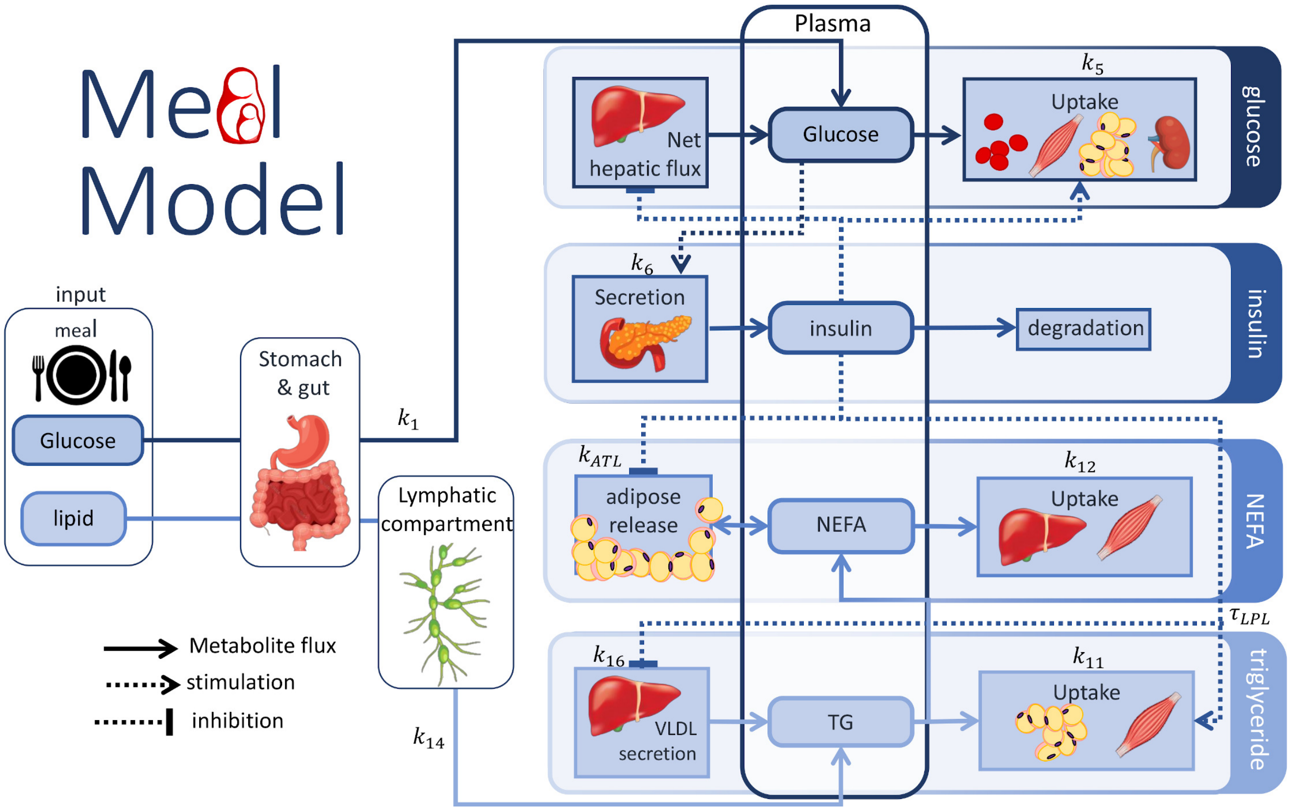

Supplemental Table S2 : Complete set of parameters for Mixed Meal Model.

