Medical Xpress

The phenotypic plasticity effect of cancer cells and how to exploit it

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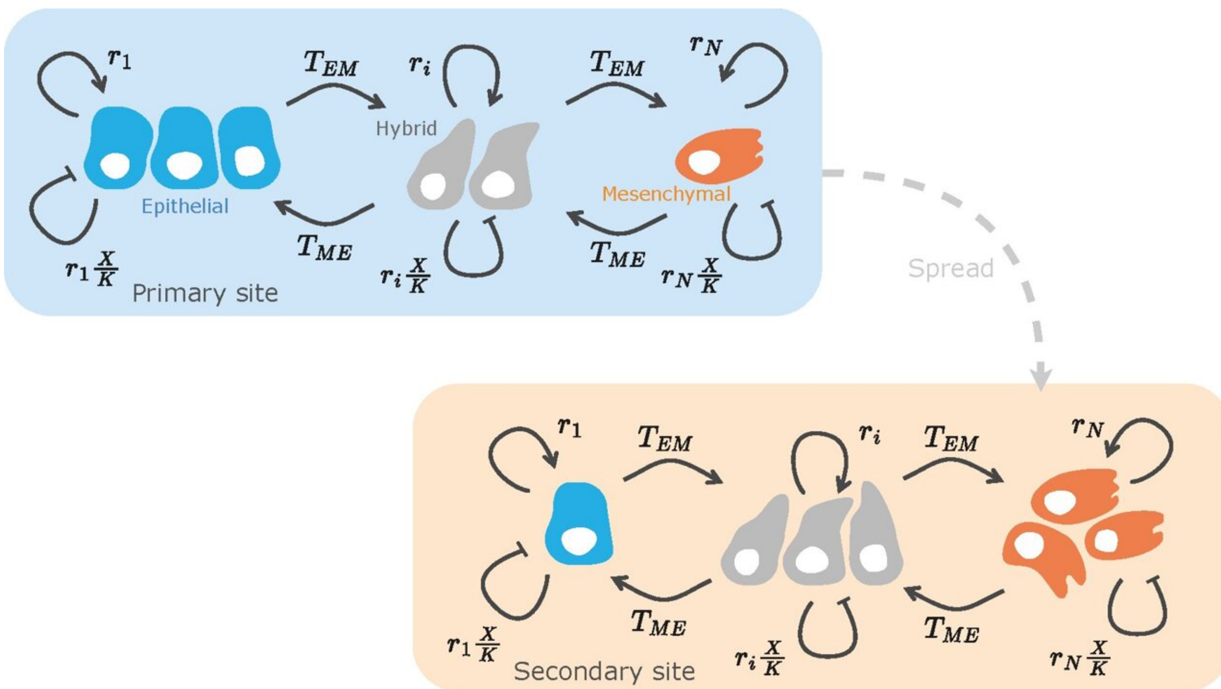

Mathematical model of tumor heterogeneity and phenotype switching: A detailed analysis. Credit: M.Raatz, MPI for Evolutionary Biology

Cancer cells are notorious for rapidly changing their phenotype, driving within-host spread and evading treatment. Scientists in Plön have used a mathematical model to understand the role of a signal used by cancer cells to control their phenotype. By manipulating these signals, cancer cells can be tricked into a less harmful phenotype that is more responsive to treatments.

Mathematical oncology is a growing interdisciplinary field of research that harnesses the power of cancer biology, clinical insights, and mathematics. By using computational techniques and mathematical equations to understand the dynamic nature of cancer, the field strives to quantify the ecology, evolution, and treatment of cancer. Mathematical oncology is pivotal in advancing the fight against the lethal disease by enhancing and personalizing the ability to diagnose and treat cancer.

Carcinomas, cancer of epithelial cells, are known to show phenotypic plasticity, the ability to change traits based on their surroundings, making them difficult to treat. Cancer cells manage their phenotype by hijacking the immune system and relying on signals from immune cells.

In a study recently published in *npj Systems Biology and Applications*, Saumil Shah, Arne Traulsen, and Michael Raatz from the Department of Theoretical Biology at Max Planck Institute for Evolutionary Biology in Plön turned this devastating feature of cancer cells into a weakness by showing how this plasticity can be exploited.

Signals secreted by immune cells change the internal state of the cancer cells, manifesting as distinct phenotypes. When this signal is manipulated, the internal state of the cancer cell changes. As a response, the cancer cell changes its phenotype, becomes less harmful, and more responsive to treatment.

Together with collaborators from the Institute for Experimental Cancer Research in Kiel, Shah and colleagues developed mathematical equations that capture the cancer cell response to these signals. They provide an understanding that will ultimately help to personalize and optimize cancer treatment.

More information: Saumil Shah et al, Understanding and leveraging phenotypic plasticity during metastasis formation, *npj Systems Biology and Applications* (2023). DOI: 10.1038/s41540-023-00309-1

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