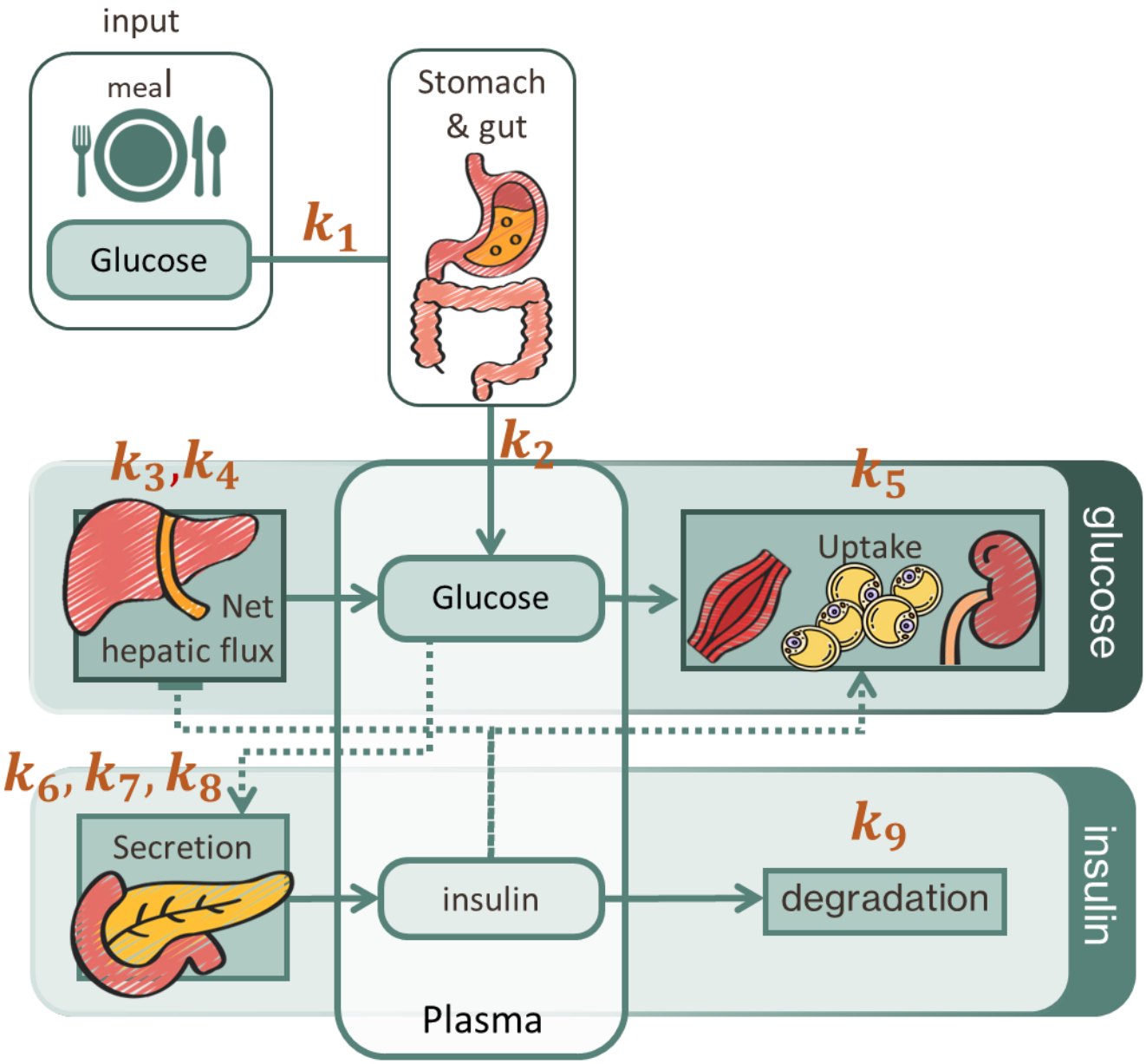
input
meal
Glucose
k_1
Stomach & gut
k_2
k_3, k_4
Net hepatic flux
Glucose
k_5
Uptake
glucose
k_6, k_7, k_8
Secretion
insulin
k_9
degradation
insulin
Plasma

