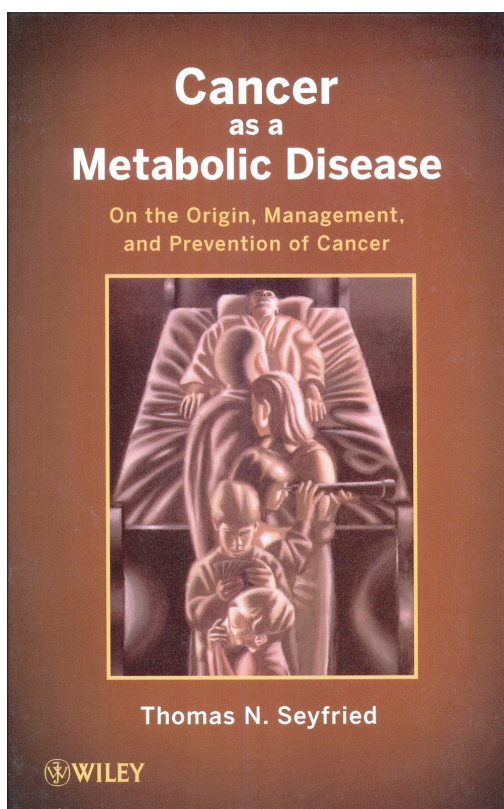


## Cancer as a metabolic disease: on the origin, management, and prevention of cancer

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By Thomas N. Seyfried  
 New Jersey: Wiley; 2012  
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Cancer is a major disease of mortality and is afflicting more people today than ever before. In this book, Seyfried carefully elaborates a fascinating theory: cancer is not the results of genetic mutation, but is the results of metabolic dysregulation first suggested by Otto Warburg.

As a gynecologic oncologist, I first had a great deal of skepticism regarding this concept. We have been taught the genetic origin as the cause of cancer and metabolic defects as a secondary phenomenon occurring from the genomic instability.

This book begins with the question: "Why we lose the fights against cancer?" From an objective perspective, we haven't won the "war" against cancer despite tremendous investigation in major pharmaceutical companies and in most leading medical centers throughout the world. This book suggests us to change our viewpoint regarding cancer. Seyfried insists that cancer has remained incurable largely due to a general misunderstanding of its origin, biology, and metabolism. This book explains that cancer is not a genetic disease, but rather a metabolic disease involving mitochondrial dysfunction and respiratory insufficiency. This book made me think about the fundamental concept of cancer- "so what is the cause of cancer?"

Otto Warburg was the first to explain the altered metabolism as the cause of tumor. The metabolic profile observed in cancer cells included increased consumption of glucose and glutamine, increased glycolysis, changes in the use of metabolic enzyme isoforms, and increased secretion of lactate. Respiration is the process by which cells use oxygen to obtain their energy through oxidative phosphorylation. According to Warburg's theory, respiratory insufficiency is the origin of cancer. Seyfried backed up the theory with substantial evidence that all other characteristics of cancer arise either directly or indirectly from insufficient respiration.

Based on this theory, the author suggested an interesting treatment strategy involving metabolic management. If can-

cer is primarily a disease of energy metabolism, then rational strategies for cancer management should be specifically targeted on tumor cell energy metabolism. Since glucose and glutamine are the major fermentable fuels for most cancer cells, dietary restriction would be a viable therapeutic strategy. Thus, implementation of a calorie-restricted ketogenic diet would be an effective initial treatment strategy. His protocols are introduced in several phases: initiation, surgery, and maintenance.

I am not an expert to challenge Seyfried's hypothesis, but we need to have a balanced insight. In the era of genome medicine, we have had a high expectation on bioinformatics but little has been applied in clinical practice. For example, we could get only little information regarding the comprehensive analysis of the ovarian cancer genome from the cancer genome atlas project. Moreover, it is very hard to identify a

targeted therapy using genomics due to inter-tumor and intra-tumor heterogeneity. At the 2011 meeting of the American Association of Cancer Research, Dr. Linda Chin mentioned in her plenary lecture that improved genomic sequencing speed was a major beneficiary of the cancer genome projects. Seyfried's view of cancer as a metabolic disease will provide us a new target for cancer management. I would like to recommend this book to other healthcare professionals, especially oncologists who are trying to find a groundbreaking new approach for cancer.

#### CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

## Correction

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## Correction: primary, secondary, and tertiary prevention of cervical cancer

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In this book review, Professor Michael Höckel was incorrectly spelled as Micahel Höckel.