



CARBOHYDRATE NEWS

Providing the most current and practical scientific information on carbohydrate and its role in nutrition and health

Carbohydrates in the Classroom

Contributed by Dr. Rena Mendelson, D.Sc., RD, Ryerson Polytechnic University

Parents and teachers alike are concerned about the impact of food on the behaviour and scholastic performance of children. Some of these concerns relate to the rapid media communication of research results, which leaves this information open to misapplication by lay persons with responsibility for child nutrition. In other cases, careful research that does not support “common wisdom” about feeding children is rejected outright in spite of its veracity.

In extreme circumstances, nutrient deprivation in early life can have a profound impact on child development. In Canada, concerns about the impact of moderate hunger on children’s learning have been expressed by teachers, social policy advocates and politicians (1). Rising numbers of Canadian children living below the poverty level have heightened the concern of the public as well as policy makers. As a result, a number of initiatives have arisen in the last few years to address the problem of hunger that is associated with poverty. These initiatives include school breakfast and snack programs as well as classroom practices which encourage children to share any unused lunch items (2). Although evaluation of these initiatives is variable, there is a need to consider the nutritional value of the foods provided by these programs and the importance of carbohydrates in the classroom.

Supplementary feeding programs for children such as the School Lunch programs (begun in 1946) and School Breakfast programs (since 1966) have been present in American schools for many years. In Canada, they began to emerge in the 1980s and 1990s in response to a recognized community need to provide food assistance to needy children (3). Recently, they have become an integral part of life at many schools. The need for such Canadian programs has been questioned following a survey of Nova Scotia’s school children which determined that 95% of those children ate some form of breakfast before leaving home (4). Nevertheless, breakfast programs have become part of many school communities and merit evaluation to determine whether they fulfil an unmet need to provide an extra morning meal for children.

Breakfast is an important meal, especially when it comes to school performance. For well nourished children participating in controlled experimental settings, breakfast has been shown to improve short term memory tasks and cognitive performance. For poorly nourished children, the impact is more dramatic (5). With changing dietary patterns and social trends, there is heightened interest in the composition of the ideal breakfast. For many years we have known that the key nutrient for brain function is glucose. More recently, researchers have demonstrated that glucose utilization increases during cognitive functioning and that increases in blood glucose levels can improve memory (6). Therefore, it would appear that the ideal breakfast should be of a size and composition that would favour the maintenance of blood glucose levels throughout the morning. Clinical trials to establish the optimal content have not yet been reported, however, a balance of carbohydrate, fat and protein is warranted. For practical purposes, this should include at least one or two servings of grains or cereals, a serving from the Meat & Alternatives group and a serving from the milk group.

Choosing a breakfast cereal can be a challenge for parents of young children. Advertisers promote sweetened versions on television aimed at preschoolers, but parents have been led to believe that these are not as nutritious as the unsweetened choices available in the marketplace. A close look at the cereal box will give a better picture of the nutrient composition, as cereal manufacturers have long been proponents of nutrient labelling. The vitamin and mineral content does not vary greatly among the products as most are

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fortified to comparable levels. In fact, fortified grains provide 50% of Canadians' dietary iron intake (7). Differences in fibre and fat content of a cereal arise mainly from the blend of grains and other foods in the recipe – and sweetened cereals can also be sources of fibre in a child's diet. The choice becomes one of personal taste. Sweetened cereals represent a grain-based breakfast, fortified with several vitamins and minerals, which also provides an acceptable taste experience. As a point of interest, a 1944 US reference actually promoted the addition of sweets, to enhance grain consumption (8).

Young children with smaller appetites may not be able to consume sufficient amounts of food to maintain blood glucose from breakfast until lunch time. Therefore, they would benefit from a planned snack during the morning. This has become part of the routine in many kindergarten classes and has also contributed to the confusion about what to offer children. Food planning has been complicated by the restrictions that have been imposed in the classroom because of potential allergic reactions, religious or other taboos and teachers' beliefs about nutrition. Teachers often equate sweet foods with a range of health problems and have a strong sense that these are the cause of excited behaviour among their students (9). These concerns remain unfounded (10) and in fact, research suggests that carbohydrate snacks could serve to improve children's classroom behaviour (11). Based on the need to enhance blood glucose, a snack should contain a reasonable amount of carbohydrate. Some practical suggestions include fruit or juices, bagels with cheese or jam, mixed cereal snack combinations, vegetables and dip, and cookies and milk. These should be viewed as nutritional supplements that are important to satisfy the child's appetite and not as forms of behaviour reinforcement. Children should be offered food but not required to eat if they are not hungry.

