Introduction

W. H. M. Saris

What constitutes good nutrition for an athlete? This question was discussed long ago in ancient Greece. Since that time athletes have searched for the optimal diet. As a result the elite athlete’s choice of food and dietary supplements is frequently enthroned by a sphere of secrecy and magic.

It is amazing that athletic nutrition has evolved largely through tradition and self-experimentation despite the fact that our basic knowledge of the quantitative relationship between exercise and metabolism of carbohydrates, fats, and protein exists for many decades.

Heavy protein diets often appear to be the preferred choice of athletes. The idea that muscles are built of protein makes it appealing for athletes to ingest large amounts of meat in order to stimulate muscle growth.

Pettenkofer and Voit (2) showed in 1866 that protein combustion did not contribute significantly to the energy metabolism during exercise compared with the resting condition. This early observation has been confirmed frequently since that time. Also the contribution of fat oxidation to the exercising muscle is ignored despite the fact that in 1911 Zuntz (4) reported that during moderate exercise fat is the predominant fuel source.

In 1928 Bock et al. (1) drew attention to the importance of the intensity of the exercise on the contribution of fat and carbohydrate oxidation to energy metabolism. The higher the intensity of the work the more important the carbohydrate content of the diet is.

Since these early observations scientists in the fields of exercise physiology and nutrition have produced a large and impressive number of studies to elucidate, in detail, mechanisms underlying the interrelationships between exercise and nutrition.

Nevertheless, elite athletes still attribute part of their success to various nutritional manipulations or rituals, which have no scientific basis.

Therefore, it is important that emphasis is placed on nutritional education, making athletes in different sport disciplines aware of the principles of basic nutrition and the possibilities of nutritional manipulation as an ergogenic aid.

In 1976 when M. Williams (3) published his first edition of an extensive monograph on *Nutritional Aspects of Human Physical and Athletic Performance*, we started our research in this field.

Based on the information available, it was concluded that especially in the area of daily eating habits of elite athletes information was scarce. Therefore, a nationwide study was started to gather data concerning the nutritional habits of elite athletes. It took several years of collecting data in different groups of elite athletes. In papers 2 and 3 data of 419 athletes are presented. The results are of special interest knowing that in the Netherlands legislation forbids supplementation of vitamins to food items except for vitamins A and D to margarine. Therefore the results reflect, in detail, what can be achieved with a “natural” food intake compared with supplementation. Furthermore, information was gathered to evaluate which groups of elite athletes may be considered at risk in relation to the advised nutritional intake.

Especially in the field of education these results can increase awareness and focus attention on specific problem areas and the development of recommendations to improve the diet.

Papers 4 and 5, although involving novice runners, represent a longitudinal study over an 18-month period of training for a marathon. At first glance, these subjects do not fit into the theme of the supplement.

As a result of an increasing interest in a healthier lifestyle, many individuals started a jogging program with the ultimate goal of running a marathon. Also a new sport, the triathlon, has stimulated people to train seriously for many hours per week.

Although they never have the intention to reach a top-level performance, they try to reach their individual limits of endurance capacity just to prove that they can. To our knowledge, no longitudinal nutritional data from this segment of the population is present in the current literature. Does such a drastic change in life-style direct the diet toward a more healthier one? Therefore, it is of interest to follow the changes in dietary habits in the course of such a training program. Paper 4 is focused on dietary intake and body composition changes during this 18-month period. Paper 5 adds another important feature to the relationship between nutrition and exercise. It deals with the drinking habits and gastrointestinal problems of these novice runners competing in two endurance runs, a 25-km run and a marathon, both run for the first time. The descriptive data support a viewpoint that gastrointestinal complaints are not associated with larger fluid intakes, but rather with the degree of dehydration.
Papers 6 to 9 center upon research on one of the world's most demanding sporting events, the Tour de France. A portion of the data was gathered in the field and a portion was gathered during laboratory simulation trials. These articles constitute the heart of the supplement.

From the dietary intake data gathered in the field from elite professional cyclists, a descriptive laboratory study was performed to simulate, under strictly controlled conditions, 2 days of extreme cycling exercise, comparable to the Tour de France situation, followed by an experimental study (papers 8 and 9) designed to make sound recommendations relative to nutrition at this level of sport competition. Unique in this project was the possibility to study in the field, and under laboratory conditions, nutritional intake and the metabolic response to sustained exhaustive exercise at the ceiling of human capacity for hard physical work, a situation which becomes more and more common for elite athletes.

The results stressed the importance of carbohydrate as a fuel source as the diet was manipulated to an 80 E% carbohydrate level. The finding of a rapid super-compensation of glycogen within a 24-h period confirms observations in the field.

The metabolic and hormonal data in paper 9 are very interesting and the discussion, although speculative in many respects, should stimulate other researchers to examine metabolism under similar conditions.

Paper 10 adds additional information to the question of the role of carbohydrate supplementation and glycogen synthesis during mild exercise.

Finally, in paper 11, a practical nutritional problem in athletes was studied. On the one hand, it is advised to take extra carbohydrates. On the other hand, there are numerous reports of reactive hypoglycemia as a result of pre-exercise carbohydrate feeding. This has led to confusion among athletes and coaches. With an experimental setup designed to mimic the sequence of events that transpire in actual competition, i.e., integration of the carbohydrate intake with a warming-up protocol and rest period before the start of a race, no detrimental effects were found.

This supplement is not meant to present a state of the art of the field. It is simply a collection of papers which represent one of the research lines in which our department and especially I have been interested in over the past 10 years.

Based on information concerning the food habits of elite athletes gathered in the field, research efforts have been directed toward better defining optimal athletic nutrition. It was a challenge and a privilege to put together these results in this supplement.

Special thanks have to go to all athletes for their willingness to undertake these diverse and often tedious investigations. The authors are particularly grateful to our colleagues Prof. Clyde Williams, Prof. Melvin H. Williams, and Prof. Jack H. Wilmore who reviewed the manuscripts and offered valuable suggestions.

Finally, my sincere appreciation is extended to each co-worker and to Mrs. R. Croes and Mrs. T. Dickhaut for their secretarial work.

References


W. H. M. Saris MD PhD
Nutrition Research Centre
Department of Human Biology
University of Limburg
PO Box 616
NL-6200 MD Maastricht