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Kinetic Modeling

A precise function was used to estimate the level of pyruvate over time. The function is of form:

$$f(t) = \begin{cases} 0 & t < t_s \\ \frac{r_p}{k_p}\left(1 - e^{-k_p(t-t_s)}\right) & t_s \le t < t_e \\ f(t_e)e^{-k_p(t-t_e)} & t \ge t_e \end{cases}$$

where r_p, k_p, t_s, and t_e are estimated by minimizing the error sum of squares.

After estimation of these parameters, we estimate the alanine-to-pyruvate and lactate-to-pyruvate ratios over time. The fitted functions are of the form:

$$g(t) = \begin{cases} 0 & t < t_s \\ \frac{k_{px} r_p}{k_p - k_x}\left(\frac{1 - e^{-k_x(t-t_s)}}{k_x} - \frac{1 - e^{-k_p(t-t_s)}}{k_p}\right) & t_s \le t < t_e \\ \frac{f(t_e)k_{px}}{k_p - k_x}\left(e^{-k_x(t-t_e)} - e^{-k_p(t-t_e)}\right) + g(t_e)e^{-k_x(t-t_e)} & t \ge t_e \end{cases}$$

where x represent alanine and lactate, and k_{px}, k_x are estimated by minimizing the error sum of squares. The fitted plots are shown in the article Figure 3 C and the parameters are listed in Table 1