
Confronting the Complex Causality of Cancer

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Abstract

Session: Historical and Philosophical Perspectives on Disease Biology (Katherine Liu, Rachel Mason Dentinger, Corinne Bloch, Nicholas Bonneau) Translational research has become a buzzword for biomedicine. In efforts to more quickly export knowledge gained from the laboratory to clinical applications, the United States National Institutes of Health and other organizations emphasize the implementation of structural changes. What has been overlooked is whether the core research strategies of biomedicine are adequate for the generation of clinical applications. Here I show that standard molecular and evolutionary approaches to cancer research are successful in some ways but fall short of making the expected clinical impact because they rely on faulty assumptions of biological causation or can only give predictive expectations for populations. Gene-based cancer explanations have the potential to identify specific difference-making causes but are lacking when facing the complexity of causal relationships in human biology. Evolutionary medicine explanations are useful for developing population level screening practices but are limited in their therapeutic potential for the individual. I argue that an evolutionary developmental (evo devo) approach to cancer bridges the proximate/ultimate divide between molecular biomedicine and evolutionary medicine by facilitating robust causal explanations of biological phenomena. This is because evo devo addresses problems of complex causality in the context of developing organisms (i.e., the realm of molecular biomedicine), while attending to the intergenerational dynamics of evolving populations (i.e., the realm of evolutionary medicine). I demonstrate that cancer is an example of pathological modularity, which encourages a particular framework of trade-offs, interactivity, and individuation. Thus, novel opportunities to comprehend the complex causality of cancer emerge and suggest new approaches to treatment and intervention.

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