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Cell Adhesion in Bio-Chemistry

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INTRODUCTION

Cell adhesion is that the process by which cells interacts and fasten to neighboring cells through specialized molecules of the cell surface. This process can occur either through direct contact between cell surfaces like cell junctions or indirect interaction, where cells attach to surrounding extracellular matrix, a gel-like structure containing molecules released by cells into spaces between them. Cells adhesion occurs from the interactions between Cell-Adhesion Molecules (CAMs), Tran's membrane proteins located on the cell surface. Cell adhesion links cells in several ways and may be involved in signal transduction for cells to detect and answer changes within the surroundings. Other cellular processes regulated by cell adhesion include cell migration and tissue development in multicellular organisms. Alterations in cell adhesion can disrupt important cellular processes and cause a spread of diseases, including cancer and arthritis. Cell adhesion is additionally essential for infectious organisms, like bacteria or viruses, to cause diseases. The system and cancer have a posh relationship with the system playing a dual role in tumor development. The effector cells of the system can recognize and kill malignant cells while immune system-mediated inflammation also can promote tumor growth and regulatory cells suppress the anti-tumor responses. Within the center of all anti-tumor responses is that the ability of the immune cells to migrate to the tumor site and to interact with one another and with the malignant cells. Cell adhesion molecules including receptors of the immunoglobulin superfamily and integrins are of crucial importance in mediating these processes. Particularly integrins play an important role in regulating all aspects of immune cell function including immune cell trafficking into tissues, effector cell activation and proliferation and therefore the refore the formation of the immunological synapse between immune cells or between immune cell and the target cell both during homeostasis and through inflammation and cancer. During this review we discuss the molecular mechanisms regulating integrin function and therefore the role of integrins and other cell adhesion molecules in immune responses and within the tumor microenvironment. We also describe how malignant cells can utilize cell adhesion molecules to market tumor growth and metastases and the way these molecules might be targeted in cancer immunotherapy. Cell adhesion is important for the event and maintenance of multicellular organisms. Cell-to-cell and cell-to-matrix adhesion provide a mechanism for intercellular communication and to define the three-dimensional architecture of organs. The regulated nature of cell adhesion is especially evident within the hematopoietic system, where blood cells routinely make transitions between nonadherent and adherent phenotypes during differentiation, and in response to stimuli within the circulation or extravascular space. within the Bone Marrow (BM), hematopoietic somatic cell s reside during a specialized microenvironment called the stem cell niche, and their proliferation and differentiation are controlled not only by soluble growth factors but also by adhesion to stromal cells and matrix molecules. Weakening of those adhesive interactions is required for mature blood cells to enter the circulation. Circulating erythrocytes normally remain nonadhesive until they become senescent and are finally cleared by the RES . Other circulating blood cells often participate in regulated adhesive events during their lifespan. for instance , prothymocytes adhere to thymic stromal cells where they undergo guided movement from the cortex to the medulla during maturation before reentering the circulation. T cells regularly stick with the specialized high endothelial venules of lymphoid tissues, migrate into these tissues for sampling of processed antigens, then exit via the lymphatics to recirculate within the blood. During inflammation, specific classes of leukocytes roll at very low velocity on the endothelium that line all blood vessels, then adhere more tightly, and eventually emigrate between endothelial cells into the tissues. There, Neutrophils and monocytes phagocytose invading pathogens, and lymphocytes adhere to antigen-presenting cells, like dendritic cells, B cells, and macrophages. During hemorrhage, platelets stick with exposed subendothelial matrix components, spread, and recruit additional platelets into large aggregates that function an efficient surface for thrombin and fibrin generation. Leukocytes also adhere to activated platelets and to other leukocytes, and platelets roll on the endothelium. When activated, endothelial cells increase expression of molecules that affect the adhesiveness of platelets or leukocytes. Tight contacts between adjacent endothelial cells also regulate access of blood cells to the underlying tissues.