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Targeting the tumour microenvironment: A new perspective on approaching cancer

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Cancer is a global concern due to the exponential increase in incidence and mortality rates. It is characterised by the uncontrolled proliferation of cells, which can be triggered by several biological and environmental factors. This disease is associated with aberrant signalling mechanisms, immune and cell cycle checkpoint evasion, reduced apoptosis and so on. One of the reasons for therapy being less effective is that cancer cells are constantly evolving and exhibiting new strategies like angiogenesis, drug efflux, etc. to resist treatment that is meant to eliminate them. Upon progression, the cancerous cells tend to migrate to distant sites, thereby showing enhanced aggression and making treatment even more difficult. Although there are studies on the nature and mechanisms of cancer, therapeutic efficiency can be achieved only if the disease is approached in an interdisciplinary manner. A holistic approach includes studying the physical and mechanical properties of cancer cells and their environment while comparing them with their normal counterparts. Studies suggest that the physical properties of the extracellular matrix (ECM) plays a major role in cancer progression. Upon onset, cells undergo severe ECM remodelling that ultimately promotes integrin signalling which makes the tumour microenvironment more evasive. The stiff ECM is known to promote tumour progression and migration. Administering agents that reduce ECM stiffness is one way of countering the malignancy. Additionally, the compressive force exerted on the tumour cells during proliferation is a significant cue in triggering migration. Also, certain cellular molecules (PI3K, YAP/TAZ) sense these mechanical signals and trigger signalling responses that contribute to poor prognosis. Inhibiting the signalling cascade with the help of specific inhibitors for such molecules can help in minimising the aggression of cancer cells. Furthermore, cancer cells are also known to have a higher viscosity than normal cells; thus, targeting these properties appears to be promising. Therefore, with the growing complexity of the disease, there is a pressing need to undertake new approaches to target cancer. Therefore, understanding and focusing on the physical and mechanical properties of cancers seem to be a promising strategy to develop novel treatments.

Keywords: Tumour microenvironment, Extracellular matrix, Metastasis, Cell migration, Mechanical signals

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