

Three Models for Extraction

- naive engineer = K is defined by portal vein conc
- parallel tube = K_m is defined by geometric mean of intra-hepatic concs
- well stirred = K_m is defined by hepatic vein conc

Naive Engineer

- $CL_I = V_{max} / (K_m + C_{pv})$

Parallel Tube

- $C^* = (C_{pv} + C_{hv}) / \ln(C_{pv} / C_{hv})$
- $c_{hv} = C_{pv} * CL_I / (Q + CL_I)$
- $CL_I = V_{max} / (K_m + C^*)$

Well Stirred

- $C_{hv} = C_{pv} * CL_I / (Q + CL_I)$
- $CL_I = V_{max} / (K_m + C_{hv})$
- $CL_I^2 * K_m + CL_I * (Q * (K_m + C_{pv}(t)) - V_{max}) - V_{max} * Q = 0$

Rate Dependent Extraction

- $C_{pv}(t) = C_p(t) + \text{Rate}(t)/Q$
- solve for CL_I
- e.g. Well Stirred Model
- $ER(t) = CL_I(t) / (Q + CL)$