

Preface

The Maturing of Oncology: Conceptual Framework

The field of oncology deals with the study of tumours and cancer. As the field has matured over the past century, we have seldom paused to critically examine its structure, and as a result it has grown increasingly murky. The field of oncology is multifaceted: we have been dissecting the circuitry of various cancers to define their signalling pathways and now we are attempting to target pathways that are overwhelming the cell. We have also studied the behaviour of tumour cells as they metastasize and have identified their ability to induce neo-angiogenesis and neo-neurogenesis. Additionally, we have attempted to examine the impact of cancer via psycho-social analysis and therefore study the “quality of life” of individuals. All these studies form the basis of oncology. It is now the time to further clarify these distinctions within oncology to reflect the ongoing maturation of the field. I propose to introduce new terminology to the field of oncology. It provides consistency with terminology used in pharmacology.

I propose that the field of oncology be further subdivided into (i) oncokinetics and (ii) oncodynamics.

- (i) *Oncokinetics*: This defines the mechanics of the tumour cells as they arise and spread in the body. It includes tumour cell signalling, tumour growth, tumour metastasis, and tumour cell apoptosis.
- (ii) *Oncodynamics*: This defines the impact of abnormal cues generated by tumours on the physiological functioning of the body. It includes tumour-induced neo-angiogenesis, tumour-induced pain, tumour-induced fatigue, tumour-induced depression, cachexia, and neo-neurogenesis.

The conceptual framework of the subdivision of oncology is based on the field of pharmacology which is also subdivided into (i) Pharmacokinetics—defined by what the body does to the drug including drug metabolism, distribution, and excretion and (ii) Pharmacodynamics—defined by what the drug does to the body. This distinction is appropriate in that it allows the study of pharmacology to be

defined on the basis of the drug and the effects of the drug on the body. Similarly, this further subdivision of oncology is useful in that it defines the abnormality of tumours and cancers and also the impact of abnormal cues from the tumours on the body.

This new terminology is necessary to ensure that research and understanding in oncology is accurately delineated. The use of drugs in treating cancer and the impact of chemotherapy drugs or radiation on the body should not be confused with oncology. Their pharmacological examination should be based on pharmacological principles whereas oncological examination should be based on tumours and cancers. Focusing on psycho-social aspects of cancer largely defines quality of life and should be regarded as a tool to gauge the success of treatment. Oncokinetics has developed its fundamentals over the last fifty years and has provided us with a comprehensive model of tumour circuitry. Its control still eludes us. Conversely, the study of oncodynamics, which is at its infancy, needs attention as it may yet provide a mechanistic basis for the treatment of cancer. This can be exemplified by the complexity of certain signalling pathways such as the mTOR pathway that is elevated in tumour cells while its suppression in the central nervous system can lead to depression. Similarly, a number of other established tumour cell signalling pathways have been identified in other normal physiological functions such as memory. Further subdivision of oncology will only help in the focused future research. It provides a framework on which cancer funding agencies and the pharmaceutical industry can develop strategies in accordance with their priorities.

The impact of oncodynamics is very important from both a cancer patient and a caregiver's perspective. This subfield has a much bigger impact on cancer patient functionality and the resultant societal implications, as it portrays the havoc of cancer on an individual. It is curious that cancer scientists and cancer funding agencies are largely consumed in curing cancer while hoping that psycho-social studies alone will address the issues of quality of life. The yardstick for understanding the oncodynamic approach to cancer research is only now being addressed and requires an active debate and the participation of other disciplines, especially neuroscientists, to engage in collaborative research with cancer biologists. Cancer-induced depression for example could provide interesting and useful models to study major depressive disorders as the origin is more distinctly defined. Similarly, the study of cancer pain can lead to novel therapeutic approaches that are not analgesic dependent.

This terminology should not be confused with other associated branches of oncology such as oncogenetics, oncoepidemiology, etc., which have individual primary disciplines such as genetics, epidemiology, etc. Various aspects of cancer treatment that include medical oncology, radiation oncology, and surgical oncology can be viewed as clinical oncology and have a foundation based on the basic science of tumours and cancers.

Finally, the defining of oncology within its subfields provides for an opportunity for cancer researchers to develop cross-discipline interactions and predict potential consequences of tumours and/or treatment. The conceptualization of tumour–host interactions from a physiological viewpoint is very important and supersedes the

“-omic” influence in understanding tumours. The ultimate goal of oncology is to have an understanding of tumours and their influence on the body. This knowledge will enable us to provide appropriate strategies to deal with cancer and limit the diverse consequences of abnormal cues sent by tumours. Thus we may be able to define novel mechanism-based treatment for oncodynamic effects such as fatigue, pain, and depression associated with cancer. We are at the cusp of making enormous advances in oncology if we embrace methods of progress in other fields of science and acknowledge the complexity beyond “-omics” to develop a framework around physiology.

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