

## The Past, Present, and Future of Nutrition and Cancer: Part 1—Was A Nutritional Association Acknowledged A Century Ago?

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### ABSTRACT

Professional interest in the association of diet and nutrition with cancer first appeared in the early 1800s, if not before. Yet, progress in understanding this association over the past two centuries has been exceedingly slow and confusing. Without addressing this confusion, progress in using diet and nutrition information to prevent and even to treat cancer, will remain uncertain. To better understand this issue, the present paper is the first of two to explore the history of the diet and cancer relationship prior to a 1982 National Academy of Sciences (NAS) report on Diet, Nutrition and Cancer. This report was a milestone in the nutrition and cancer history because it was the first science-based, institutional report on this topic. But, based on the evidence cited in that report, it could be inferred that this topic was relatively new, perhaps beginning around 1940. While it attracted great public interest, it also generated great controversy, some of which was a natural response from affected industries. Exploring the history prior to 1940, therefore, might provide clues on the present-day confusion concerning the relationship between diet and cancer. This investigation asks three questions. First (the subject of this paper), was the relationship of nutrition to cancer even considered prior to 1940 and, if so, what was said? Second (the subject of the upcoming paper), assuming that nutrition was seriously considered, why then was it ignored or forgotten? Third, has the forgotten information contributed to the contemporary confusion surrounding the relationship to cancer? The answer to the first question, considered here, is that, yes, nutrition as a possible cause of cancer was not only hypothesized, it was a major topic for discussion in some quarters. But it also was a topic struggling to be heard among the authorities who had most of the power and influence in the professional cancer community. This paper documents that history and the corresponding struggle for this message to be heard. One figure, Frederick Hoffman, founder of the American Cancer Society and prodigious researcher, led much of that effort during the period of 1913-1943, but his contributions have remained almost totally unknown.

### ARTICLE HISTORY

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*The best prophet of the future is the past*

—Lord Byron

The association of diet and nutrition practices with cancer has had a most unusual history. On the one hand, major contemporary reports have suggested that diet is likely the most important risk factor for human cancer. In 1975, under the leadership of Ernst Wynder, the American Health Foundation in conjunction with the National Cancer Institute, sponsored the 1975 Key Biscayne Conference on nutrition in the causation of cancer (1). At this conference, for the first time, researchers from around the world convened to discuss epidemiological, preclinical, and molecular studies associating nutrition and diet to cancer causation and prevention. Then, in 1977, the US Senate Committee recommended highly publicized dietary goals, mostly based on diet and heart

disease (2). But this prompted the US Senate to make a special appropriation to determine if the same relationship existed for cancer as it does for heart disease, which resulted in the 1982 NAS Diet, Nutrition and Cancer report (3). Subsequently, many more public policy reports repeated that about one-third of all cancers were caused by diet (4–7) although others believed that this estimate could be as high as 70–80% (8–10).

Research was undertaken for the following article, originally written, when the author spent a year (1985–1986) as a Visiting Scholar at Oxford University in England collaborating with the research group of the epidemiologist, Sir Richard Peto, and his computer specialist Jillian Boreham, on a population survey of cancer mortality in rural China (11). I was motivated to write it as a result of my participation in co-authoring the widely read and discussed NAS report on diet, nutrition, and cancer.

The findings of this NAS report, based on research published after about 1940, generated a striking level of disbelief from the cancer community and outright hostility from people whose livelihood depended on foods in question and the food industry whose products were being questioned (12). When an author of the NAS report sponsored by the NAS is accused of “killing more people than those being saved (12),” when release of that report is passionately pronounced within legitimate science circles as “the day that food was declared poison (13),” when promotion of evidence supporting a link between dietary fiber and colon cancer is said to “border on fraud (14),” and when petitions were formally organized to expel from their professional societies those who have participated in furthering research and policy development on this topic,<sup>1</sup> clearly a very sensitive nerve was touched.

