Wall permeability of isolated small arteries. Role of the endothelial surface layer
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The Netherlands. You will be contacted as soon as possible.
Figure B.1: Dependence of the time course of $X_{\text{tot}}$ on the different model parameters of the lumped model. From left to right the columns of panels show the influence of ESL thickness $d_{\text{ESL}}$, of wall thickness $d_w$ of the mobility coefficient $M$ and of the solute velocity $v_s$ on $X_{\text{tot}}(t)$. From top to bottom the panel rows show $X_{\text{tot}}$ in case of diffusive solute transport, in case of convective transport, and in case of combined diffusive and convective transport. For diffusive transport $X_{\text{tot}}$ is plotted against $V_s$ to emphasize its square-root-like course. Chosen parameter values are indicated in the panels as well.
Figure B.2: We empirically formulated equations for $X_{o_0}(t)$ that approximate its kinetics:

- Diffusion:
  \[ X_{o_0}^d = X_{o_0}^{d_0} - A^d \cdot t \quad \text{for } t < t_0 \]
  \[ X_{o_0}^d = X_{o_0}^{d_0} \quad \text{for } t > t_0 \]
  where
  \[ A^d = \frac{X_{o_0}^{d_0} - X_{o_0}^d}{t} \quad \text{at } t = 0 \]
  \[ A^d = \text{slope [\mu m/min]} \]
  \[ X_{o_0}^{d_0} = \text{Limit value for } X_{o_0}^d \text{ when } t \to \infty, \text{resulting from the fact that the arterial wall is restricted} \]

- Convection:
  \[ X_{o_0}^c = X_{o_0}^{c_0} - B^c \cdot t \quad \text{for } t < t_0 \]
  \[ X_{o_0}^c = X_{o_0}^{c_0} \quad \text{for } t > t_0 \]
  where
  \[ B^c = \frac{X_{o_0}^{c_0} - X_{o_0}^c}{t} \quad \text{at } t = 0 \]
  \[ B^c = \text{slope [\mu m/min]} \]
  \[ X_{o_0}^{c_0} = \text{Limit value for } X_{o_0}^c \text{ when } t \to \infty \]

- Linear superposition of diffusion and convection results in:
  \[ X_{o_0}^* = X_{o_0}^{d_0} + X_{o_0}^{c_0} \cdot t \quad \text{for } t < t_0 \]
  \[ X_{o_0}^* = X_{o_0}^{d_0} \quad \text{for } t > t_0 \]
  where
  \[ A^* = \frac{X_{o_0}^{d_0} - X_{o_0}^d}{t} \quad \text{for } t < t_0 \]
  \[ A^* = \frac{X_{o_0}^{c_0} - X_{o_0}^c}{t} \quad \text{for } t > t_0 \]
  \[ B^* = \text{slope [\mu m/min]} \]
  \[ X_{o_0}^{d_0} = \text{Limit value for } X_{o_0}^d \text{ when } t \to \infty \]
  \[ X_{o_0}^{c_0} = \text{Limit value for } X_{o_0}^c \text{ when } t \to \infty \]

