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J Biosci. 2015 Sep;40(3):657-66.

## Cancer research in need of a scientific revolution: Using 'paradigm shift' as a method of investigation.

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### Abstract

Despite important human and financial resources and considerable accumulation of scientific publications, patents, and clinical trials, cancer research has been slow in achieving a therapeutic revolution similar to the one that occurred in the last century for infectious diseases. It has been proposed that science proceeds not only by accumulating data but also through paradigm shifts. Here, we propose to use the concept of 'paradigm shift' as a method of investigation when dominant paradigms fail to achieve their promises. The first step in using the 'paradigm shift' method in cancer research requires identifying its founding paradigms. In this review, two of these founding paradigms will be discussed: (i) the reification of cancer as a tumour mass and (ii) the translation of the concepts issued from infectious disease in cancer research. We show how these founding paradigms can generate biases that lead to over-diagnosis and over-treatment and also hamper the development of curative cancer therapies. We apply the 'paradigm shift' method to produce perspective reversals consistent with current experimental evidence. The 'paradigm shift' method enlightens the existence of a tumour physiologic-prophylactic-pathologic continuum. It integrates the target/antitarget concept and that cancer is also an extracellular disease. The 'paradigm shift' method has immediate implications for cancer prevention and therapy. It could be a general method of investigation for other diseases awaiting therapy.

PMID: 26333409

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