

Investigation of Oral Carcinogenesis Biomarker by FT-IR Microspectroscopy

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Synchrotron-radiation-based infrared microspectroscopy (SR-IMS) is emerging to become an analytical tool for biochemical events profiling during disease progression. Each population of cells were randomly selected. For achieving high signal-to-noise ratio, 128 scans were collected for a spectrum with an aperture of $10 \times 10 \mu\text{m}^2$ and the spectral resolution of 4 cm^{-1} was used [1].

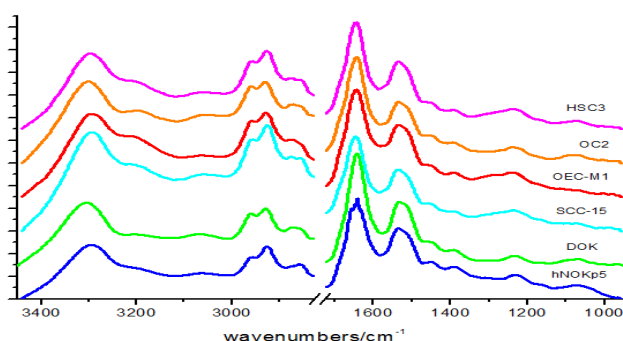


Fig.1: using SR-FTIR to detect all different progression cell lines hall spectrum of mid-IR ($3600\text{--}900\text{cm}^{-1}$) and Average spectra for six cells were performed.

Additionally, at C-H stretching region ($3000\text{--}2800\text{cm}^{-1}$), the variance groups in tumor cells was observed between normal oral cancer cells[2].

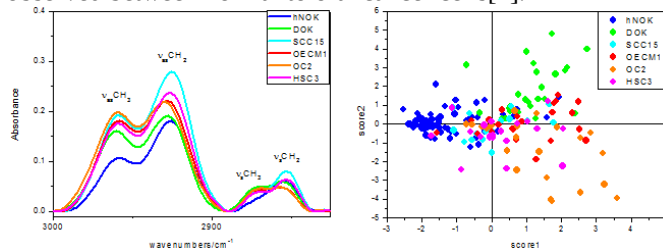


Fig. 2: shown the Cluster analysis by employing Linear Discriminate Analysis at cell carcinogenesis in C-H stretching region. The tolerance region for lipid of normal keratinocyte (hNOK) and dysplasia cells (DOK) was dramatically discriminated from all cancer cells.

Based on the molecular structure in this C-H

stretching region ($3000 - 2800\text{cm}^{-1}$), most of methylene group ($-\text{CH}_2$) and methyl group ($-\text{CH}_3$) are two most composition contributed form membrane lipid and protein, respectively. Therefore, we propose that removed cell lipid [3] for identifying the absorption contributed from other molecules else in the spectral range.

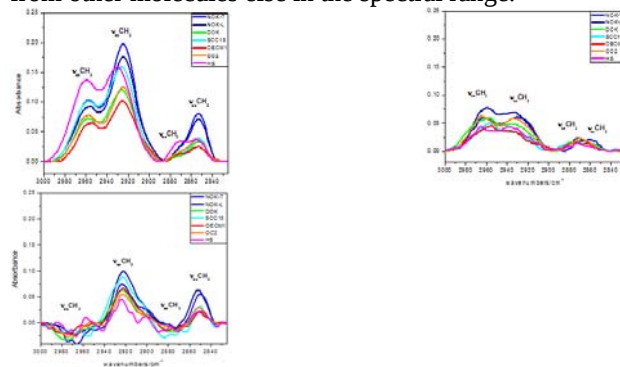


Fig. 3: the variant of absorbance was shown after lipid removed. (a) Normal spectrum in C-H stretching region, (b) lipid-removal spectrum and (C) the subtraction of spectrum.

It shown that the removal of lipid composition was almost in methylene group ($-\text{CH}_2$) absorbance. It also supposed that the most important absorbance in methylene group was from lipid component and the other components were lower efficiency.

References

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- [2] C. Conti *et al.*, Journal of Molecular Structure **834-836**, 86 (2007).
- [3] W. Wang *et al.*, Analytical Biochemistry. **329(1)**, 139 (2004).