The development and characterization of a novel cell-based biosensor for the functional screening of bioaerosols

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Exposure to bioaerosols has been associated with adverse effects on human health and airborne transmission of infections. The lack of technology to determine the exposure-response relationship has hampered the assessment of health risks and development of regulatory frameworks associated with bioaerosol emissions.

Cell-based biosensors have been recognized as potential leaders in the next generation of functional biosensing as they provide rapid and useful information on physiological responses to a variety of bioactive analytes. We have developed 2D and 3D co-culture systems which show promise as cell-based biosensors in a variety of settings.

Alveolar macrophages (AM) are the first line of defence against airborne environmental microbes.ecently, we have described a novel, continuously growing, non-transformed, model of lung AMs (MPI cells), a first in the field (Fejer et al, 2013). This robust system provides an excellent new model for AMs without restricted availability. To mimic the *in vivo* interactions of AMs and alveolar type II epithelial cells upon exposure to bioaerosols, MPI cells and a well-established alveolar epithelial cell line were used to develop a co-culture. For the detection and characterization of unique inflammatory/molecular signatures in response to LPS stimulation, cutting-edge technologies such as SILAC labelling, secretome analysis using mass spectrometry, Luminex multiplex platforms, RT-PCRs, Western Blotting were performed.

The results from these experiments strongly support the potential of this model to study bioaerosol/LPS associated health hazards. Moreover, advancement of such a model will allow the future development of high throughput and potentially 'in-field' use of cell-based biosensors.

References-

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