An Innovative Infrared Kinetic Study of Wax Physisorption for Diagnosis of Oral Cavity Cancer by Utilizing Infrared Microspectroscopy

Pei-Yu Huang (黃佩瑜)[1], Ching-Iue Chen (陳慶曰)[1], Dar-Bin Shieh (謝達斌)[2], and Yao-Chang Lee (李耀昌)[1]

[1]National Synchrotron Radiation Research Center, Hsinchu, Taiwan
[2]Medical Colleges Institute of Oral Medicine, National Cheng Kung University, Tainan, Taiwan

Cancer incidence and mortality will be still the serious issues in the twenty-first century. The invasion and metastasis usually happen in the advanced stage of cancer, which are the major factors causing the failure of medical treatment to cancer patients. Therefore, early detection of cancer is important factor for increasing the survival rate of cancer patients. Based on estimated cancer statistics of World Health Organization, there will be 13% of the death for those cancer people for the year of 2009, and most of mortality is contributed from patients dying of lung cancer, gastric cancer, liver cancer, colorectal cancer and breast cancer. Although oral cavity cancer is minor mortality, the mortality was as high as 22% according to 2009 American Cancer Society estimated statistics. Therefore, it is important to establish a rapid, easily accessible and precision method for screening oral cavity cancer at early stage.

According to the high ratio of lipid/ protein within cancer tissue from previous studies, we developed an innovative infrared spectral imaging kinetics of wax physisorption for differentiating malignancy from human oral cavity cancer by employing infrared microspectroscopy. Therefore, we employed two different types of wax, paraffin ($C_{25}H_{52}$) and beeswax ($C_{46}H_{92}O_2$), to be the adsorbent for differentiating malignancy from oral cavity tissue sections and cells. Moreover, the absorption of the range 3000-2800 cm^{-1} was measured to be the signpost of the residual of wax onto oral cavity cells sample or tissue sections after waxing-dewaxing treatment at variant kinetic period. The results of IR wax residual images for wax cells sample revealed that OECM-1 cells showed a much stronger capability for adsorbing beeswax than that of paraffin. On the contrary, hHOK cells showed a strong capability for adsorbing paraffin but relatively weak with beeswax comparing with OECM-1 cells samples. However, there was a dramatically decreasing the capability for adsorbing wax for both of cells sample after 1N HCl treatment. Based on our finding, we proposed the membrane protein of oral cavity cells would alter during carcinogenesis of tissues and cells, which caused the membrane potential variation between normal and malignant oral cavity cells. Therefore, the innovative infrared spectral imaging kinetics of capability of wax physisorption will be one of potential methods for detecting oral cavity cancer.

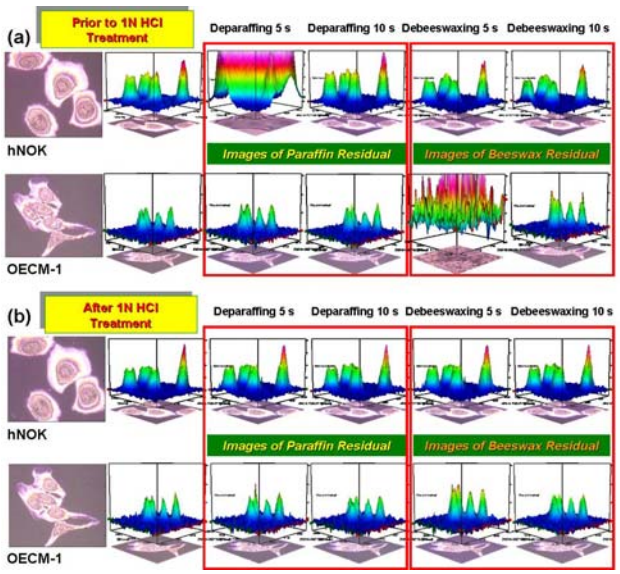

Fig. 1: IR spectral images were for wax residual onto the membrane of waxed oral cavity cells of hNOK and OECM-1 after waxing-dewaxing treatment and 1N HCl treatment based on the absorbance in the spectral range of 2800-3000 cm^{-1}. (a) Prior to 1N HCl treatment, there was a obvious amount of wax residual onto the membrane of both of waxed cells samples, however, (b) a dramatic decrease for amount of wax residual of waxed cells samples after 1N HCl treatment.

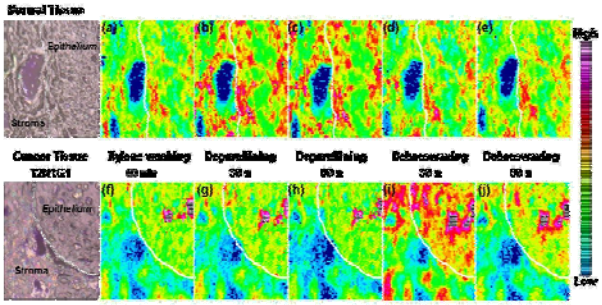

Fig. 2: Infrared spectra of waxing-dewaxing kinetics for (a-e) oral normal and (f-j) oral cavity cancer tissues.

References

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