

## ***This Week's Citation Classic***

**Antar M A, Ohlson MA & Hodges R E.** Changes in retail market food supplies in the United States in the last seventy years in relation to the incidence of coronary heart disease, with special reference to dietary carbohydrates and essential fatty acids. *Amer. J. Clin. Nutr.* 14:169-78, 1964. [Dept. Intern. Med., State Univ. Iowa, Iowa City, IA]

**The increased incidence of coronary heart disease from 1900 to 1960 in the US cannot be attributed to a relative deficiency of dietary polyunsaturated fatty acids, since the polyunsaturated to saturated fatty acid ratio of the food supply in 1961 had increased about 30%. In contrast, the ratio of complex to simple carbohydrates had decreased to about 70%. A possible role of excess simple sugar intake, with saturated fat and concomitant low complex carbohydrates, in the development of coronary heart disease was suggested. [The SC<sup>®</sup> indicates that this paper has been cited over 125 times since 1964.]**

Mohamed A. Antar  
Department of Nuclear Medicine  
University of Connecticut Medical School  
Farmington, CT 06032  
and VA Medical Center  
Newington, CT 06111

March 14, 1980

"It is gratifying to learn that our paper has been so frequently cited. In 1962 it was widely accepted that a high consumption of saturated fat was responsible, at least in part, for the increase of coronary heart disease in the US.

"During a three-hour wait in the rail station at Chicago, I observed the different selections made by patrons from vending machines. To my surprise, 37 people selected the highly sugared items and only one person selected an apple. This impromptu observation provoked my thoughts on the role of carbohydrates. Before 1960, little work had been carried out with dietary carbohydrates. Therefore, we studied the changes in food consumption in the US and investigated the effect of the kind of carbohydrates upon serum lipids in man.<sup>1</sup>

"Although as a fellow I had minimal resources to work with, I was fortunate to be able to perform my research in four different labs (those of M. Ohlson, W. Connor, G. Stearns, and M. Osborn, to whom I am most grateful). The grueling task of calculations and

analysis of data was done by hand using a mechanical calculator.

"I recall distinctly how I was both surprised and pleased to observe emerging specific patterns. There was a great progressive decline (more than 55%) of complex carbohydrates with their fiber, and a concurrent dramatic increase of simple sugars (more than double) over the last 70 years. The even greater surprise was the finding that polyunsaturated fatty acids had increased by 40% while saturated acids hardly increased. The rise in dietary cholesterol was minimum. These data did not fit the hypothesis that low ratios of dietary polyunsaturated to saturated fatty acids contribute to the increase of coronary heart disease. In contrast, changes in the type of dietary carbohydrates may be a factor. Such a simple and obvious conclusion proved to my amazement not only a source of initial skepticism and controversy, but also a stimulant for research in this area. Since our initial report, hundreds of articles, several books, editorials, an Australian Academy of Science report, and two congressional Senate hearings have dealt with the subject.

"This paper is widely cited in my belief because: (a) it is one of the first comprehensive studies to offer another light on the relationship of dietary factors and coronary heart disease (carbohydrate connection) and to present a challenge to the then widely accepted hypothesis 'lack of unsaturated fat' and (b) the data were shown to have many ramifications into other fields such as dental caries, obesity, hyperinsulinemia, and cancer of the colon and rectum.

"Several years later, we found a synergistic hyperlipidemic effect between dietary simple sugars and saturated fat in patients<sup>2</sup> (i.e., when saturated fat levels surpassed a certain threshold, excess simple sugars with concomitant low complex carbohydrates were hyperlipidemic). These hypotheses may offer a better explanation of the problem and stimulate further research."

1. **Antar M A & Ohlson M A.** Effect of simple and complex carbohydrates upon total lipids, nonphospholipids, and different fractions of phospholipids of serum in young men and women. *J. Nutrition* 85:329-37, 1965.
2. **Antar M A, Little J A, Lucas C, Buckley G C & Csima A.** Interrelationship between the kinds of dietary carbohydrate and fat in hyperlipoproteinemic patients. Part 3. Synergistic effect of sucrose and animal fat on serum lipids. *Atherosclerosis* 11:191-201, 1970.