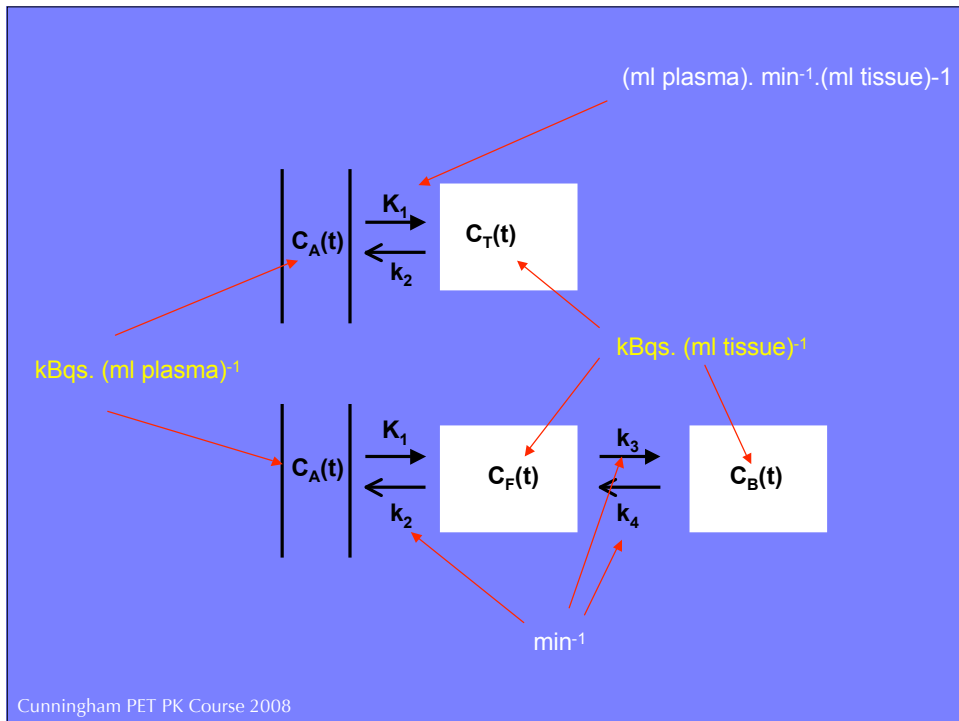
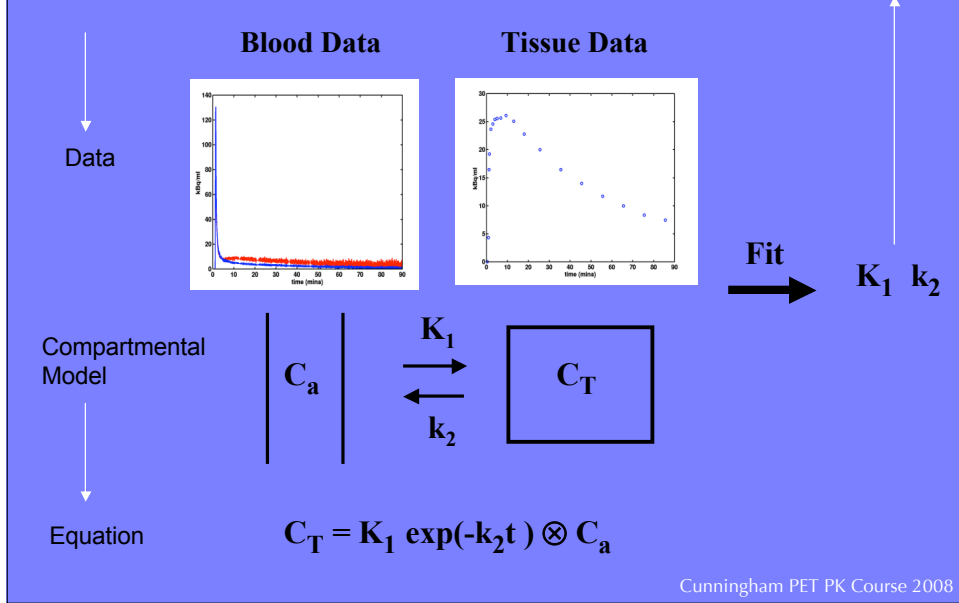
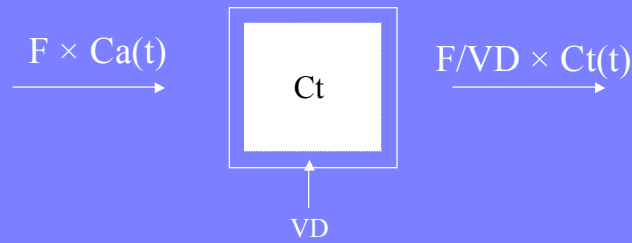
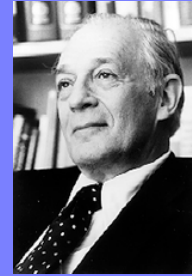


