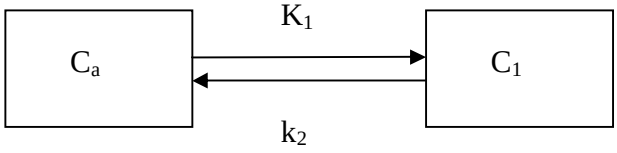
Turku PET Centre Modelling report TPCMOD0039 2009-04-08
Updated 2010-10-06
Chunlei Han, Vesa Oikonen

Model equations for myocardial perfusion studies with [1-^{11}C]Acetate PET

Symbol	Description	Unit
C_1	Tracer concentration in myocardial region	kBq ml^{-1}
C_a	Tracer concentration in blood without metabolite	kBq ml^{-1}
C_m	Tracer concentration in blood including metabolite	kBq ml^{-1}
K_1	Tracer exchange rate	ml ml^{-1}min^{-1}
k_2	Tracer exchange rate	min^{-1}
V_a	Arterial blood volume; volume of arterial vascular space (including the spill-over from the chamber) in ROI	ml ml^{-1}
f	Regional MBF	ml min^{-1} ml^{-1}
E	Extraction fraction	

1-tissue compartment model (1,2,3) is employed as:



$$\frac{dC_1}{dt} = K_1 C_a - k_2 C_1$$
$$C_{TET} = V_a C_m + (1 - V_a) C_1$$

E, *f* and K_1 are related as

$$E = 1 - 0.64 e^{-1.2(\frac{t}{t_{1/2}})/f}$$
$$K_1 = E \times f$$

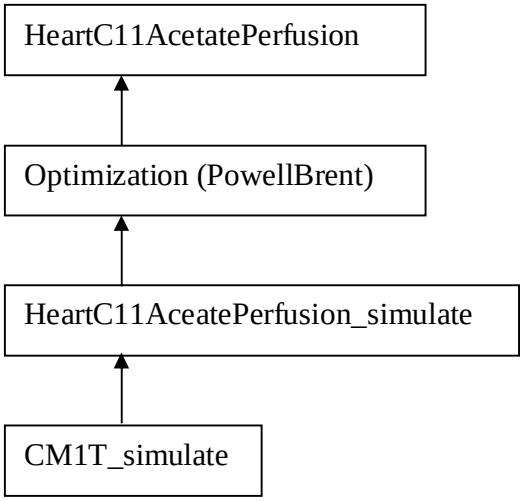
Input function metabolite correction is performed by equation

$$C_a(t) = 0.91e^{-\ln 2\left(\frac{t}{t_{1/2}}\right)}C_m(t)$$

, where $t_{1/2}$ = 5.3 min.

This model is implemented into TPClib.model and also in Carimas2. The program name is ***HeartC11AcetatePerfusion.***

The ***HeartC11AcetatePerfusion*** working flow is



Reference:

1. van den Hoff et al: [1-^{11}C]Acetate as a quantitative perfusion tracer in myocardial PET. J Nucl Me 2001; 42:1174-1182.

2. Timmer et al: Potential of [^{11}C] acetate for measuring myocardial blood flow: studies in normal subjects and patients with hypertrophic cardiomyopathy. J Nucl Cardio 2010; 17:264-75.

3. Sörensen et al: Simultaneous quantification of myocardial perfusion, oxidative metabolism, cardiac efficiency and pump function at rest and during supine bicycle exercise using 1-^{11}C-acetate PET – a pilot study Clin Physiol Funct Imaging (2010) 30, pp279–284.