



Review

On the origin of cancer: Can we ignore coherence?

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Abstract

A growing number of inconsistencies have accumulated within the genetically deterministic paradigm of the origin of cancer. Among them the most important are the nonspecific nature of cancer mutations and the non-cell-autonomous factors of cancer initiation and progression. Epigenetic aspects of cancer and cancer systems biology represent novel approaches to cancer aetiology and converge in the notion that cancer is characterized by a nonspecific progressive destabilization of multiple molecular pathways. The coherent behaviour of certain cellular subsystems has been theoretically predicted for a long time to have a general role in coordinating biological processes. However, it has only recently gained major scientific interest when it was measured on photosynthetic complexes at physiological temperatures and confirmed to have a direct effect over the dynamics of the energy transfer. Several theoretical and experimental considerations suggest that cancer might be associated with the absence or impairment of the proper coherent dynamics in certain biological structures, most notably in the microtubules. We review those models and suggest that impaired coherence might largely contribute to the progressive destabilization of the molecular and gene regulatory networks, thus connecting different non-genetic aspects of cancer.