

Detection of lung cancer cells using a terahertz chemical microscope

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1. INTRODUCTION

A *cancer genome therapy* is one kind of the precision medicine, which is an idea to analyze a patient's genetic information and optimize medical treatment for each patient. To evaluate the analyzed tissue includes the information of the cancer genome, quantitative evaluation of the ratio of cancer cells to normal cells in the tissue is required. However, evaluation conventionally takes more than two days because formalin fixed paraffin embedded (FFPE) blocks are firstly prepared, which was followed by dyeing.

In our group, we have proposed and developed a terahertz chemical microscope (TCM)¹ to detect specific cancer cells using immune-reaction of cancer cells. The TCM potentially can detect cancer cells without any pretreatment, so that rapid evaluation of the ratio of cancer cells to normal cell in the tissue can be realized. We have demonstrated the detection of breast cancer cells using the TCM².

2. EXPERIMENTAL

An AE1/AE3 was used as antibody to immobilize on the sensing plate. The AE1/AE3 well recognize both of acidic and basic subfamilies of cytokeratins, and it was generally used for the marker of squamous cell carcinoma. We applied physical adhesion method to immobilize the antibodies on the sensing plate. To avoid unspecific adhesion of cancer cells on the sensing plate, the sensing plate was coated by skim milk after immobilization.

Here, change in the terahertz amplitude from the sensing plate was observed before and after immune-reaction between AE1/AE3 and lung cancer cells.

3. RESULT

Fig. 1 shows the change in the THz amplitude as a function of cell population in the 1-ml-buffer solution. The red line indicates the linear fitting of the plots. The THz amplitude increased by increasing the cell populations of

squamous cell carcinoma.

Although the standard deviation of each plot was still large, this result suggests that the TCM can be one of the options to detect squamous cell carcinoma without FFPE process.

4. SUMMARY

We have developed the TCM to evaluate the ration of cancer cells to normal cells for realizing the cancer genome therapy. The THz amplitude radiated from the sensing plate increased by increasing the cell population of lung cell carcinoma.

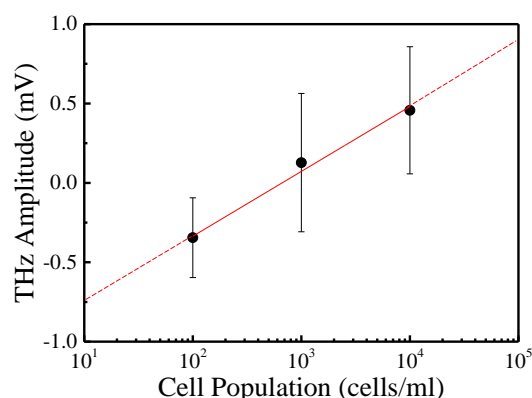


Fig. 1 change in the THz amplitude as a function of cell population in the 1-ml-buffer solution.

Reference

1. T. Kiwa, Appl.Opt,47,18,pp.3324-3327 (2008)
2. E.M. Hassan, Sen. Act. B, 287, pp. 595-601 (2019)