Human Tumor Microbiome Detection using Correlative Light and Electron Microscopy

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In recent years, bacteria have shown to be present of human tumors, but their role and advantageous to the tumors or to the bacteria themselves is still mostly unclear. Characterization of the tumor microbiome is challenging because of its low biomass. In order to confirm the presence of bacteria in human tumors, various methodologies were conducted including immunohistochemistry by using antibodies against bacterial lipopolysaccharide and lipoteichoic acid to detect Gram-negative and Gram-positive bacteria, respectively. However verifying the presence of bacteria inside cancer cells is challenging, due to the small size of the bacteria and its sparsity in the tumor tissue. We used Correlative Light-Electron Microscopy (CLEM) that localize specific cellular components using fluorescence labeling and microscopy and visualize in high resolution details the cell ultrastructure by electron microscopy. Fluorescent labeling has been used to identify bacteria over a large area of interest in a sample, and particularly beneficial in samples exhibiting a sparse number of targets or events. In this work we were able to validate the presence of bacteria inside cancer cells of human breast tumor. Combined fluorescence staining of bacteria and transmission electron microscopy imaging of the same cells clearly demonstrated the intracellular localization of bacteria in tumors [1].

Keywords:

CLEM, Light and electron microscopy

Reference:

D. Nejman, I. Livyatan, G. Fuks, et al., The human tumor microbiome is composed of tumor type-specific intracellular bacteria, Science, 368 (6494) (2020), pp. 973-980