Fourier Transform Infrared (FTIR) spectroscopy analysis of human pancreatic progenitor cell lines

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Infrared spectroscopy of single eukaryotic cells is inherently problematic due to the fact that cells are very efficient scatters of IR radiation. Consequently the raw measured spectra contain both absorption and scattering information. The advent of the RMieS-EMSC correction algorithm, however, has enabled absorption spectra to be extracted from the measured spectra facilitating data analysis based on the biochemistry present in the cells[1,2]. Here we apply this correction algorithm in the study of human pancreatic progenitor cell lines.

Congenital Hyperinsulinism (CHI) is a potentially lethal, *β*-cell associated, disorder of the neonate characterized by severe hypoglycaemia. As many patients undergo a sub-total or near total pancreatectomy in the post-natal period order to alleviate hypoglycaemia, we have used post-operative resections of pancreas in order to generate pancreatic progenitor cell lines. In each of the cell lines – designated NES139, 140, 143 and 144, islet and pancreatic endocrine progenitor cell markers were identified. These included: *Pdx1*, *Sox9*, *Hlbx9*, *Nkx2.2*, *Nkx6.1*, *NeuroD1*, *Pax6*, and *FoxA2*. Cell lines continuously maintained over a 6 month period developed a mesenchyme to epithelial-like morphological transition. This involved a decrease in the protein expression of α-smooth muscle actin (α-sma) and vimentin and the upregulation of E-cadhein and occludin. The cell lines established in this work showed very similar behaviour and here we have used FTIR spectroscopy to compare the newly established cell lines to a mouse insulin-secreting cell line, MIN6, and NES2Y – a human side-population progenitor cell line.

Cell lines (NES139, 140, 143 and 144) were derived with consent from 4 patients with CHI, and were maintained under standard cell culture conditions. These cell lines as well as the MIN6 and NES2Y cell lines were analysed by FTIR and Principal Component Analysis (PCA) was carried out on spectra corrected for Resonant Mie Scattering (RMieS).

The Results showed that the MIN6 and NES2Y cell lines separated well from the pancreatic progenitor cell lines generated by the group. Furthermore, the individual cell lines could also be separated by PCA, but the separation between them was smaller than that between them and the MIN6 and NES2Y cell lines, supporting the observation that the newly established cell lines behave similarly and that they are different from MIN6 cells and the human pancreatic cell line NES2Y. We believe that FTIR spectroscopy may be of value in the detection of populations of progenitor cells from the pancreas.

References

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