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Receptor tyrosine kinase pathways in cancer therapy

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Receptor tyrosine kinases (RTKs) constitute the largest class of cell membrane receptors that not only transmit signals from the surroundings but also work as enzymes. When signalling molecules get bound to the membrane receptors, they trigger the initiation of the receptors’ inherent enzymatic activity. These cell surface receptors bind and respond to growth factors along with some other locally released proteins and hence play an important role in the regulation of cell growth, cell differentiation and survival. Therefore, it is natural for such a class of cell membrane receptors to be involved in the sophisticated process of signal transduction in cancer cells, such that it triggers the activation of multiple kinases in the cytoplasm of the cell that are usually either serine or threonine kinases. Phosphatidylinositol-3-kinase, protein kinase C family and mitogen-activated protein kinase are identified as the three major signalling pathways that utilise RTKs and also play important roles in the uncontrolled growth and proliferation of cancer cells. Research has been conducted to test the effect of selectively blocking one of the kinases at the level of receptors. However, such an inhibition proved to be irregular or inconsistent. Further study of the signalling pathways indicated that inhibition of all of the key kinases has to be done simultaneously for the blocking method to show efficient and effective therapeutic results. Targeting such multiple pathways with a single agent has shown promise as an anticancer strategy. Additional research is required to identify which subtypes of cancer patients are suitable candidates for specific multitargeted therapy and to determine different combinations of procedures for optimisation of anticancer strategy.

Keywords: Receptor tyrosine kinase, Phosphatidylinositol-3-kinase, Protein kinase C family, Mitogen-activated protein kinase, Anticancer, Multitargeted therapy

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