In searching out the pre-1940s literature on this topic, I was surprised to find an entire body of scientific and medical inquiry and debate that seems to have been either forgotten or ignored by contemporary investigators. Going retrospectively from the present, it was as if the field had entered a black hole around 1960,<sup>2</sup> reappearing on an earlier time in 1937 in the form of a massive 729-page document entitled *Cancer and Diet* (16) by Professor Frederick L. Hoffman. In that document, he summarized his life’s observations drawn from a career devoted to the question why cancer prevalence had apparently increased so markedly since the nineteenth century.<sup>3</sup> Prior to writing his *magnus opus*, Hoffman, professionally trained as a statistician, published a comprehensively documented 826-page tome which demonstrated that cancer mortality rates were vastly different in different parts of the world (17). Later, in 1923, he embarked on a project to document the types of cancer deaths, as age-truncated rates, in San Francisco, and then compared these rates over the next decade (18) with similar data from 21 other cities and localities both within and outside the United States. He obtained these data from death certificates and an extended questionnaire, which included questions on the “... ordinary daily diet, especially as regards green vegetables, fresh fruits, cereals, white bread, condensed and conserved food, meat, sugar, salt, etc.” Hoffman’s massive 1937 document on diet and cancer, which reviewed the earlier

history more comprehensively than any review since that of Williams in 1908 (19), offers an unusual opportunity for evaluating the pre-1940 literature. On the basis of criteria to be discussed, there is no doubt that Hoffman’s review is the most thorough, scholarly, and authoritative account of the subject between 1908 (Williams (19)) and 1937.

Hoffman’s book was divided into four chapters. The first chapter reviewed the diet and cancer literature up to 1935; the second considered dietary patterns among different people and places; the third discussed the relationship between cancer and various aspects of metabolism; and the last chapter was a report of an extended case-control study, including 2,234 cases and 1,149 controls residing in five major metropolitan areas of the United States.<sup>4</sup> In the preface to his book, Hoffman tells about the origin of his views and the extent to which he tried to insure that his presentation was not only comprehensive but, above all, reliable. He had traveled widely in Europe, North Africa, and the United States, met and interviewed many authorities, extensively corresponded with specialists—particularly on the more debatable questions, and personally reviewed and analyzed the questionnaire data obtained in the case-control study. He consulted with numerous colleagues in an attempt, in his words, “to guard myself against personal bias quite common in work of this kind.” His humility to the rigorous objectivity of the scientific method is frequently expressed in a variety of ways.

Hoffman began by commenting on “... the writings of almost two hundred authorities, more or less eminent in their respective fields of practice or research,” he concluded that “most writers ... are agreed that excessive nutrition if not the chief cause (of cancer) is at least a contributory factor of the first importance.” (This comment on nutrition was truly surprising, especially when we on the NAS committee had assumed for ourselves the “discovery” of effects of nutrition on cancer.)

Hoffman’s 1937 review was certainly unique, not only because it was impressively comprehensive for its time but also because it was never seriously considered again! This observation appears to be so surprising that a special effort was made to assess its credibility. First, original writings were retrieved for the majority of the investigators cited by Hoffman, and a comparison was then made between the views of these investigators and Hoffman’s assessment of those views; no significant misrepresentations or errors of omission could be found. The fidelity of his representations seems to be related not only to his extensive use of verbatim, paragraph-length quotations from the original works, but also because of his humble

<sup>1</sup>Action against myself (October 1984 and April 1986) and Sushma Palmer, Executive Director, NAS Food and Nutrition Board.

<sup>2</sup>Mider, Research Director of NCI in 1957, in summarizing the first 20 years of NCI-supported research (15), discussed a variety of projects concerned with the discovery of possible causes of cancer, ranging from chemical carcinogens to hormones, viruses, sunlight, radiation, and milk transmissible agents; no mention was made of diet or nutrition.

<sup>3</sup>I am indebted to my associate, Dr. Thomas O’Connor, for bringing this review to my attention.

