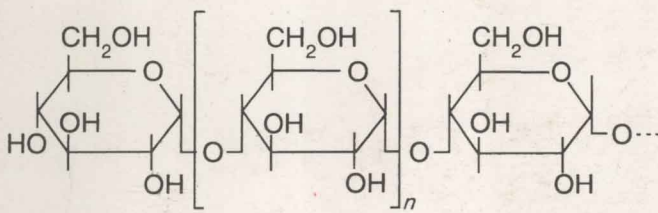


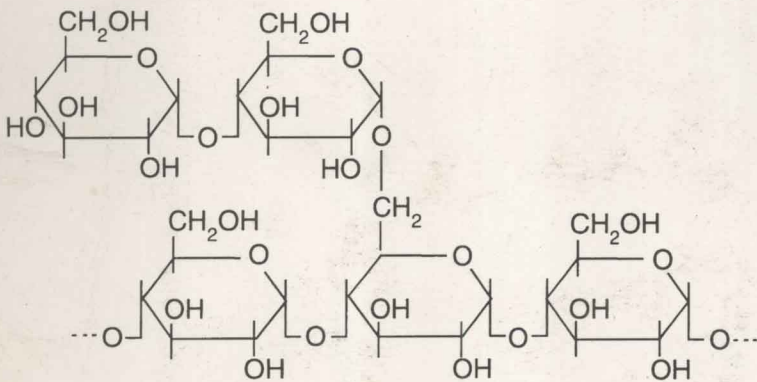
# Carbohydrates in human nutrition

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Amylose



Amylopectin

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# Carbohydrates in human nutrition

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Report of a Joint FAO/WHO Expert Consultation  
Rome, 14-18 April 1997

WORLD  
HEALTH  
ORGANIZATION



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## PREFACE

Carbohydrates are the single most important source of food energy in the world. They comprise some 40 to 80 percent of total food energy intake, depending on locale, cultural considerations or economic status. Those persons with high carbohydrate diets are often in the lower economic strata as foods high in carbohydrate, such as cereal grains, are most often the least expensive. Rice is an excellent example and is the primary staple in the diet of much of the world's population.

Food carbohydrates are not only an energy source, however, they have other roles as well. Typically, sugars are used as sweeteners to make food more palatable and to assist in food preservation. Diets high in carbohydrate may reduce individual propensity to obesity, and there is some evidence that such diets may also provide some protection against various non-communicable human diseases and conditions.

The concept of dietary fibre has changed. Fibre was originally described as plant cell wall material which simply passed through the gut unchanged and provided bulk to feces. Today it is known as an important moderator of digestion in the small bowel and as a major substrate for fermentation in the colon, where the non-starch polysaccharides of the plant cell wall are metabolized to short chain fatty acids. Absorption of the latter provides some energy. In addition, it has been shown that other carbohydrates are present in the diet which enter the colon and are fermented, including resistant starch and non-digestible oligosaccharides.

A previous Joint Expert Consultation on Carbohydrates in Human Nutrition, held in 1979, was wide ranging in scope. The report of that consultation (1) is essentially a reference document outlining the knowledge at that time of the various roles that carbohydrates have in the human diet. Included were the effects of processing on carbohydrates as well as carbohydrate digestion, absorption and metabolism. Of special concern to the consultation were the diets of infants and children. That consultation reached several conclusions regarding each of the areas discussed, and made a number of recommendations for future work.

The Joint FAO/WHO Expert Consultation on Carbohydrates in Human Nutrition was held in Rome from 14 to 18 April 1997. The Consultation was opened by Dr. H. de Haen, Assistant Director-General, Economic and Social Department, FAO, who welcomed the participants on behalf of the Directors-General of FAO and WHO.

In welcoming the participants, Dr. de Haen recalled the previous joint consultation on this subject, which was held in Geneva in 1979. That and the present Consultation are part of a long series of such expert consultations which have as a primary objective the review of the state of knowledge on the role of various nutrients in the human diet and the formulation of practical recommendations where interpretation is needed or controversy exists. The most recent in this series was the Joint FAO/WHO Expert Consultation on Fats and Oils in Human Nutrition held in Rome in 1993.

Consultations such as this are part of a continuing commitment by both FAO and WHO to promote a reliable, nutritious and safe food supply and to provide scientifically sound nutritional advice to member nations. This commitment was recently reaffirmed at the World Food Summit held in November 1996 in Rome.

Dr. de Haen pointed out that the understanding of the role that carbohydrates play in human nutrition and health has made great strides in the 18 years since the previous

carbohydrate consultation. Progress in carbohydrate chemistry has permitted the development of a variety of new food products, many of which are based on improved nutritional considerations. Perhaps the greatest impact of recent knowledge is our growing understanding of the diverse physiological roles that carbohydrates have, depending to a great extent on the site, rate and extent of their digestion and fermentation in the gut. This is leading to new dietary approaches, not only for better nutrition, but for improved health as well. Another understanding which has come about in recent years is the influence of carbohydrates on physical performance through glycogen loading. This technique is now well-established as an important factor for the improvement of endurance performance and capacity.

With these new advances in carbohydrate understanding come new issues which have important implications for agricultural production, the food industry and public health policy. Dr. de Haen pointed out that this Consultation will be addressing a number of these issues, and underlined the importance of the Consultation in providing international guidance in this broad area.

Dr. de Haen reminded the participants that they had been invited to the Consultation as independent experts and that their participation in the Consultation was to be in their individual capacity and not as a representative of any organization, affiliation or government.

Dr. Graeme Clugston, Director, WHO Nutrition Programmes, added his welcome to the participants, on behalf of the Director-General of WHO. Dr. Clugston pointed out that the formulation and implementation of science-based dietary guidelines have become a central issue for the nutritional sciences, as well as a major challenge for governments world wide, especially since the International Conference on Nutrition held in Rome, December 1992.

Research during the last two decades has firmly established that diet is one of the major risk factors in the development of a spectrum of non-communicable diseases. Dr. Clugston outlined some of the critical issues in this area, including the roles of mono- and disaccharides and starch as distinct from non-starch polysaccharides, their relation with dietary fats, and their contribution to dietary energy intakes. Obesity, non-insulin dependent diabetes, coronary heart disease, some cancers (notably colorectal) and other gastrointestinal tract conditions are among the diseases which can be beneficially influenced by dietary carbohydrates. However, frequent consumption of sugar and other fermentable carbohydrates throughout the day increases the cariogenic risk potential of the diet, especially in the absence of reasonable oral hygienic practices. On the other hand, sugar intake plays a less important role in caries causation if fluoridation and hygienic measures have been taken.

Dr. Clugston expressed confidence that this Expert Consultation would lead to scientifically sound, up-to-date, pragmatic recommendations on carbohydrates in human nutrition. FAO and WHO would then ensure that these recommendations would be passed on to all member states world wide, providing them with the best possible guidance for developing their own appropriate dietary guidelines for health promotion, good nutrition and disease prevention.

The Consultation elected Dr. David Lineback as Chairman and Dr. Ruth Oniang'o as Vice-Chair. Dr. Mark Wahlquist and Dr. Thomas Wolever were appointed jointly as Rapporteurs. Dr. Lineback in his response indicated the importance of this Consultation and outlined the scope of the issues that would be discussed and on which the two agencies, FAO and WHO, were seeking expert guidance from the Consultation.

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