

This script allows to estimate the parameters of a mathematical model for homeostasis of glucose and insulin from experimental data using the equations described elsewhere (Lombarte M, Lupo M, Campetelli G, Basualdo M, Rigalli A. Mathematical model of glucose-insulin homeostasis in healthy rats. *Math Biosci.* 245(2):269-77. 2013).

To estimate the parameters follow the next instruction:

- 1- After 24 h fasting, give rats 0.6 g glucose/100 g body weight (for healthy rats) and 0.3 g glucose / 100 g body weight (D_0) for diabetic rats by an oral tube.
- 2- Obtain blood samples at 0, 5, 10, 15, 30, 60, 90, 120, 180, 240, 300 min after glucose dose.
- 3- Measure insulin (pmol/l) and glucose (mg/dl) in plasma or serum.
- 4- Load glucose and insulin values arranged in a txt file with 3 columns separated by space. The data should have the following order and the following headings: t G I (where t is the time when samples were taken, G is plasma glucose levels in mg/dl and, I is plasma insulin levels in pmol/l). The names of the txt files should not have spaces or special characters (~ ! @ # \$ % ^ & * () { } _ + : " < > ? , . / ; ' [] - =) nor begin with numbers, e.g data.txt
- 5-Open the software R
- 6-Type source("measure.txt") and follow the instructions. The measure.txt and data.txt files have to be in the working directory.

You can use the file data.txt as an example. In this case you have to put:

$t_{Mg}=30$

$G_{Mg}=271$

$t_{mg}=240$

$t_{Mi}=30$

$I_{Mi}=261.79$

$D_0=1274$

and you will obtain:

"Values of parameters"

$ka= 0.0292306843289117$

$ke= 0.00543197477921154$

$k0= 0.00337535731716455$

$k1= 0.0145848952320436$

$k2= -0.00464065179804706$

$k3= 2.23089390932226$

$k4= 0.0749508851735671$

$k6= 0.0274165698761265$

$I_{pi}= 101.094743994098$

$Vd= 8.66002665266465$

$Ga= 105.2$

$Ia= 71.33$

$D0= 1274$