<sup>4</sup>Hoffman first described the design and purpose of this massive case-control study in 1924 (20); it may be the first case-control study ever.

reference to the knowledge of others. For example, of 59 papers on diet and cancer (he occasionally referred to other topics on cancer) between 1900 and 1908, Hoffman provides verbatim comments of 50 of the authors.

A second measure of its credibility results from his personal acquaintance and professional recognition with so many, perhaps most, of the cited investigators who published between the turn of the century and 1937. He mentions personal correspondence or discussions with several from 1890 onward. The fact that the reviewed papers were only those readily accessible to him in his “library of (his) laboratory” would suggest that Hoffman was personally given those papers, as was the usual custom at that time. His professional recognition on a variety of health issues was widespread, as indicated by his presentations at a large number of professional meetings in Europe and America from very early on in his career. Prior to 1913, he had statistically documented and critically reviewed the prevalence rates for a wide variety of public health problems including malaria, leprosy, tuberculosis, suicide, and industrial health hazards (21).

George Rosen, writing in 1958 (22), has credited Hoffman’s 1908 publication on *Mortality from Consumption in Dusty Trades* (23) as having had an important impact not only on the efforts to control tuberculosis but also on American labor legislation affecting occupational hazards (21,24). In fact, Hoffman was a charter member of the National Tuberculosis Association (25). In addition to these early contributions, he developed for the Prudential Insurance Company, ... “the most comprehensive library in the United States of statistical works, health reports, and demographic data” (21). Being self-educated (21,24), and after immigrating to the United States from Germany in 1888, he eventually became President of the American Statistical Association in 1911 (25). He published prodigiously from the beginning of his professional career in 1892, finally producing some 16 books (21) and, in all likelihood, nearly 100 scientific publications on cancer alone.<sup>5</sup>

On May 7, 1913, he delivered to the American Gynecological Society what was to become a famous lecture entitled “The Menace of Cancer.”(26) In that presentation, he called for a careful study of the rising prevalence of cancer in the United States and recommended, among other things, that “the nutritional influences on the induction of cancer be analyzed.” That presentation was eventually presented several times to different organizations and was instrumental in the founding of the American Society for the Control of Cancer (27–29), later to become the American Cancer Society (ACS).<sup>6</sup> He proposed that “...the time has come for a

nationwide interest in the problem of prevention and control.” Hoffman was named the Chairman of the ACS Statistical Advisory Board, which was the organization’s first research bureau. This bureau spurred the development of the first officially mandated United States Cancer Census (29), which confirmed the rising prevalence of cancer earlier noted by Hoffman in 1914 (27). According to Triolo and Shimkin (29), who reviewed the early history of ACS, the Hoffman panel’s “... pump priming activities on behalf of statistical and epidemiological investigations deserve notice as outstanding contributions to the American public health movement.” Following these early contributions, many exceptionally productive years were to pass, when finally, in 1943, Hoffman was presented with the American Cancer Society Clement Cleveland Medal “for distinguished services to the field of cancer statistics (29).” It would not be an understatement to suggest that few, if any, scientists concerned with biological investigations during the first half of this century could have been more productive than was Frederick Hoffman.

A third measure of credibility of Hoffman’s 1937 diet and cancer review relates to the confidence derived from Hoffman’s ample use of comments by investigators who were critical of the dietary theory of cancer causation. He did not conceal the fact that there were detractors. Hoffman’s comments on each paper, whether or not he agreed with the conclusions, appear to be graciously presented, with reasoned objectivity and without resort to the personal sentiment and zeal, which characterized so much of that early literature.

And finally, a last measure of credibility for Hoffman’s review is indicated by his summary remarks. He noted that, “Every work referred to, otherwise than in abstract, has been read carefully by myself from beginning to end to make sure that no important observation should be missed,” and he went on to point out that his review had been limited to approximately 200 authorities because he had “... neither the strength nor the time to visit other libraries for the purpose of amplification and completeness.”<sup>7</sup> Nonetheless, he said that he felt “... satisfied that it would have served no useful present purpose to have enlarged upon this aspect of the problem under consideration since the evidence presented seems fully sufficient to prove that cancer from the earliest times has been looked upon as a question involving dietary and nutritional considerations...”

