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Commentary

Transmembrane Proteins Function in Cancer Growth and Inhibition

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ABSTRACT

The ground-breaking research discovered transmembrane protein as a protein that may contribute to the spread of cancer and demonstrated that blocking it significantly reduced the adhesion and invasion of breast and brain cancer cells by up to 90%. Although several proteins have been identified as having a function in the metastatic process, their structures and modes of action are largely unknown or poorly understood. Nowadys, researchs had predicted that how the transmembrane (TMEM) protein family is involved in the development of metastases or in the processes that cause cancer cells to spread, like migration and extracellular matrix remodelling.

Keywords: Transmembrane protein; Cancer; Organs; Chemoresistance

DESCRIPTION

A particular class of protein known as a TransMembrane Protein (TMEM) traverses biological membranes. Some of them are found near the membrane of organelles, whereas others extend across the lipid bilayer of the plasma membrane. The proteins of the TMEM family are generally uncharacterized. TMEM protein has many roles in cancer growth as well as resistance to cancer cells. Research regarding the proteins is on the current trends for describing its role in the disease called as cancer. Ninety percent of deaths due to cancer are caused by metastasis. Together, a group of proteins construct supply channels that carry oxygen and nutrients to tumours, allowing them to live and develop. Receptor-tyrosine-kinase-like Orphan Receptor 1 (ROR1) is a protein that has been linked to the Epithelial-Mesenchymal Transition (EMT), a process that takes place during embryogenesis when cells migrate and then transform into new organs throughout early development. ROR1 is expressed by many different malignancies and during embryogenesis, but not by normal postpartum tissues. It was also found out that human breast cancer cells' ability to grow and survive was destructed when the protein was silenced. In patients with breast cancer, a form of cancer that develops in glandular tissue, ROR1 in breast cancer cells is associated with increased risks of relapse and metastasis.

In contrast, suppressing ROR1 expression in animal models prevents breast cancer cells from metastatically spreading and reverses EMT. The researchers also discovered that the highly metastatic cancers that express ROR1 could be prevented from growing and spreading by administering a monoclonal antibody that targets ROR1. According to scientists, ROR1 presents a single, focused target for anti-cancer medicines that would spare normal cells from harm because it is exclusively produced in cancer cells. Although the effects of the monoclonal antibody method, which has only been studied in culture and animal models, on primary tumours are not yet fully understood, it does show promise for preventing the spread of cancer.

A humanised monoclonal antibody is being created by the researchers for possible therapeutic trials in people with malignancies that express ROR1.

Transmembrance proteins are said to be the biomarkers used for the prediction. Potential predictive biomarkers for lung cancer include TMEMs like TMEM48 and TMEM97. It is predicted that the proteins in this family will be found in a variety of cell membranes, including those in the mitochondria, endoplasmic reticulum, lysosomes, and Golgi. Numerous cell types include TMEMs, which carry out crucial physiological processes such epidermal keratinization, autophagy, smooth muscle contraction. Differential regulation of the expression of TMEMs has been seen in a variety of malignancies, including lymphomas (TMEM176), colorectal cancer (TMEM25), hepatic cancer (TMEM7), and lung cancer (TMEM48). The literature has discussed how some TMEMs function as tumour suppressors. Typically, tumour tissue exhibits a downregulation of their expression when compared to nearby healthy tissue. It applies to

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TMEM25, for instance. This protein belongs to the immunoglobulin superfamily and functions in cell adhesion, growth factor signalling, and immune response. TMEM97 is the final protein discussed in this section. This protein, also known as MAC30, belongs to the class of proteins that bind insulin-like growth factors. In contrast to pancreatic and renal malignancies, which both show modest expression levels of TMEM97 protein and mRNA, many cancer types exhibit higher expression of TMEM97. With 275 amino acids and a predicted five to seven transmembrane domains, TMEM45A is a TMEM that is found in the trans Golgi apparatus. Breast cancer, liver cancer, renal cancer, glioma, head and neck cancer, ductal carcinoma, and ovarian cancer are among the malignancies in which this protein is overexpressed. Higher expression levels of TMEM45A have been linked to worse patient overall survival in studies of breast cancer and cervical lesions, suggesting that TMEM45A may be a biomarker for the aggressiveness of these diseases. Chemotherapy resistance can emerge from the tumor environment as well as the cancer cells' own adaptability. In addition, the mechanisms causing treatment resistance can vary depending on the kind of cancer and the chemotherapeutic medication. Although TMEM proteins have a variety of roles and are found in many locations, most of them are connected to cancer. Some of them can serve as biomarkers or classifiers because of their correlation with patient survival and disease phases. Others play a part in the development of cancer and tumours, but it is yet unclear how many of them work. A more thorough analysis of these proteins might make it easier to comprehend how they relate to cancer. They could be exploited as new therapeutic targets to increase the effectiveness of chemotherapies because some of them are even involved in chemoresistance.