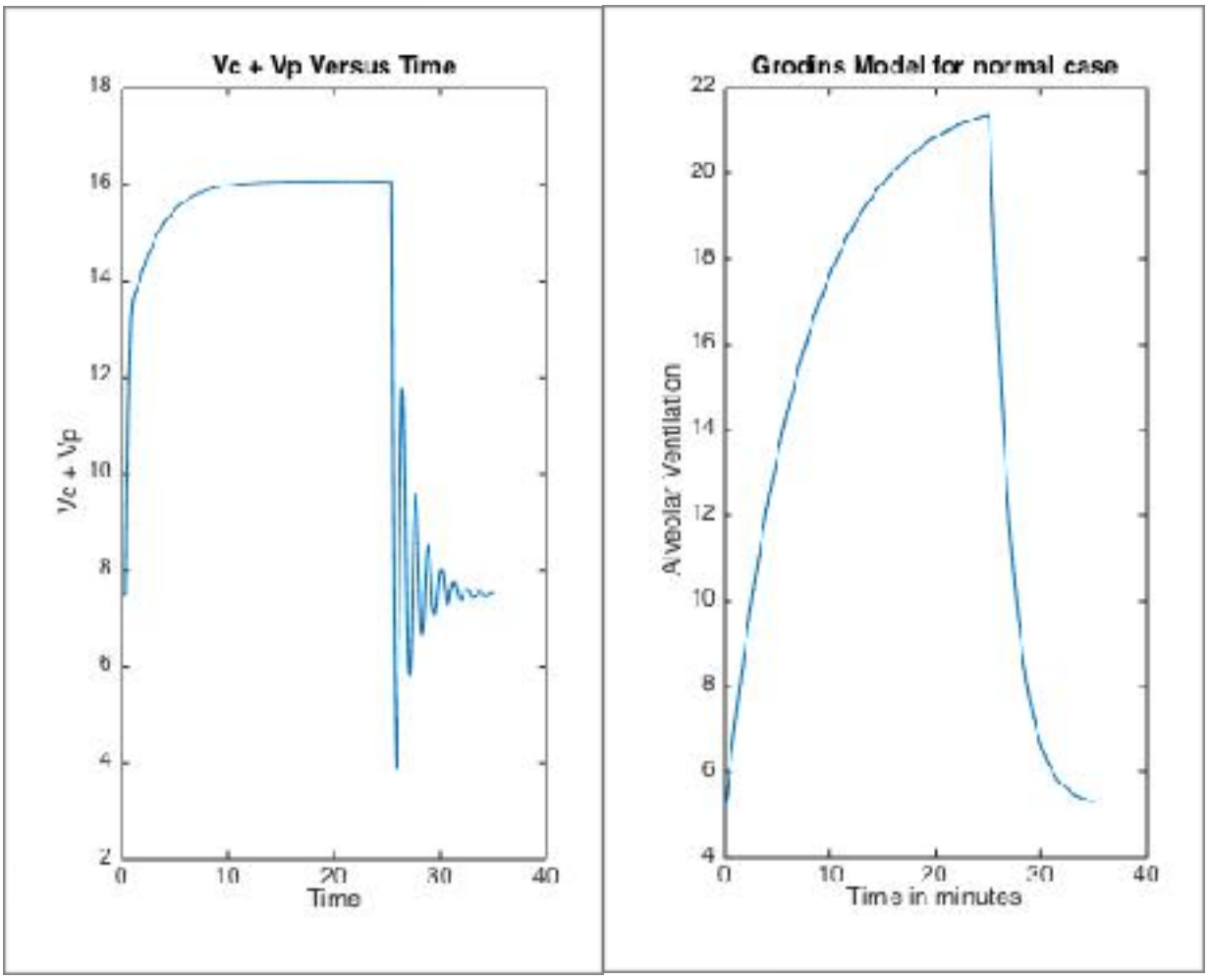

Alveolar ventilation in a conventional grodins model increases over time and decreases whereas the alveolar ventilation in the grodins model with modified control equation increases over time and remains constant for sometime after which it begins to oscillate (damped oscillation).

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PLOT FACO2, VC, AND VP FROM 0-25 MINUTES FOR Q=6 AND Q=4.25 LITERS/MIN

SOLUTION

DDE FUNCTION

```
function yp = ddex1ab(t,y,z)
Faco2=y(1);
Ctco2=y(2);
Vc=y(3);
Vp=y(4);
Gc= 1.5;
Gp= 1.5;
Tc= 3;
Tp=0.25;
B=36.1493;
Q=4.5;
Vl=3;
Vt=42;
dc=23/60;
dp=23/60;
b=760;
Paco2=(b-47)*y(1);
ydelay=z(1,1);
Va=y(3)+y(4)-2.07;
if(t<25)
   Fico2= 0.05;
else
   Fico2=0;
end
Caco2= 48+(6*(Paco2-40)/7);
yp(1)=(Fico2*Va+((8.63*Q*(y(2)-Caco2)/(b-47)))-(y(1)*Va));
yp(3)= ((Gc*(((b-47)*ydelay)-B))-y(3))/Tc;
yp(4)= ((Gp*(((b-47)*ydelay)-B))-y(4))/Tp;
yp=yp';
end
```

HISTORY FUNCTION

```
function S = ddex1hist(t)
    S=[0.0542,50.8714,3.7345,3.7217];
end
```

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MAIN PROGRAM

```
lags=23/60;
sol = dde23(@ddex1ab,lags,@ddex1hist,[0,35]);
time= sol.x;
y1=sol.y(1,:);
y3=sol.y(3,:);
y4=sol.y(4,:);
plot(time,y1);
xlabel('Time');
ylabel('Response');
hold on
plot(time,y3);
plot(time,y4);
title('Faco2,Vc and Vp at Q=4.5');
legend('FACO2','Vc','Vp','Location','SouthWest');
hold off
```