What can be said about Hoffman’s professional competence? That is best considered by examining his observations which, based on later knowledge, can be judged by the test of time. His massive study of cancer mortality rates in 1915 (17) must be viewed as a classic. It referred

<sup>5</sup>Eighty-one are listed in his 1933 report of the San Francisco survey (18).

<sup>6</sup>Hereinafter, the ACS abbreviation will be used for both the present Society and for its predecessor; the name change was made in 1943 (28).

<sup>7</sup>Hoffman had already been suffering from Parkinson’s disease for about ten years (27) when he wrote his 1937 book.

to 579 sources, included a meticulous presentation of statistical methodology and conclusions (first 221 pages), and finally presented a vast amount of data, generally expressed in the sex-specific crude death rate form, although age-standardized data or evidence of age distribution was provided where possible. He provided a very succinct and critical commentary on the importance of using age-standardized data. The value of this document is indicated by the fact that it formed the basis for the first United States Cancer Census referred to earlier (29). Later, in 1923, he organized the San Francisco Cancer Survey, under sponsorship of the ACS and two major insurance companies, and eventually produced a project of equal magnitude to his 1915 study. A series of nine reports of that latter survey were to be published over the course of the next 11 years (18). His analysis of the adverse effects of tobacco began with these studies, and his summary evaluation of tobacco use (30), eventually published in 1931<sup>8</sup> in a very discriminating and analytical manner, serves as an impressive testimonial to his professional judgment in originating useful and reliable hypotheses. He came to the rather remarkable conclusion that “the increase in cancer of the lungs observed in this and many other countries is, in all probability, to a certain extent directly traceable to the more common practice of cigarette smoking and the inhalation of cigarette smoke. The latter practice unquestionably increases the danger of cancer development.” He also warned against the consequences likely to result from the widening practice of cigarette smoking by women. That was 20 years before the classic studies on smoking and lung cancer were published by Wynder and Graham (32) and Doll and Hill (33), thirty-three years before the US Surgeon General’s report on smoking (34), and predates by over a half century the current debates (as of 1985–86) on smoking and lung cancer.

To capture some of the messages of Hoffman’s 1937 book, it is useful to consider a few of Hoffman’s observations and citations. Of course, any serious student of this subject should read the review in its entirety. Throughout the 150- to 200-year period for which Hoffman found significant literature, there was a wide range of foods said to be associated with cancer prevalence. However, the overwhelming message on food was the recommendation against “overnutrition,” which generally meant the nutritional condition resulting from an abundance of rich food to be found in the more

industrialized countries. With regard to individual food groups, the recommendations most consistently found were the admonition against the consumption of meat and the promotion of a greater consumption of vegetables and fruits. With respect to individual nutrients, excessive protein intake was the first and most frequently noted. William Lambe, Fellow of the Royal College of Physicians in London, in 1809 (35), and more extensively in 1815 (36), warned “... against the danger of excess in food consumption, particularly meat and other protein products.”<sup>9</sup>