Parents, teachers and communities have a role to play in providing children with the optimal nutrients required for learning and socialization. As long as a variety of nutritious foods are provided within the appropriate context, children will develop positive nutrition habits and enhanced school performance.

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DEFINITIONS: HYPERACTIVITY

Hyperactivity, more specifically known as Attention-Deficit/Hyperactivity Disorder (ADHD), is part of a group of psychological disturbances known as disruptive behaviour disorders (1). These disorders are characterized by behaviour that is socially disruptive and causes significant impairment in the social, academic or occupational functioning of the individual. ADHD is diagnosed up to nine times more frequently in boys than girls, and is estimated to affect 3 to 5% of school-age children.

The diagnosis of ADHD is complicated. An extensive assessment of the child's behaviour must be made. The goal is to determine that the child has met several criteria related to inattention, hyperactivity or impulsivity, over the course of at least 6 months, to a greater degree than would be expected for the child's mental age. These symptoms must have been present before the child's 7th birthday, and evident in two or more settings (eg. at home and at school). Further, the most current manual used to diagnose mental disorders specifies that "in early childhood, it may be difficult to distinguish symptoms of Attention-Deficit/Hyperactivity Disorder from age-appropriate behaviors in active children" (1).

An extensive review of the scientific research on this subject demonstrated that sugar in the diet does not affect the behaviour or cognitive performance of children suffering from ADHD (2). It is a common belief that dietary change will improve the behaviour of hyperactive children, but the optimism is unwarranted. For children who are believed to be suffering from these disorders it is best to confirm the diagnosis and the most appropriate course of treatment with a physician.

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TABLE 1. INTAKE OF CARBOHYDRATE

Country	Year of survey	Age
Netherlands ⁴	1987-88	4-18
UK ⁵	1986-87	15-16
UK ⁶	1990	11-12
USA ⁷	1988	10-11
Australia ⁸	1985	10-15
New Zealand ⁹	1993	10-11

TABLE 2. SOURCES OF SUGARS CONSUMPTION – CHILDREN

Food Group
Grain products
Sugars, jams, honey and syrups
Milk and milk products
Beverages
Fruit and fruit juices
Vegetables
Confectionery
Other foods
n
Age of subjects
Method of dietary assessment
Sugars intake, g
Sugars % energy
*in this study, sugars, jams, honey and syrups

? ASK A QUESTION ??

How much carbohydrate are Canadian children eating?

Carbohydrate Intakes in Canadian Children

Contributed by Dr. Alison Stephen, Ph.D., University of Saskatchewan

Although it seems like a straightforward question, it is difficult to estimate how much carbohydrate Canadian children are eating. There has been no nation-wide assessment of the diets of Canadian children since the Nutrition Canada Survey, conducted in 1971-72 (1). In that survey, children were subdivided into four age groups: 1-4 years, 5-11 years, 12-19 year old males and 12-19 year old females. Total carbohydrate contributed 46-50% of food energy, with the highest levels in those aged 5-11 years. Cereal products provided the highest proportion of carbohydrate – approximately 40% for those over age 5, and somewhat less, 34%, in the 1-4 year age group. Fruit, vegetables, dairy and other foods all provided similar proportions of dietary carbohydrate, from 9-24% depending on age. The youngest groups consumed more carbohydrate from fruit and dairy foods and less from other foods, including soft drinks, confectionery, syrups, jams and frostings.

A number of small surveys conducted since Nutrition Canada have reported similar carbohydrate intakes among Canadian children. In 1986-87, Moisan et. al. studied the diets of 666 girls in Grade 5 in Quebec City and found a carbohydrate intake of 49.4% energy (2). A 1988-89 study by Shatenstein and Ghardirian described the diets of 182 Montreal children aged 5-18 years and found that carbohydrate intake ranged from 45 to 53% of energy, with the higher proportions in children aged 5-10 years

(50 to 53 % of energy), as was reported in Nutrition Canada, 15 years earlier (3). There appears to have been very little change in intake of total carbohydrate in Canada since the early 1970s.

