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Cancer tumors as Metazoa 1.0: tapping genes of ancient ancestors.

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Abstract

The genes of cellular cooperation that evolved with multicellularity about a billion years ago are the same genes that malfunction to cause cancer. We hypothesize that cancer is an atavistic condition that occurs when genetic or epigenetic malfunction unlocks an ancient 'toolkit' of pre-existing adaptations, re-establishing the dominance of an earlier layer of genes that controlled loose-knit colonies of only partially differentiated cells, similar to tumors. The existence of such a toolkit implies that the progress of the neoplasm in the host organism differs distinctively from normal Darwinian evolution. Comparative genomics and the phylogeny of basal metazoans, opisthokonta and basal multicellular eukaryotes should help identify the relevant genes and yield the order in which they evolved. This order will be a rough guide to the reverse order in which cancer develops, as mutations disrupt the genes of cellular cooperation. Our proposal is consistent with current understanding of cancer and explains the paradoxical rapidity with which cancer acquires a suite of mutually-supportive complex abilities. Finally we make several predictions and suggest ways to test this model.

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