**Cell-based Immunotherapy in Breast Cancer**

**Abstract**

Breast cancer (BC) is the most frequently diagnosed cancer in women, leading to high level of cancer mortality woldwide. Traditional treatment strategies including surgery, chemotherapy and radiotherapy, however, have limited therapeutic effect in BC patients. Nowadays, cell-based immunotherapy especially adoptive cell therapy (ACT) is a novel and promising option for cancer treatment. Due to the long-term protection with less toxicity compared to conventional therapies, cell-based immunotherapy serves as a potential treatment strategy to attack BC cells. Here we have listed a series of ACT methods, such as tumor-infiltrating lymphocytes, T cell receptors (TCRs) cells, chimeric antigen receptor (CAR)-T cells, CAR-natural killer cells and CAR- macrophages. Since the initiation and progression of BC is complicated, the anti-tumor effects may vary between different treatments. Therefore, this review has summarized certain factors, for instance, tumor antigen category, BC subtypes, tumor microenvironment and other combinational therapies, which can influence the outcome of BC through various mechanisms. Futhermore, the comparison between TCRs and CARs demonstrates that adjusting CARs sequence to better phosphorylated cell signaling proteins can result in promoted immune activation against tumor cells with a low density of antigen. Meanwhile, the differences between various CARs approaches are also considered, as are side effects, sources, persistence, cytokines and gene transduction. Overall, this review summarizes abundant studies and clinical trials applying cell-based immunotherapies of BC in the perspective of comprehensive factors.