Parameter	Function	Value
k_1	Stomach emptying glucose (stomach $\rightarrow$ gut)	0.015
k_2	Glucose appearance from gut (gut $\rightarrow$ plasma)	0.28
k_3	Supression of hepatic glucose release by change in plasma glucose.	6.07x10^{-3}
k_4	Supression of hepatic glucose release by remote insulin	2.34x10^{-4}
k_5	Coefficient for rate of insulin dependent glucose uptake to tissues.	0.102
k_6	Coefficient for rate of insulin production (proportion to glucose)	2.85
k_7	Coefficient for rate of insulin production (integral term)	1.15
k_8	Coefficient for rate of insulin production (derivative term)	7.27
k_9	Coefficient for rate of outflow of plasma insulin to remote compartment.	3.83x10^{-2}
k_{10}	Coefficient for rate of degradation of insulin in remote compartment.	2.84x10^{-1}
σ	Shape factor meal	1.4
K_m	Michaelis-Menten coefficient for glucose uptake into tissues.	13.2
G_b	Basal glucose level (glucose set-point of model)	fasting glucose value
I_b	Basal insulin level (insulin set-point of model)	fasting insulin value
EGP_b	Basal rate of endogenous glucose production	0.43
f_{spill}	Fractional spill-over of LPL derived NEFA	30
k_{11}	Coefficient of rate of LPL lipolysis of circulating triglyceride.	0.0008
ATL_{max}	Coefficient for maximum rate of lipolysis of triglyceride stored in adipose tissue.	0.215
K_{ATL}	Michaelis-Menten coefficient for rate of lipolysis of adipose triglyceride	0.126
k_{12}	Coefficient for rate of NEFA uptake into tisues	0.0598
τ_{LPL}	Time delay coefficient for insulin effect on lipid reactions.	320
k_{13}	Stomach emptying triglyceride (stomach $\rightarrow$ gut)	8.8x10^{-3}
k_{14}	Rate constant for triglyceride appearance in plasma (gut $\rightarrow$ lymphatic compartment $\rightarrow$ plasma)	0.017
k_{15}	Coefficient for inhibition of triglyceride secretion from liver by delayed insulin.	1.0x10^{-5}
k_{16}	Basal rate of triglyceride secretion from liver (VLDL)	0.015

Supplemenary Section S1: Complete set of equations for Mixed Meal Model Introduced in STAR Methods

Equation	Role
Glucose	
$G_{meal} = \sigma k_1^{\sigma} t^{\sigma-1} e^{-k_1 t^{\sigma}} \cdot D_G$	Glucose mass in stomach
$\frac{d[\boldsymbol{M_{G-gut}}]}{dt} = G_{meal} - k_2[\boldsymbol{M_{G-gut}}]$	Rate of transition of glucose from stomach through gut to plasma.
$G_{gut} = k_2(\frac{f_G}{V_G \cdot BW})[\boldsymbol{M_{G-gut}}]$	Glucose appearance in plasma from the meal via the gut.
$G_{liver} = EGP_b - k_4[\boldsymbol{I_{d1}}] - k_3([\boldsymbol{G_{PL}}] - G_b)$	Net hepatic glucose flux - EGP inhibited by insulin and glucose
$G_{uii} = EGP_b(\frac{K_m + G_b}{G_b}) \cdot (\frac{[\boldsymbol{G_{PL}}]}{K_m + [\boldsymbol{G_{PL}}]})$	Insulin independent glucose uptake into tissues (maintain steady state)
$G_{uid} = k_5[\boldsymbol{I_{d1}}](\frac{[\boldsymbol{G_{PL}}]}{K_M + [\boldsymbol{G_{PL}}]})$	Insulin dependent glucose uptake into tissues (delayed insulin signal)
$G_{ren} = (\frac{c_1}{V_G \cdot BW})([\boldsymbol{G_{PL}}] - G_{ren})([\boldsymbol{G_{PL}}] > G_{ren})$	Renal excretion of excess glucose (iff G_{PL} > sepecified threshold)
$\frac{d[\boldsymbol{G_{PL}}]}{dt} = G_{gut} + G_{liver} - G_{uii} - G_{uid} - G_{ren}$	Rate of change of plasma glucose
Insulin	
$I_{pro} = k_6([\boldsymbol{G_{PL}}] - G_b) + \frac{k_7}{\tau_i}(G_{int} + G_b) + \frac{k_8}{\tau_d}(\frac{d[\boldsymbol{G_{PL}}]}{dt})$	Insulin production in pancreas (PID controller)
$I_{liver} = k_7(\frac{G_b}{\tau_i \cdot I + b})[\boldsymbol{I_{PL}}]$	Insulin degradation in liver (maintain steady state)
$I_{rem} = k_9([\boldsymbol{I_{PL}}] - I_b)$	Insulin transport to insterstitial space
$\frac{d[\boldsymbol{I_{PL}}]}{dt} = I_{pro} - I_{liver} - I_{rem}$	Rate pf change of plasma insulin
$\frac{d[\boldsymbol{I_{d1}}]}{dt} = k_9([\boldsymbol{I_{Pl}}]I_b) - k_{10} \cdot [\boldsymbol{I_{d1}}]$	Insulin delay 1 (glucose)
$\frac{d[\boldsymbol{I_{d2}}]}{dt} = \frac{3}{\tau_{LPL}}([\boldsymbol{I_{PL}}] - [\boldsymbol{I_{d2}}])$	Insulin delay 2 (triglyceride liver)
$\frac{d[\boldsymbol{I_{d3}}]}{dt} = \frac{3}{\tau_{LPL}}([\boldsymbol{I_{d2}}] - [\boldsymbol{I_{d3}}])$	Insulin delay 3
$\frac{d[\boldsymbol{I_{d4}}]}{dt} = \frac{3}{\tau_{LPL}}([\boldsymbol{I_{d3}}] - [\boldsymbol{I_{d4}}])$	Insulin delay 4 (LPL lipolysis)

