各コンパートメントの連立微分方程式

- *ET*

$$ET_1: \quad \frac{dq_{14}}{dt} = \dot{I}_{14} - \left(m_{14,16} + \lambda_p\right)q_{14}$$

$$ET_2: \quad \frac{dq_{11}}{dt} = \dot{I}_{11} - \left(m_{11,15} + m_{11,17} + m_{11,11b} + m_{11,11T} + \lambda_p\right)q_{11} + m_{8,11}q_8 + m_{7,11}q_7$$

$$ET_{2T}: \quad \frac{dq_{11T}}{dt} = -\left(m_{11T,15} + m_{11T,17} + m_{11T,11b} + \lambda_p\right)q_{11T} + m_{8T,11T}q_{8T} + m_{7T,11T}q_{7T} + m_{11,11T}q_{11}$$

$$ET_{seq}: \quad \frac{dq_{12}}{dt} = \dot{I}_{12} - \left(m_{12,13} + m_{12,17} + m_{12,11b} + m_{12,12T} + \lambda_p\right)q_{12}$$

$$ET_{seqT}: \quad \frac{dq_{12T}}{dt} = -\left(m_{12T,13T} + m_{12T,11b} + m_{12T,17} + \lambda_p\right)q_{12T} + m_{12,12T}q_{12}$$

$$ET_b: \quad \frac{dq_{11b}}{dt} = -\left(m_{11b,17} + \lambda_p\right)q_{11b} + m_{12,11b}q_{12} + m_{11,11b}q_{11} + m_{12T,11b}q_{12T} + m_{11T,11b}q_{11T}$$

- *BB*

$$BB_1: \quad \frac{dq_7}{dt} = \dot{I}_7 - \left(m_{7,11} + m_{7,17} + m_{7,7T} + m_{7,7b} + \lambda_p\right)q_7 + m_{4,7}q_4 + m_{5,7}q_5$$

$$BB_{1T}: \quad \frac{dq_{7T}}{dt} = -\left(m_{7T,11T} + m_{7T,17} + m_{7T,7b} + \lambda_p\right)q_{7T} + m_{4T,7T}q_{4T} + m_{5T,7T}q_{5T} + m_{7,7T}q_7$$

$$BB_2: \quad \frac{dq_8}{dt} = \dot{I}_8 - \left(m_{8,11} + m_{8,17} + m_{8,8T} + m_{8,7b} + \lambda_p\right)q_8$$

$$BB_{2T}: \quad \frac{dq_{8T}}{dt} = -\left(m_{8T,11T} + m_{8T,17} + m_{8T,7b} + \lambda_p\right)q_{8T} + m_{8,8T}q_8$$

$$BB_{seq}: \quad \frac{dq_9}{dt} = \dot{I}_9 - \left(m_{9,10} + m_{9,17} + m_{9,9T} + m_{9,7b} + \lambda_p\right)q_9$$

$$BB_{seqT}: \quad \frac{dq_{9T}}{dt} = -\left(m_{9T,10T} + m_{9T,17} + m_{9T,7b} + \lambda_p\right)q_{9T} + m_{9,9T}q_9$$

$$BB_b: \quad \frac{dq_{7b}}{dt} = -\left(m_{7b,17} + \lambda_p\right)q_{7b} + m_{7,7b}q_7 + m_{7T,7b}q_{7T} + m_{8,7b}q_8 + m_{8T,7b}q_{8T} + m_{9,7b}q_9 + m_{9T,7b}q_{9T}$$

- *bb*

$$bb_1: \quad \frac{dq_4}{dt} = \dot{I}_4 - \left(m_{4,7} + m_{4,17} + m_{4,4T} + m_{4,4b} + \lambda_p\right)q_4 + m_{1,4}q_1 + m_{2,4}q_2 + m_{3,4}q_3$$

$$bb_{1T}: \quad \frac{dq_{4T}}{dt} = -\left(m_{4T,7T} + m_{4T,17} + m_{4T,4b} + \lambda_p\right)q_{4T} + m_{4,4T}q_4 + m_{1T,4T}q_{1T} + m_{2T,4T}q_{2T} + m_{3T,4T}q_{3T}$$

$$bb_2: \quad \frac{dq_5}{dt} = \dot{I}_5 - \left(m_{5,7} + m_{5,17} + m_{5,5T} + m_{5,4b} + \lambda_p\right)q_5$$

$$bb_{2T}: \quad \frac{dq_{5T}}{dt} = -\left(m_{5T,7T} + m_{5T,17} + m_{5T,4b} + \lambda_p\right)q_{5T} + m_{5,5T}q_5$$

