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Determination of Circulating Tumor Cells in Breast Cancer Patients by Electrochemical Biosensor

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Abstract : It has been determined that the main reason for the death of cancer disease is caused by metastases rather than the primary tumor. The cells that leave the primary tumor and enter the circulation and cause metastasis in the secondary organs are called "circulating tumor cells" (CTCs). The presence and number of circulating tumor cells has been associated with poor prognosis in many major types of cancer, including breast, prostate, and colorectal cancer. It is thought that knowledge of circulating tumor cells, which are seen as the main cause of cancer-related deaths due to metastasis, plays a key role in the diagnosis and treatment of cancer. The fact that tissue biopsies used in cancer diagnosis and follow-up are an invasive method and are insufficient in understanding the risk of metastasis and the progression of the disease have led to new searches. Liquid biopsy tests performed with a small amount of blood sample taken from the patient for the detection of CTCs are easy and reliable, as well as allowing more than one sample to be taken over time to follow the prognosis. However, since these cells are found in very small amounts in the blood, it is very difficult to capture them and specially designed analytical techniques and devices are required. Methods based on the biological and physical properties of the cells are used to capture these cells in the blood. Early diagnosis is very important in following the prognosis of tumors of epithelial origin such as breast, lung, colon and prostate. Molecules such as EpCAM, vimentin, and cytokeratins are expressed on the surface of cells that pass into the circulation from very few primary tumors and reach secondary organs from the circulation, and are used in the diagnosis of cancer in the early stage. For example, increased EpCAM expression in breast and prostate cancer has been associated with prognosis. These molecules can be determined in some blood or body fluids to be taken from patients. However, more sensitive methods are required to be able to determine when they are at a low level according to the course of the disease. The aim is to detect these molecules found in very few cancer cells with the help of sensitive, fast-sensing biosensors, first in breast cancer cells reproduced in vitro and then in blood samples taken from breast cancer patients. In this way, cancer cells can be diagnosed early and easily and effectively treated.

Keywords : electrochemical biosensors, breast cancer, circulating tumor cells, EpCAM, Vimentin, Cytokeratins
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