The results are summarized in the present figure. In all cases $X_{o_0}$ at $t = 0 \text{ min}$ is approximately equal to ESL thickness $d_{o_0}$.
Furthermore, the maximal decrease in $X_{o_0}$ denoted as $X_{o_0}^{d_0} - X_{o_0}^d$, is correlated to total wall thickness, denoted as $d_{o_0} + d$, except for some deviations that occur at high values for total wall thickness. For diffusive transport the slope $A' [\mu m/min]$ is clearly correlated to the mobility coefficient $M$, whereas for convective transport the slope $B' [\mu m/min]$ is clearly correlated to the solute velocity $v$. In case of combined diffusive and convective transport these latter two relations are not present anymore.
Figure B.3: Sensitivity analysis to the 5 parameters ($d_{ESL}^L$, $M_{ESL}^L$, $v_{ESL}^L$, fact$_{Mi}^L = M_{i}^L/M_{ESL}^L$ and fact$_{Mi}^L = v_{i}^L/v_{ESL}^L$) of the second model. The left column of panels shows the influence of variations in $d_{ESL}^L$ on $R^2$ of the fits, the second column shows the influence of $M_{ESL}^L$, the third column shows the influence of $v_{ESL}^L$, the fourth column shows the influence of the ration $M_{i}^L/M_{ESL}^L$, and the right column shows the influence of the ratio $v_{i}^L/v_{ESL}^L$. The top row panels show the results in case of diffusive transport, the middle row in case of convective transport, and the bottom row when both diffusion and convection is taken into account.
<table>
<thead>
<tr>
<th>parameter</th>
<th>FITC-ΔΔ</th>
<th>FITC-Δ50</th>
<th>FITC-Δ148</th>
</tr>
</thead>
<tbody>
<tr>
<td>diffusion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$d_{DES}$ [10$^{-6}$ m$^3$]</td>
<td>8.9 ± 1.1</td>
<td>8.4 ± 1.4</td>
<td>7.8 ± 0.6</td>
</tr>
<tr>
<td>$M_{DES}$ [10$^{-15}$ m$^3$ s$^{-1}$]</td>
<td>10.0 (1.8-57.4)</td>
<td>13.9 (6.3-30.9)</td>
<td>0.19 (0.07-0.54)</td>
</tr>
<tr>
<td>$M_{CC}/D_o$ [10$^{-17}$]</td>
<td>7.4 (1.3-42.5)</td>
<td>32.1 (14.4-71.1)</td>
<td>0.75 (0.27-2.1)</td>
</tr>
<tr>
<td>$M_w/M_{DES}$</td>
<td>1.0 ± 0.04</td>
<td>1.0 ± 0.04</td>
<td>1.0 ± 0.04</td>
</tr>
<tr>
<td>$M_w$ [10$^{-14}$ m$^3$ s$^{-1}$]</td>
<td>10.3 (1.7-62.8)</td>
<td>14.1 (6.2-31.8)</td>
<td>0.18 (0.06-0.51)</td>
</tr>
<tr>
<td>$M_w/D_o$ [10$^{-17}$]</td>
<td>7.6 (1.2-46.5)</td>
<td>32.4 (14.3-73.0)</td>
<td>0.71 (0.25-2.0)</td>
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<tr>
<td>$R^2/R^2_{RI}$</td>
<td>0.95 ± 0.02</td>
<td>0.96 ± 0.02</td>
<td>0.92 ± 0.05</td>
</tr>
<tr>
<td>convection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$d_{ESL}$ [10$^{-6}$ m$^3$]</td>
<td>6.0 ± 0.5</td>
<td>6.1 ± 0.9</td>
<td>7.9 ± 0.5</td>
</tr>
<tr>
<td>$\nu_{ESL}$ [10$^{-10}$ m$^3$ s$^{-1}$]</td>
<td>13.0 (6.8-25.1)</td>
<td>18.1 (14.9-72.1)</td>
<td>3.4 (2.0-5.8)</td>
</tr>
<tr>
<td>$\nu_{ESL}$</td>
<td>1.0 ± 0.04</td>
<td>1.0 ± 0.04</td>
<td>0.9 ± 0.03</td>
</tr>
<tr>
<td>$\nu_{w}$ [10$^{-10}$ m$^3$ s$^{-1}$]</td>
<td>13.5 (6.6-27.8)</td>
<td>17.3 (13.7-21.7)</td>
<td>3.1 (1.8-5.4)</td>
</tr>
<tr>
<td>$R^2/R^2_{RI}$</td>
<td>0.81 ± 0.05</td>
<td>0.75 ± 0.07</td>
<td>0.86 ± 0.09</td>
</tr>
</tbody>
</table>

1 mean ± SEM; geometric mean (95% confidence interval); * P<0.05, vs. FITC-Δ48; † P<0.05, vs. convection; ‡ P=0.07, vs. FITC-Δ148;