In Hoffman’s opinion (16), it was John Hughes Bennett in 1849, Senior Professor of Clinical Medicine at the University of Edinburgh, who provided “the first definite indication of the recognition of cancer as a nutritional disease.” Specifically, Bennett said that “an excessive cell development (as in cancer) must materially be modified by diminishing the amount of fatty elements, which originally furnish elementary granules and nuclei; the circumstances which diminish obesity, and a tendency to the formation of fat, would seem a priori to be opposed to the cancerous tendency (37).” Later, in the fourth edition of his textbook on medicine published in 1865 (38), Bennett continued to argue that tumor/development was connected with an “excess of nutrition” and added the more specific recommendation that “in carcinoma ... the body ... is for the most part fatty, and a diminution of this element in the food should be aimed at.” However, after writing his 1849 book (37), Bennett, in a postscript, recommended a newly discovered 1845 book by the physician George Macilwain (39), who said that the causes of cancer were due to dietary excesses and particularly warned against “grease, fat, and alcohol” because of their toxic effects on the liver. Macilwain further observed that “... of the cause of (cancer), I am at least certain of this, that either the food contains something unusual, or that some of the assimilating organs are acting on it in some unusual manner, or both. This seems indisputable.” Bennett, in 1849 (37), also made an interesting comment, which may be of interest, some 137 years later, to the Food and Nutrition Board of the U.S. National Academy of Sciences (40,41) that nutrition standards should reflect both upper and lower limits. Specifically, he said, “In the one case, we should do all we can to bring the nutrition up to and above the average (to reduce the risk of tuberculosis); in the other, down to and below it (to reduce the risk of cancer).”

<sup>8</sup>In 1929 (31), he had discounted the possibility that influenza and pulmonary tuberculosis were responsible causes of the increasing prevalence of lung cancer and stated that, as of that time, there was, “...no definite evidence that smoking habits are a direct contributory cause toward malignant growth in the lungs”; instead, he suggested that the new road surfacing practices might be considered as a responsible cause.

<sup>9</sup>This verbatim comment cited both by Williams (19) and by Hoffman (16) may have been a paraphrase of Lambe’s very strong views against meat consumption, as I could not locate it either in Lambe’s 1809 (35) or 1815 (36) books. It is, however, an accurate representation of his views published elsewhere by others.

Hoffman suggested that the 1908 publication by W. Roger Williams (19) "... marked an epoch in cancer literature, reviewing the whole subject with absolute impartiality and resulting in a cancer classic of the first importance." Further, he believed that "it is comparable only with Walshe's book on 'The Nature and Treatment of Cancer' published in 1846 (42) and that "the work of Williams has had no successor to the present time." If Williams' work was indeed a classic, what did it say? First, he considered that, of the various factors affecting tumor outcome, "probably no single factor is more potent in determining the outbreak of cancer in the predisposed, than excessive feeding." Williams then became more specific, stating that "many indications point to the gluttonous consumption of proteids—especially meat—which is such a characteristic feature of the age, as likely to be especially harmful in this respect ... no doubt other factors cooperate besides those I have already mentioned, and among these I should be inclined to name deficient exercise, and probably also lack of sufficient fresh vegetable food." He emphasized the effect of migration of peoples upon the changed incidence of cancer and said that "excessive feeding" and "changed environment" were the two major contributing factors to cancer causation. Although Williams emphasized in 1908 the environmental origin of cancer and the effects of migration upon cancer risk, his observations were already a half century after a similar view was expressed in 1846 by Walsh (42) who presented cancer mortality data to show that it was primarily a disease of "civilization."

This early literature suggested that the number of reports on the subject of diet, nutrition, and cancer reviewed by Hoffman were only a fraction (20–30%?) of those actually present in that early literature (16). Many were uniquely perceptive, in light of recent information. Here are a few gems that will be all too familiar to readers of the subject. Howard, in 1811 (43), as well as many others to follow in the next 175 years (see extensive comments by Thomson, writing in 1932 (44), advanced the argument that constipation was an important cancer-causing factor. Howard had come to this view after 40 years of practice with cancer patients. The important corollary belief that the consumption of plant foods decreased the incidence of constipation was widely understood. Howard also in 1811 (!) suggested that "... a virus generated probably within the body of the tumor itself ..." could be important (43). Braithwaite in 1901 (45) suggested that the four principal causes of cancer were salt, high nourishment (especially meat), "old cells with effete nourishment," and local irritation. In 1905, Hare (46) said that there was an "old standing idea in the profession that the increase of malignant disease is in some way associated with the increased cheapness and

improved quality of the world's food supply." An old standing idea in 1905? Williams, in 1908 (19), pointed out the parallel relationship between "good" nutrition and cancer, heart disease, diabetes, arthritis, and gallstones. Thomson, writing in 1932 (44), claimed that "... food is undoubtedly of great importance in the study of cancer..." "Undoubtedly of great importance" in 1932? He also worried that "many surgeons, radiologists, and chemotherapists scoff at the idea of food exerting any influence in the cause, arrest, or cure of the disease, and they carry their conviction so far as to put their patients on ordinary fare as soon as possible after an operation and also during treatment by radiation."