The purpose of PET kinetic modelling is to interpret the kinetic behaviour of the PET tracer quantitatively in terms of the underlying Physiology, Biochemistry and Pharmacology



The Kety Blood Flow Model



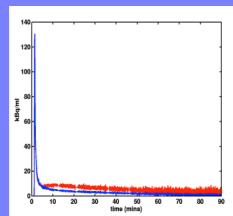
$$C_t(t) = C_a(t) \otimes K_1 \cdot \exp(-k_2 \cdot t)$$

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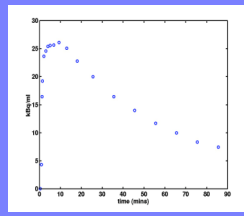
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Data

Blood Data

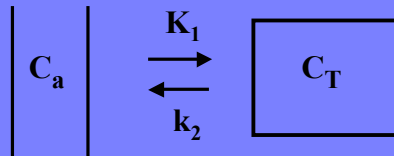


Tissue Data



Fit K_1 k_2

Compartmental Model



Equation

$$C_T = K_1 \exp(-k_2 t) \otimes C_a$$

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Convolution Integral

$$C_{tissue}(T) = \int_0^T C_{input}(t) \cdot IRF(T-t) \cdot dt$$

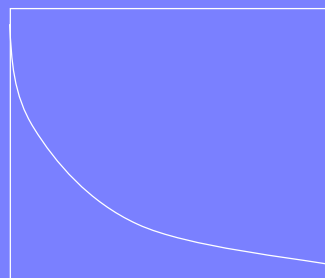
$$C_{input} \otimes IRF$$

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Impulse Response Function

Reversible Tracer

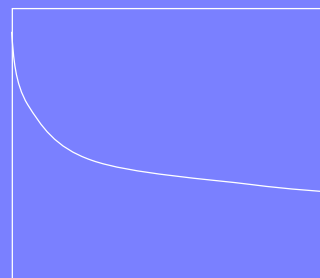
e.g. [¹¹C]Diprenorphine,
[¹¹C]Raclopride



time

Irreversibly Trapped Tracer

e.g. [¹⁸F]FDG, [¹⁸F]FDOPA



time

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Impulse Response Function for Compartmental Models

