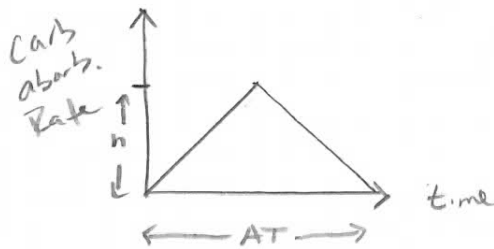


## Carb Absorption



Approximate absorption curve in Thick Like a Pancake

High GI : 90 min  
Medium GI : 180 min  
Low GI : 240 min

> Activity Times

AT = Activity Time  
D = Dose of Carbs (total)

CAR(t) = carb absorption rate  
COB(t) = Carbs on board

\* Assume AT NOT a function of Dose

$$D = \frac{1}{2} AT \cdot h$$

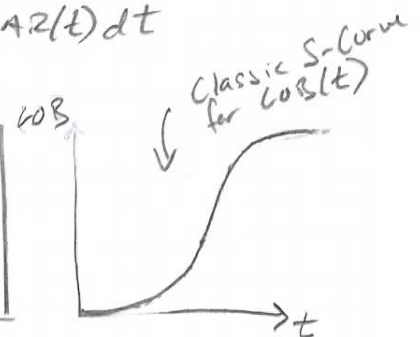
$$CAR(t) = \begin{cases} \frac{2ht}{AT} & \text{if } 0 < t < \frac{AT}{2} \\ 2h(1 - \frac{t}{AT}) & \text{if } \frac{AT}{2} < t < AT \end{cases}$$

$$CAR(t) = \begin{cases} \frac{4D}{AT^2} t & \text{if } 0 < t < \frac{AT}{2} \\ \frac{4D}{AT} (1 - \frac{t}{AT}) & \text{if } \frac{AT}{2} < t < AT \end{cases}$$

$$COB(t) = \int_0^t CAR(t) dt = \int_0^{AT/2} CAR(t) dt + \int_{AT/2}^t CAR(t) dt$$

skipping some algebra

$$COB(t) = \begin{cases} \frac{2D}{AT^2} t^2 & 0 < t < \frac{AT}{2} \\ -D + \frac{4D}{AT} (t - \frac{t^2}{2AT}) & \frac{AT}{2} < t < AT \end{cases}$$



$\Delta BGC$  = Change in Blood Glucose from Carbs

$$\Delta BGC = \frac{SF}{CR} \cdot COB(t)$$

\* Assume SF and CR are NOT functions of BG, COB, IOB, etc

## Bolus / Temp Basal

### Bolus

$\Delta BGI$  = Change in Blood Glucose from Insulin

$$\Delta BGI(t) = -SF \cdot B \cdot \left(1 - \frac{IOB(t)}{100}\right)$$

Assume SF not a function of t

SF = Sensitivity Factor

B = Bolus Amount

IOB(t) = Insulin on Board

IDUR = Insulin Duration

$$\begin{cases} 100 & \text{at } t=0 \\ 0 & \text{at } t=IDUR \end{cases}$$

### Temp Basal

$\Delta BGITB$  = Change in Blood Glucose from Temp Basal

$$\Delta BGITB(t) = - \int_{t_1}^{t_2} \frac{db}{dt^*}(t^*) \cdot SF(t^*) \left(1 - \frac{IOB(t-t^*)}{100}\right) dt^*$$

$\frac{db}{dt}$  = basal flux,  $t_1 \rightarrow t_2$  = time of temp basal

Assume  $\frac{db}{dt}$ , SF are constant during  $t_1 \rightarrow t_2$

$$= -\frac{db}{dt} \cdot SF \int_{t_1}^{t_2} \left(1 - \frac{IOB(t-t^*)}{100}\right) dt^*$$

$$\Delta BGITB(t) = -\frac{db}{dt} \cdot SF \left[ (t_2 - t_1) - \frac{1}{100} \int_{t_1}^{t_2} IOB(t-t^*) dt^* \right]$$

Since IOB function may change in future to

something else, just integrate numerically.

Can solve closed form with 4<sup>th</sup> Order Polynomial

fit currently being used if more speed is required