$$bb_{seq}: \quad \frac{dq_6}{dt} = \dot{I}_6 - \left(m_{6,10} + m_{6,17} + m_{6,6T} + m_{6,4b} + \lambda_p\right)q_6$$

$$bb_{seqT}: \quad \frac{dq_{6T}}{dt} = -\left(m_{6T,10T} + m_{6T,17} + m_{6T,4b} + \lambda_p\right)q_{6T} + m_{6,6T}q_6$$

$$bb_b: \quad \frac{dq_{4b}}{dt} = -\left(m_{4b,17} + \lambda_p\right)q_{4b} + m_{4,4b}q_4 + m_{4T,4b}q_{4T} + m_{5,4b}q_5 + m_{5T,4b}q_{5T} + m_{6,4b}q_6 + m_{6T,4b}q_{6T}$$

- *AI*

$$AI_1: \quad \frac{dq_1}{dt} = \dot{I}_1 - \left(m_{1,4} + m_{1,17} + m_{1,1T} + m_{1,1b} + \lambda_p\right)q_1$$

$$AI_{1T}: \quad \frac{dq_{1T}}{dt} = -\left(m_{1T,4T} + m_{1T,17} + m_{1T,1b} + \lambda_p\right)q_{1T} + m_{1,1T}q_1$$

$$AI_2: \quad \frac{dq_2}{dt} = \dot{I}_2 - \left(m_{2,4} + m_{2,17} + m_{2,2T} + m_{2,1b} + \lambda_p\right)q_2$$

$$AI_{2T}: \quad \frac{dq_{2T}}{dt} = -\left(m_{2T,4T} + m_{2T,17} + m_{2T,1b} + \lambda_p\right)q_{2T} + m_{2,2T}q_2$$

$$AI_3: \quad \frac{dq_3}{dt} = \dot{I}_3 - \left(m_{3,4} + m_{3,17} + m_{3,3T} + m_{3,1b} + \lambda_p\right)q_3$$

$$AI_{3T}: \quad \frac{dq_{3T}}{dt} = -\left(m_{3T,4T} + m_{3T,17} + m_{3T,1b} + \lambda_p\right)q_{3T} + m_{3,3T}q_3$$

- LN_{ET}

$$LN_{ET}: \quad \frac{dq_{13}}{dt} = -\left(m_{13,17} + m_{13,13b} + m_{13,13T} + \lambda_p\right)q_{13} + m_{12,13}q_{12}$$

$$LN_{ETT}: \quad \frac{dq_{13T}}{dt} = -\left(m_{13T,17} + m_{13T,13b} + \lambda_p\right)q_{13T} + m_{12T,13T}q_{12T} + m_{13,13T}q_{13}$$

$$LN_{ETb}: \quad \frac{dq_{13b}}{dt} = -\left(m_{13b,17} + \lambda_p\right)q_{13b} + m_{13,13b}q_{13} + m_{13T,13b}q_{13T}$$

- LN_{TH}

$$LN_{TH}: \quad \frac{dq_{10}}{dt} = -\left(m_{10,17} + m_{10,10T} + m_{10,10b} + \lambda_p\right)q_{10} + m_{6,10}q_6 + m_{9,10}q_9 + m_{3,10}q_3$$

$$LN_{THT}: \quad \frac{dq_{10T}}{dt} = -\left(m_{10T,17} + m_{10T,10b} + \lambda_p\right)q_{10T} + m_{10,10T}q_{10} + m_{3T,10T}q_{3T}$$

$$LN_{THb}: \quad \frac{dq_{10b}}{dt} = -\left(m_{10b,17} + \lambda_p\right)q_{10b} + m_{10,10b}q_{10} + m_{10T,10b}q_{10T}$$

- *Blood*: $\quad \frac{dq_{17}}{dt} = -\left(m_{17,16} + \lambda_p\right)q_{17} + \sum_i m_{i,17}q_i + \sum_{iT} m_{iT,17}q_{iT}$

- *GI tract*: $\quad \frac{dq_{15}}{dt} = -\left(m_{15,16} + \lambda_p\right)q_{15} + m_{11,15}q_{11} + m_{11T,15}q_{11T}$

$$m_{iT,jT} = m_{i,j}, \quad m_{i,iT} = s_{pt}, \quad m_{i,17} = (1 - f_b)s_p, \quad m_{iT,17} = (1 - f_b)s_t$$
$$m_{i,jb} = f_b s_p, \quad m_{iT,jb} = f_b s_t, \quad m_{ib,17} = s_b$$