Why have so many experienced authorities and investigators said so much for so long about diet, nutrition, and cancer, yet been so completely ignored by contemporary writers? Why does investigation of this question (in 1985–86) emote such impassioned rebuke, especially by those outside the field? (12,13,47,48) Why are old hypotheses recycled for the present time without realizing their first proponents? Part of the answer to these questions must lie in our ignorance, and at times, rejection of history, no matter how many times through the centuries we have been reminded otherwise. After reading this account, I hope that the reader will realize that we must in the future, economize our research resources by taking into account what already has been considered. We participate in thinking what others have thought before us. Unfortunately, medical historians tend to write for other medical historians and researchers for other researchers. Much more insight could be gained if medical historians were invited to write in researchers' journals. Furthermore, these histories must be critical analyses, not mere chronologies of events that only tend to justify the status quo. Relevant histories should be comprehended by researchers, and assumptions must be continually questioned.

Hoffman's contributions to the research literature were truly remarkable, both in quantity and in scholarly pursuit. Few individuals, if any, appear to have contributed more to our knowledge on cancer causation during the years of 1913–1937. Yet, in spite of these achievements, his views on nutrition (and smoking) appear to have been largely ignored. Not a single reference to this day could be found either to his paper on smoking or to his monumental 1937 treatise on diet and cancer (16). Even the Medal granted in 1943 by ACS to Hoffman, their patron saint, seems to have been saved until the last possible minute of his life and then, no acknowledgment is given to his thirty-year-long interests and laborious studies on the nutritional causation and prevention of cancer. It was if the cancer research barons of that period were willing to have Hoffman undertake his

painstakingly detailed cancer census but then chose to ignore, even belittle his interpretation of the data. Did it have anything to do with the possibility that he was not in agreement with the overly simplistic local, as opposed to systemic, theory of cancer causation demanded by surgeons, chemotherapist, and radiation specialists? Did Hoffman's views imply that the services of surgeons might become curtailed? (49,50) Did his views tending toward vegetarianism (but not supporting the practice) present him as a timid soul? Did his boldly stated opinion on varied topics ranging from birth control, public policy (51,52), national health insurance (21), racism (21,25), and workplace legislation personally bias his peers? (22,23,53) Was his conclusion that "the principal dietary errors of the present day consist of a too heavy intake of protein and a corresponding excess in sugar intake" (see Eighth Annual Report of San Francisco Survey (18)), unquestionably suggesting a much diminished meat and sugar consumption, cause concern among the affected food industries? (54) Is it possible that early diet, nutrition, and cancer reports were ignored and/or vilified because of the inability of surgeons and other medical professionals, to comprehend a complex nutritional (nonmedical) issue for which they had no training?

Not only has there been since 1800 serious interest in an effect of nutrition on cancer occurrence but also it is abundantly clear that throughout this period, nutritional and environmental hypotheses were well known, especially to the founders and early leaders of the major cancer research and education societies, which were to subsequently dominate virtually all discussion and policy in this field. For example, Hoffman (26) in 1913 could not have been more specific in his "The Menace of Cancer" speech, which led to the founding of the ACS. Among his ten recommendations for the new Society, most were directed to the need for better statistical procedures and data for recording cancer prevalence among different populations, but two concerned specific advisories on the determination of cancer. He recommended that "incidences of occupational hazards with respect to cancer be exactly determined" and, further, that "nutritional influences on the induction of cancer be analyzed."<sup>10</sup> The new Society, although supporting his recommendation on research and development of statistical surveys, essentially discarded his recommendations to study nutrition and the environment as possible causes, thus setting a pattern that was to last for most of the Society's history.

