```
$PROBLEM AN EXAMPLE DIRECT EFFECT MODEL
;DVID = 0 for dose, 1 for PK, 2 for PD

$INPUT ID TIME AMT RATE DV DVID MDV KAI CLI VI

$DATA testdata1.csv IGNORE=C IGNORE=(DVID.EQ.1)

$SUBROUTINES ADVAN2 TRANS2


$PK
  ;PK parameters
   CL = CLI
   V  = VI
   KA = KAI
   S2 = V/1000

 ;PD parameters
   TVEMAX  = THETA(1)
   EMAX    = TVEMAX*EXP(ETA(1))
   TVEC50  = THETA(6)
   EC50    = TVEC50*EXP(ETA(4))

$ERROR
 CP=A(2)/S1    ;Plasma concentration needs to be calculated
 EFF = (EMAX*CP)/(EC50 + CP) ;Drug effect

 IF (DVID.LE.1) THEN
   IPRED = CP
   Y = IPRED*(1+ERR(1))  ;Proportional residual error for drug concentration
 ENDIF

 IF (DVID.EQ.2) THEN
   IPRED = EFF
   Y = IPRED+ERR(2)       ;Additive residual error for effect
 ENDIF

$THETA
 10     ;EMAX
 0.3    ;EC50


$OMEGA
 0.05    ;IIV EMAX
 0.05    ;IIV EC50

$SIGMA
 0.02 FIX  ;RUVPROPCP - fixed because PK is not estimated
 0.2       ;RUVADDE
```