



Review Article

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On Cancer's Theories, True Nature and Possible Self-Eradication



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Abstract

Having began some 4,000 years ago, cancer is one of the oldest – quite possibly the oldest disease seen in human specimens. It is also an age-related disease. However, it was fleetingly rare because hidden by other illnesses such as cholera, dropsy, leprosy, plague, pneumonia, smallpox and tuberculosis. As these diseases were vanquished, and as the human lifespan lengthened, cancer emerged. I remark on the various theories advanced over the past 4,000 years regarding the nature of cancer, on cancer's true nature, and on its possible self- eradication.

Abbreviations: AF: Anti-Folates; AML: Acute Myeloid Leukemia; AL: Acute Leukemia; ALL: Acute Lymphoblastic Leukemia; AV: Anti-Vitamins; BL: Burkitt's Lymphoma; BS: Blood Suppuration; CL: Chronic Leukemia; CRI: Cancer-Related Inflammation; CT: Coley's Toxin; EBV: Epstein-Barr Virus; FDA: Folate Deficiency Anemia; HCGP: Human Cancer Genome Project; HGP: Human Genome Project; IM: Infectious Mononucleosis; IWA: Indian Workers' Anemia; PA: Pernicious Anemia; PO: Proto-Oncogene; PV: Pro-Virus; RSV: Rous Sarcoma Virus; RV: Retro-Virus; SM: Somatic Mutation; TSG: Tumor Suppressor Genes

Introduction

Table 1 is a listing of the various exogenous and endogenous theories of cancer.

Table 1: Exogenous and endogenous theories of cancer.

Exogenous	Endogenous
Infectious blood suppuration	Endogenous virus
Somatic mutation and exposure to environmental carcinogens	Retroviruses and proviruses (not applicable)
Bacterial toxins	Two-hit – Proto-oncogenes and tumor suppressor genes
Infectious mononucleosis	
Anti-vitamins	
Anti-folates	
Sensitivity to cytotoxic drugs	
Inflammation	

On the True Nature of Cancer

In the mid-1970s, Harold Varmus and J. Michael Bishop showed that a precursor of a cancer-causing gene - which they called the "proto-oncogene" (PO), was a normal cellular gene existing inside cancer cells. Mutations induced by chemicals or X-rays caused cancer, not by inserting foreign genes, but by

activating such endogenous proto-oncogenes. Thus, cancer genes come from within the human genome [1]. Cancer is woven into our genome as the mutated genes are but distorted versions of the normal ones; they are braided together and unbraiding them is the most formidable undertaking [2,3].

Unleashing a Natural Cancer killing Mechanism

The histories and approaches to eradicating cancer and malaria are amazingly parallel to each other and one would hope that a similar strategy to that used in malaria would be more successful at eradicating cancer. In the case of malaria, a better understanding of the disease transmission has led to the current development of a transmission-block vaccine, a much more preferable approach than the current targeting of the mosquito vector and treating the infection.

In the case of cancer, taking advantage of the deep understanding of the events of cell division, particularly the anaphase in mitosis, an "inherent death mechanism" can self-eradicate duplicating cancer cells without impairing healthy cells in both normally and rapidly proliferating human cancer cells. The faster cancer cells proliferate, the faster and more efficiently they will be eradicated. The mechanism may be

suitable for treating aggressive cancers that are not responsive to traditional chemotherapy, heralding a novel specific cancer target mechanism [4].

The various therapeutic approaches to cancer therapy have been described at length elsewhere, including surgery, chemotherapy, radiation therapy, electrochemotherapy, immunotherapy, synthetic chimeric antigen receptors, or a combination thereof, and their corresponding nanotherapies. In analogy with the malaria situation and the development of a malaria blocking-vaccine, one wonders whether cancer transmission, which is somewhat analogous to malaria transmission, could likewise be eradicated by going back to the basics of cell biology. This would be tantamount to a complete paradigm change in the approach to cancer therapy. Indeed, this seems to have been realized and accomplished by a team of Israeli researchers [5].

The research team led by Prof. Malka Cohen-Armon found that three proteins can be specifically modified during mitosis to unleash an “inherent death mechanism” that self-eradicates duplicating cancer cells without impairing healthy cells. The mechanism also works on normally and rapidly (or at least a variety) of proliferating human cancer cells. As he put it “the faster cancer cells proliferate, the faster and more efficiently they will be eradicated”. The mechanism may be suitable for treating aggressive cancers that are not responsive to traditional chemotherapy, heralding a novel specific cancer target mechanism. I concur with this suggestion.

The newly-discovered mechanism involves the modification of specific proteins that affect the construction and stability of the spindle. The Israeli team also found that certain compounds (the phenanthridine derivatives) were able to impair the activity of these proteins, distorting the spindle structure and preventing the segregation of chromosomes. Once the proteins were modified, the cells were prevented from dividing, inducing the cell's rapid self-destruction and apoptosis. Further, a variety of additional drugs that also modify these specific proteins may now be developed.

Research was conducted using both cancer cell cultures and mice transplanted with human cancer cells. The scientists harnessed biochemical, molecular biology and imaging technologies to observe the mechanism in real-time. In addition, mice transplanted with triple negative breast cancer cells, currently resistant to available therapies, revealed the arrest of tumor growth. The researchers are currently investigating the potential of one of the phenanthridine derivatives to treat two aggressive cancers known to be unresponsive to current chemotherapy: pancreatic cancer and triple negative breast cancer.

Conclusion

After a circuitous detour through several hypotheses and theories (elements of which are nonetheless valuable), we have now come to the conclusion that cancer is stitched into our genome; oncogenes arise from mutations in essential genes that regulate the growth of cells. Mutations accumulate in these genes when DNA is damaged by carcinogens (theoretically preventable), but also by seemingly random errors in copying genes when cells divide (a flaw deeply entrenched in ourselves and therefore unpreventable). Thus, we can rid ourselves of cancer only in as much as we can rid ourselves of the processes in our physiology that depend on growth – aging, regeneration, healing, and reproduction. With the momentous advances of the Human Genome Project (HGP) and the sequel the Human Cancer Genome Project (HCGP), we have now come to the realization that understanding more intimately the biology of cancer, gene by gene and pathway by pathway, will direct us into the right direction for cancer therapeutics. A second direction would obviously be cancer prevention, or at least prevention of those factors that may trigger cancer. The third and last direction would be to integrate our understanding of aberrant genes and pathways to explain the behavior of cancer.

Notwithstanding the numerous exogenous and endogenous theories of cancer, it appears that cancer genes come from within the human genome. It further appears that modifying specific proteins that affect the construction and stability of the spindle, a newly discovered mechanism is able to arrest cancer cells from dividing and multiplying, thus stopping cancer progression in its track. The process is one of self-destruction by a natural mechanism and the faster the proliferation of the cancer the faster and the more efficient the mechanism of self-eradication. While only a phenanthridine derivative has been so far investigated, a variety of additional drugs can likewise be employed. This newly discovered mechanism may counter aggressive cancers that have so far proven unresponsive to chemotherapy such as pancreatic cancer and triple negative breast cancer. This is a hopeful new vista in cancer therapy.

References

1. Changes in DNA that specifically affect genes and incite unlimited growth.
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