Complete set of equations for the EDES

Equation	Role	Source
Glucose		
$G_{meal} = \sigma k_1^{\sigma} t^{\sigma-1} e^{-k_1 t^{\sigma}} \cdot D_G$	Glucose mass in stomach	Maas et al. 2015
$\frac{d[M_{G-gut}]}{dt} = G_{meal} - k_{2[M_{G-gut}]}$	Rate of transition of glucose from stomach through gut to plasma.	Rozendaal et al. 2018
$G_{gut} = k_2 \left(\frac{f_G}{V_G \cdot BW}\right)[M_{G-gut}]$	Glucose appearance in plasma from the meal via the gut.	Rozendaal et al. 2018
$G_{liver} = EGP_b - k_{4[I_{d1}]} - k_3([G_{PL}] - G_b)$	Net hepatic glucose flux – EGP inhibited by insulin and glucose	Rozendaal et al. 2018
$G_{uii} = EGP_b \left(\frac{K_m + G_b}{G_b}\right) \cdot \left(\frac{[G_{PL}]}{K_m + [G_{PL}]}\right)$	Insulin independent glucose uptake into tissues (maintain steady state)	Rozendaal et al. 2018
$G_{uid} = k_5[I_{d1}] \left(\frac{[G_{PL}]}{K_M + [G_{PL}]}\right)$	Insulin dependent glucose uptake into tissues (delayed insulin signal)	Rozendaal et al. 2018
$G_{ren} = \left(\frac{c_1}{V_G \cdot BW}\right)([G_{PL}] - G_{ren})([G_{PL}] > G_{ren})$	Renal excretion of excess glucose (iff $G_{PL} >$ sepecified threshold)	Rozendaal et al. 2018
$\frac{d[G_{PL}]}{dt} = G_{gut} + G_{liver} - G_{uii} - G_{uid} - G_{ren}$	Rate of change of plasma glucose.	Rozendaal et al. 2018
Insulin		
$I_{pro} = k_6([\boldsymbol{G_{PL}}] - G_b) + \frac{k_7}{\tau_i}(G_{int} + G_b) + \frac{k_8}{\tau_d}\left(\frac{d[\boldsymbol{G_{PL}}]}{dt}\right)$	Insulin production in pancreas (PID controller)	Rozendaal et al. 2018
$I_{liver} = k_7 \left(\frac{G_b}{\tau_i \cdot I + b}\right)[\boldsymbol{I_{PL}}]$	Insulin degradation in liver (maintain steady state)	Rozendaal et al. 2018
$I_{rem} = k_9([\boldsymbol{I_{PL}}] - I_b)$	Insulin transport to interstitial space	Rozendaal et al. 2018
$\frac{d[\boldsymbol{I_{PL}}]}{dt} = I_{pro} - I_{liver} - I_{rem}$	Rate pf change of plasma insulin	Rozendaal et al. 2018
$\frac{d[I_{d1}]}{dt} = k_9([I_{Pl}]I_b) - k_{10} \cdot [I_{d1}]$	Insulin delay 1 (glucose)	Rozendaal et al. 2018

EDES Model parameters

	Parameter	Function	value	
Eindhoven Diabetes Education Simulator	k_1	Stomach emptying glucose (stomach-> gut).	estimated	[51]
	k_2	Glucose appearance from gut (gut->plasma).	0.28	[51]
	k_3	Suppression of hepatic glucose release by change in plasma glucose.	6.07×10^{-3}	[51]
	k_4	Suppression of hepatic glucose release by remote insulin.	2.34×10^{-4}	[51]
	k_5	Coefficient for rate of insulin dependent glucose uptake to tissues.	estimated	[51]
	k_6	Coefficient for rate of insulin production (proportional term)	estimated	[51]
	k_7	Coefficient for rate of insulin production (integral term)	1.15	[51]
	k_8	Coefficient for rate of insulin production (derivative term)	7.27	[51]
	k_9	Coefficient for rate of outflow of plasma insulin to remote compartment.	3.83×10^{-2}	[51]
	k_{10}	Coefficient for rate of degradation of insulin in remote compartment.	2.84×10^{-1}	[51]
	σ	Shape factor glucose meal	1.4	[51]
	K_m	Michealis-Menten coefficient for glucose uptake into tissues.	13.2	[53]
	G_b	Basal glucose level. (glucose set point of model)	Fasting glucose value	[51]
	I_b	Basal insulin level (insulin set point of model)	Fasting insulin value	[51]
	EGP_b	Basal rate of Endogenous glucose production	0.043	[51]

A complete list of EDES Model parameters, indicating the biological function attributed to them in the model construction, the value to which they are fixed, and their source.