<sup>10</sup>In the history of the Society written by E.H. Rigney (28), Hoffman specifically said, "Since an erroneous diet is a probable causative factor in cancer occurrence, the nutrition of cancerous patients should be investigated in conformity with the strictly scientific and conclusive methods of Professors Atwater and Chittenden."

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## References

1. Wynder EL: Introductory remarks. *Cancer Res* 35, 3238–3239, 1975.
2. Select Committee on Nutrition and Human Needs (U.S. Senate). *Dietary goals for the United States*, 2nd Edition. 83 (Washington, DC: U.S. Government Printing Office, 1977).
3. Committee on Diet Nutrition and Cancer. *Diet, Nutrition and Cancer*. (National Academy Press, 1982).
4. United States Department of Health and Human Services. *The Surgeon General's Report on Nutrition and Health*. (Superintendent of Documents, U.S. Government Printing Office, 1988).
5. National Research Council & Committee on Diet and Health. *Diet and health: implications for reducing chronic disease risk*. (National Academy Press, 1989).
6. Expert Panel. *Food, nutrition and the prevention of cancer, a global perspective*. (American Institute for Cancer Research/World Cancer Research Fund, 1997).
7. World Cancer Research Fund/American Institute for Cancer Research. *Food, Nutrition, Physical Activity, and Prevention of Cancer: A Global Perspective*. (Washington, D. C.: American Institute for Cancer Research, 2007).
8. Higginson J: Present trends in cancer epidemiology. *Proc Can Cancer Conf* 8, 40–75, 1969.
9. Higginson J and Muir CS: In: *Cancer Medicine*, Holland JF and Frei E (eds). Philadelphia: Lea and Febiger, 1973, pp. 241–306.
10. Doll R and Peto R: The causes of cancer: quantitative estimates of avoidable risks of cancer in the United States today. *J Natl Cancer Inst* 66, 1191–1308, 1981.
11. Chen J, Campbell TC, Li J, and Peto R: *Diet, Life-style and Mortality in China. A Study of the Characteristics of 65 Chinese Counties*. Oxford University Press; Cornell University Press; People's Medical Publishing House, 1990.
12. Garst JE: *Comments on Diet, Nutrition and Cancer*. Ames, IO: Council for Agricultural Science and Technology, 1982, pp. 28–29.

