Supporting Information

Non-Invasive and Label-Free On-Chip Impedance Monitoring of Heatstroke

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Calculating values of TEER and C_I

As described in figure 3 in the context, the values of TEER and C_I can be calculated as following:

For no cells (Figure 3b) condition, the whole impedance can be seen as:

$$Z_0 = R_s - j\frac{1}{\omega C_{dl}} = Z_{0re} + jZ_{0im} \qquad \text{Eq (S1)}$$

Where ω represents angle frequency, and R_s represents the resistance of medium.

For monolayer HUVECs (Figure 3c) condition, the impedance is described as:

$$Z = R_s + \frac{1}{\frac{1}{TEER} + j\omega C_I}$$

$$= R_s + \frac{TEER}{1 + j\omega C_I \cdot TEER}$$

$$= R_s + \frac{TEER}{1 + \omega^2 {C_I}^2 \cdot TEER^2} - j\frac{\omega C_I \cdot TEER^2}{1 + \omega^2 {C_I}^2 \cdot TEER^2}$$

$$= Z_{re} + jZ_{im} \qquad \text{Eq (S2)}$$

Where the C_I is capacitance of cell-cell adhesion, and Z_{0re}, Z_{0im}, Z_{re} and Z_{im} are real and imagery of no cell and monolayer HUVECs respectively.

By combining eq(S1) and (S2), and supposing:

$$a = Z_{re} - Z_{0re} = \frac{TEER}{1+\omega^2 {C_I}^2 \cdot TEER^2} \qquad \text{Eq (S3)}$$

$$b = Z_{im} = \frac{\omega C_I \cdot TEER^2}{1+\omega^2 {C_I}^2 \cdot TEER^2} \qquad \text{Eq (S4)}$$

Combining eq (S3) and (S4), the values of TEER and C_I are calculated as:

$$TEER = \frac{a^2 + b^2}{a}$$

$$C_I = \frac{b}{\omega(a^2 + b^2)}$$