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Monoclonal antibodies in cancer treatment

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Monoclonal antibodies (mAbs) are those antibodies produced in laboratories that mimic the ability of the immune system to combat pathogens. Specific monoclonal antibodies target cancer cells through the antigens that are abundantly present on the surface of cancer cells. A common mechanism that mAbs utilise for cancer treatment is block, flag and deliver. In the blocking mechanism, the mAbs block the molecules or genes that cancer cells need to grow. The human epidermal growth factor receptor 2 (HER2) gene mutates in certain cancers, thus helping cancer cells to grow by sending signals that are necessary for growth. Trastuzumab, a mAb used to treat breast cancer, gastroesophageal, and gastric cancers, blocks the HER2 receptors. Further, bevacizumab blocks the vascular endothelial growth factor (VEGF) molecules, hence stopping the growth of new blood vessels, i.e, angiogenesis preventing the survival of cancer cells. Another mAb called pembrolizumab attaches to immune checkpoints on the immune cells and helps the immune cells in killing the cancer cells. In the flag mechanism, the mAbs flag cancer cells for destruction through the body’s immune system. The mAb rituximab flags or attaches itself to a molecule called cluster of differentiation 20 (CD20) on the cancer cells. It acts as a flag for the immune cells which detect and destroy the cancer cells. Furthermore, the delivery mechanism encompasses the use of mAbs as potential drug vehicles owing to their selectivity, specificity and binding affinity. The mAbs deliver harmful substances such as drugs, toxins, radioisotopes, cytokines or other active conjugates to the cancer cells. Thus, mAbs can be used for targeted cancer therapy. In addition, mAbs are used to develop antibody-drug conjugates (ADCs) for controlled cancer therapy. The ADCs are developed by conjugating cytotoxic drugs with monoclonal antibodies using a stable linker. It is a novel drug delivery method to target cancer cells. The ADCs specifically target the malignant cells, unlike conventional formulations which have side effects on healthy tissues or organs. For example, an antibody drug called brentuximab vedotin is linked to a chemotherapy drug to deliver it to the targeted cancer cells. Therefore, mAbs can be used for better therapeutic effects with minimum toxic effects. More than a dozen mAbs have been approved by the Food and Drug Administration (FDA) to fight different types of cancer. However, there is still a scope for significant growth of therapeutic antibodies in the field of cancer treatment.

Keywords: Monoclonal antibody, Cancer, Chemotherapy, Antigens, Antibody drug conjugate, Drug delivery

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