Equation	Role
Triglyceride	
$TG_{meal} == \sigma k_{13}^{\sigma} t^{\sigma-1} e^{-k_{13}t^{\sigma}} \cdot D_{TG}$	Triglyceride mass in stomach
$\frac{d[\boldsymbol{M_{TG-gut1}}]}{dt} = TG_{meal} - k_{14} \cdot [\boldsymbol{M_{TG-gut1}}]$ $\frac{d[\boldsymbol{M_{TG-gut2}}]}{dt} = k_{14}([\boldsymbol{M_{TG-gut2}}] - [\boldsymbol{M_{TG-gut1}}])$ $\frac{d[\boldsymbol{M_{TG-gut3}}]}{dt} = k_{14}([\boldsymbol{M_{TG-gut3}}] - [\boldsymbol{M_{TG-gut2}}])$	delayed transition of triglyceride mass from stomach to plasma via lymphatic system. (gut → lymphatic system → plasma)
$TG_{gut} = k_{15}(\frac{f_{TG}}{V_{TG} \cdot BW} \cdot [\boldsymbol{M_{TG-gut3}}]$	Triglyceride appearance in plasma from the meal via the lymphatic system.
$TG_{LPL} = k_{11} \cdot [\boldsymbol{TG_{PL}}] \cdot [\boldsymbol{I_{d4}}]$	Hydrolysis of circulating triglcyeride by LPL (Insulin stimulated)
$TG_{VLDL} = k_{16} - k_{15}([\boldsymbol{I_{d4}}] - I_b)$	Secretion of triglyceride from the liver occurs at a basal rate and inhibited by insulin.
$\frac{d[\boldsymbol{TG_{PL}}]}{dt} = TG_{VLDL} + TG_{gut} - TG_{LPL}$	Rate of change of plasma triglyceride concentration.
NEFA	
$\frac{d[\boldsymbol{NEFA_{PL}}]}{dt} = 3spill \cdot [\boldsymbol{TG_{PL}}] + \frac{ATL_{max}}{1+K_{ATL} \cdot [\boldsymbol{I_{d2}}]^2} - k_{12}[\boldsymbol{NEFA_{PL}}]$	Rate of change of plasma NEFA concentration.