Impedance-based Monitoring of two cell monolayers co-cultured without physical contact (cis-TER)

T. Naber[1,2]; L. Rottbauer[1]; J. Wegener[1,2]

[1]Universität Regensburg, Regensburg (Germany),
[2]Fraunhofer Institut für Elektronische Mikrosysteme und Festkörper-Technologien EMFT, Regensburg (Germany)
tobias.naber@emft.fraunhofer.de

The delivery of active ingredients over epithelial and endothelial barriers is a key parameter of drug efficacy. In addition, the effect of the drug not only on the target but on the passed barriers is of great interest. So far, the detection of these crucial parameters has to be performed by using several different assay types. In the presented work we describe the development of an assay platform monitoring the morphology of two indirectly co-cultured monolayers, offering the possibility to determine afore mentioned parameters in a single experiment. The assay platform is based on impedance spectroscopic monitoring and combines two different approaches of impedance readings. A first cell layer, the *sensing layer*, is cultured on a set of thin-film gold electrodes. Monitoring of this cell layer is based on the ECIS approach [1]. Simultaneously, a second cell layer, the *barrier forming layer*, is cultured on a permeable culture insert mounted above the first cell layer. By applying a stainless-steel dipping electrode on the apical side and the combination of the thin film gold electrodes as basolateral electrode, the TER and the TEC of the cell layer cultured on the permeable substrate can be monitored [2]. At the current status of development, the device offers a throughput of 24 individual co-cultures. We developed two different basolateral electrode set-ups convenient for different assay scenarios. Furthermore, we demonstrated the functionality of the monitoring system with a proof-of-principle experiment. We believe that an assay platform based on the *CIS-TER* approach can strongly assist future drug development processes.

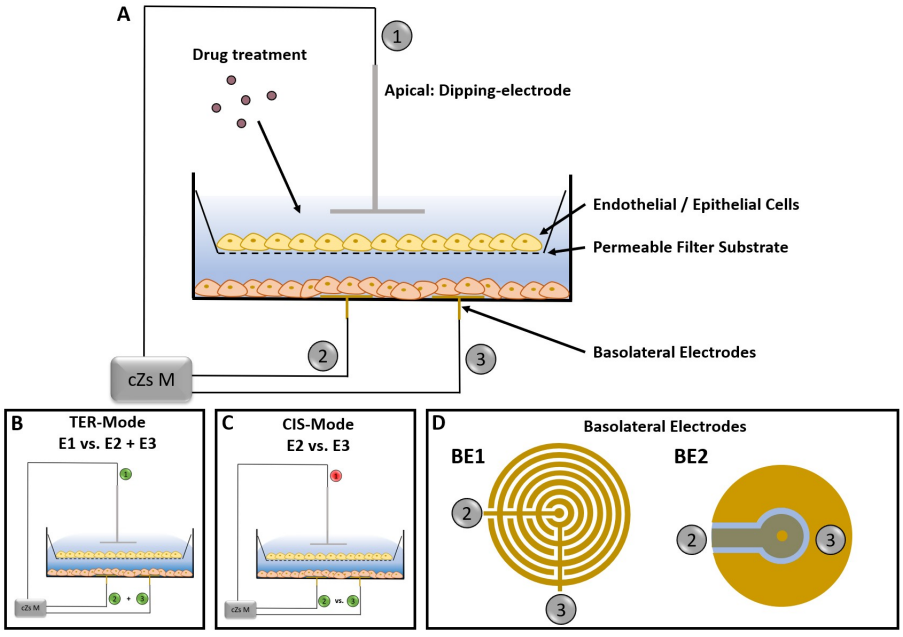

Figure 1 : (A) Schematic set-up of the CIS-TER assay. Possible measurement modes, determining the TER of the upper cell layer **(B)** and the impedance of the lower cell layer **(C)**. **(D)** Developed layouts for the basolateral set of electrodes.

References:

[1] J.A. Stolwijk and J. Wegener, *Bioanalytical Reviews*, vol 2. (2019) pp 1 - 75.
[2] J. Wegener, et al., *Biotechniques*, 37(4) (2004), pp 590 – 597.