$$IRF(t) = \sum_{i=1}^{i=n} \alpha_i \exp(-\beta_i)t$$

n = number of compartments

α and β are functions of the rate constants, K_1, k_2, k_3, \dots

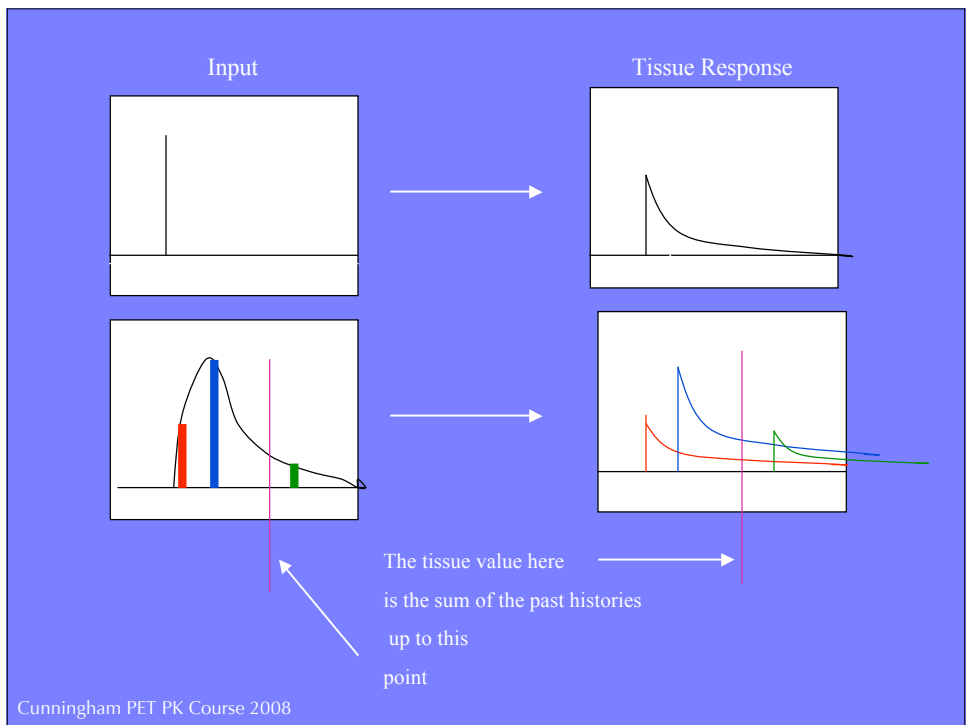
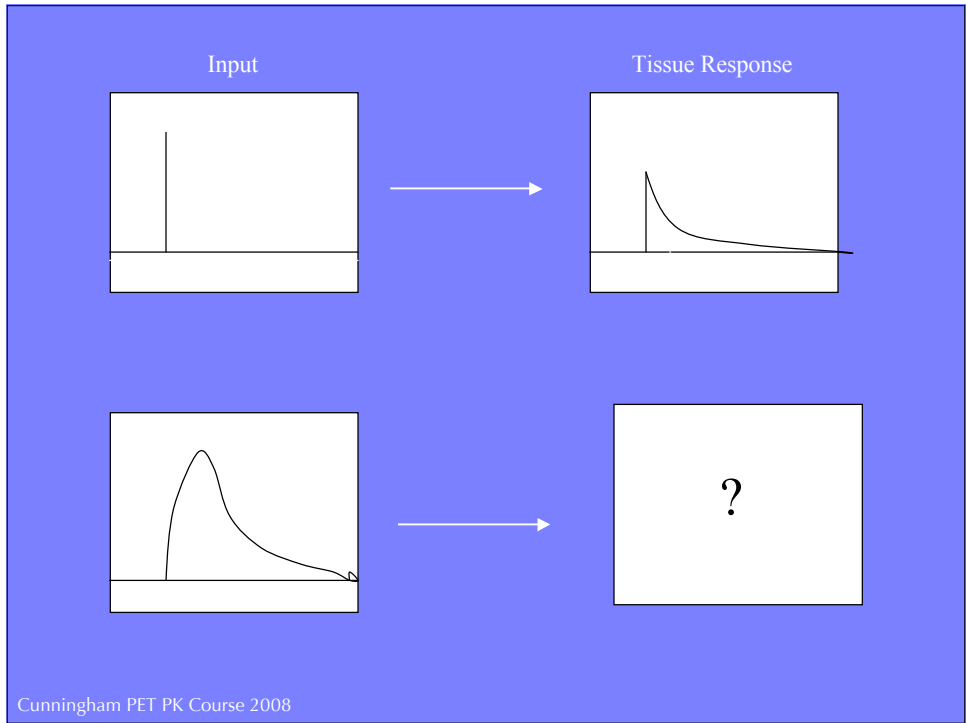
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Convolution Integral

$$C_{tissue}(T) = \int_0^T C_{input}(t) \cdot IRF(T-t) \cdot dt$$

$$C_{input} \otimes IRF$$

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Convolution Integral

$$C_{tissue}(T) = \int_0^T C_{input}(t) \cdot IRF(T-t) \cdot dt$$

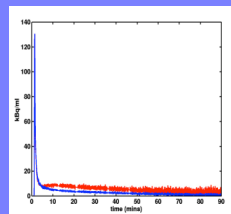
$$C_{input} \otimes IRF$$

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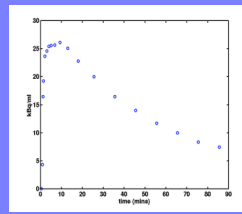
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Data

Blood Data



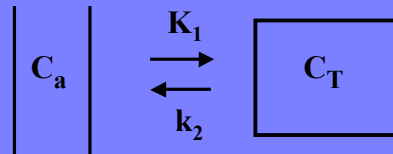
Tissue Data



Fit

K_1 k_2

Compartmental Model



Equation

$$C_T = K_1 \exp(-k_2 t) \otimes C_a$$

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