13. Jukes TH: *The Day that Food was Declared a Poison*. Ames, IO: Council for Agricultural Science and Technology, 1982, pp. 42–45.
14. Marshall E: Diet advice, with a grain of salt and a large helping of pepper. *Science* **231**, 537–539, 1986.
15. Mider GB: Research at the National Cancer Institute. *J Natl Cancer Inst* **19**, 191–223, 1957.
16. Hoffman FL: *Cancer and Diet*. Baltimore, MD: Williams and Wilkins Co., 1937.
17. Hoffman FL: *The Mortality from throughout the World*. Newark, NJ: The Prudential Press, 1915.
18. Hoffman FL: *San Francisco Survey. Preliminary and Final Reports*. Newark, NJ: The Prudential Press, 1924–1934.
19. Williams WR: *The Natural History of Cancer, with Special References to its Causation and Prevention*. London: William Heinemann, 1908.
20. Hoffman FL: In: *American Association for Cancer Research*. Buffalo NY, 1924.
21. Cassidy JH: Hoffman, Frederick Ludwig. *DAB Suppl.* **4**, 1946–1950.
22. Rosen G: *A History of Public Health: MD monographs on Medical History*, Vol. 1. New York: MD Publications, 1958.
23. Hoffman FL: *The Mortality from Consumption to the Dusty Trade*. Washington D.C.: Bureau of Labor, 1908.
24. Galishoff S: Hoffman, Frederick Ludwig. *Dict Amer Med Biogr* **1**, 1984.
25. Anonymous: In: *Who Was Who in America* Vol. 2. Chicago, IL: Marquis Who's Who Inc., 1943–1950.
26. Hoffman FL: The menace of cancer. *Trans Amer Gynecological Soc* **38**, 397–452, 1913.
27. Hoffman FL: The Menace to Cancer and American vital statistics. *Lancet*, 1079–1083, 1914.
28. Rigney EH: *The American Society for the Control of Cancer*. New York: New York City Cancer Committee Publ., 1944, pp. 1913–1943.
29. Triolo VA and Shimkin MB: The American Cancer Society and cancer research origins and organization: 1913–1943. *Cancer Res* **29**, 1615–1641, 1969.
30. Hoffman FL: In: *Cancer*, Adair FE (ed). Philadelphia: J.B. Lippincott Co, 1931, pp. 50–67.
31. Hoffman FL: Cancer of the lungs. *Am Rev Tuberculosis* **19**, 392–406, 1929.
32. Wynder EL and Graham EA: Tobacco smoking as possible etiologic factor in bronchiogenic carcinoma: study of 684 proved cases. *JAMA* **143**, 329–336, 1950.
33. Doll R and Hill AB: A study of the aetiology of carcinoma of the lung. *Brit Med J* **2**, 1271–1286, 1952.
34. U.S. Public Health Service. *Smoking and health*. (Washington D.C.: U.S. Government Printing Office, 1964.
35. Lambe W: *Reports on the effects of a peculiar regimen on scirrhus tumors and cancerous ulcers*. London, 1809.
36. Lambe W: Additional reports on the effects of a peculiar regimen in cases of cancer, scrofula, consumption, asthma, and other chronic diseases. *J. Mawman*, 1815.
37. Bennett JH: *On Cancerous and Cancroid Growths*. Edinburgh: Sutherland and Knox, 1849.
38. Bennett JH: *Clinical Lectures on the Principals and Practice of Medicine*, 4th Edn. London, UK: Adam and Charles Black, 1865.
39. Macilwain G: *The General Nature and Treatment of Tumors*. London, UK: John Churchill, 1845.
40. Marshall E: The Academy kills a nutrition report. *Science* **230**, 420–421, 1985.
41. Kamin H: Nutrition report and the academy. *Science* **230**, 1324, 1326, 1985.
42. Walshe WH: *The Nature and Treatment of Cancer*. London, UK: Taylor and Walton, 1846.
43. Howard J: *Practical Observations on Cancer*. London, UK: J. Hatchard, 1811.
44. Thomson WB: *Cancer: Is it Preventable?* London, UK: Chatto and Winders, 1932.
45. Braithwaite J: In: *What is the Root Cause of Cancer*, Marwood FT (ed). London, UK: John Bale, Sons and Danielson, Ltd., 1924, pp. 27–31.
46. Hare F: *The Food Factor in Disease*. Vol. 2. London, UK: Longmans, Green and Company, 1905.
47. Olson RE: *Diet, Nutrition and Cancer, a Critical Review*. Ames, IO: Council for Agricultural Science and Technology, 1982, pp. 55–61.
48. Scott ML: *Comments on the Diet, Nutrition and Cancer report with supplementary comments on related reports*. Ames, IO: Council for Agricultural Science and Technology, 1982, pp. 72–75.
49. Austoker J: The 'treatment of choice': breast cancer surgery 1860–1985. *Soc Soc Hist Med Bull (London)* **37**, 100–107, 1985.
50. Hayward J: The principles of conservative treatment for early breast cancer. *Handler* **141**, 168–171, 1981.
51. Hoffman FL: In: *Jubilee Historical Volume of the American Public Health Association*, Ravenel MP (ed). New York, 1921, pp. 94–117.
52. Hoffman FL: In: *National Organization for Public Health Nursing*. St. Louis, 1914.
53. Hoffman FL: In: *Fifth Annual Welfare and Efficiency Conference*. Harrisburg, PA, 1917.
54. Hoffman FL: In: *The Belgian National Cancer Congress Meetings*. Brussels, Belgium, 1923.