More than simply the total amount, it is also of value to know which types of carbohydrate are being eaten by young Canadians, and from what sources. Very little information exists about carbohydrate components in the Canadian food supply, due to the lack of comprehensive analytical information about the carbohydrate content of foods in the Canadian Nutrient File. However, studies from Europe, the United States, Australia and New Zealand, where overall dietary patterns are similar, provide more information about intakes of starch and total sugars (including naturally occurring mono- and di-saccharides, as well as those added in food processing and preparation). In these international studies, using similar methods of dietary assessment, total carbohydrate provided 47 to 54% energy, starch 22-28% and total sugars 21-27% (4-12), in the diets of children under age 18.

As found in Nutrition Canada, the major sources of dietary carbohydrate in these countries are grain products, generally contributing 40-50% of the total carbohydrate. Vegetables and fruit also make a major contribution, with most carbohydrate from vegetables coming from potatoes. The carbohydrate contribution from specific foods varies considerably from one country to another, with those in the US and Australia consuming considerably more fruit, fruit juices, milk products, and beverages than in the UK. In the UK, there was a proportionally greater intake of confectionery, sugars, jams and syrups than in the US or Australia. While no recent Canadian survey is available, adult surveys in Quebec and Nova Scotia suggest that Canadian intake patterns are more like those of the US and Australia than the UK.

Canada's Nutrition Recommendations promote the consumption of 55% of energy as carbohydrate, from a variety of sources. From the information that is currently available, it appears that Canadian children are falling short in their intake of this important group of nutrients. There is a place for all sources of carbohydrate in the diet, and all Canadians should be encouraged to choose often from the wide variety of carbohydrate-containing foods available in the food supply.

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DIETARY CARBOHYDRATE AND ITS COMPONENTS, INDIVIDUAL COUNTRIES

n	Energy kcal	CHO g/d	CHO % energy	Starch g/d	Starch % energy	Total sugars g/d	Sugars % energy
1409	2256	271	48.0	121	21.5	148	26.2
4760	2369	278	46.9	154	26.0	124	20.9
379	2015	258	51.2	139	27.6	119	23.6
871	1613	202	50.1	104	25.8	99	24.6
5224	2049	259	50.6	129	25.2	130	25.4
251	1946	263	54.0	130	26.7	133	27.3

DIETARY CARBOHYDRATE AND PERCENT CONTRIBUTION TO DAILY TOTAL SUGARS IN CHILDREN – INDIVIDUAL ASSESSMENTS

USA ¹⁰ 1987-88	USA ¹¹ 1977	Australia ⁸ 1983	UK ¹² 1983
20.1	20.2	16.5	28.8
na*	9.8	10.0	18.6
26.9	25.9	23.2	13.0
21.6	13.8	18.0	9.2
15.9	20.3	16.3	7.1
2.1	na	2.4	3.7
2.7	2.6	8.3	18.2
10.7	4.9	4.0	1.5
1008	657	5224	2705
7-15y	5-12y	10-15y	10-15y
3d record	7d record	24h recall	7d weighed record
116	134	131	123
24.8	24.9	25.6	23.0

*and syrups are included in "other" foods

Carbohydrate News

Carbohydrate News is an annual publication of the Canadian Sugar Institute (CSI). CSI maintains a scientific library and comprehensive computer database of current literature pertaining to carbohydrate, sugar and health. CSI also publishes resource material for health professionals, educators and the public.

CSI gratefully acknowledges the contributions made by the Editorial Board; Gérald Fortier, for his French adaptation; and Nathalie Jobin, dt.p., M.Sc., for her additional review of the French adaptation of *Carbohydrate News*.



Publié en français sous le titre : «*Glucides-Info*».

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CARBOHYDRATE LIT SCAN

Duffy VB, Anderson GH. Position of the American Dietetic Association: Use of nutritive and non-nutritive sweeteners. *J Amer Diet Assoc* 1998;98(5):580-7.

This updated position statement from the American Dietetic Association reviews the literature on the use of nutritive and non-nutritive sweeteners within the context of a healthy diet, as defined by the Dietary Guidelines for Americans. The authors conclude that the moderate use of many types of sweeteners can safely add pleasure to healthy eating.

Birch LL, Fisher JO. Food intake regulation in children. *Ann NY Acad Sci* 1997; 819:194-220.

This paper summarizes current research on the impact of macronutrient substitutes on children's appetites and food intake. Limited existing data suggest that by altering the energy density and macronutrient composition of foods through the use of macronutrient substitutes (often fat or sugar substitutes), children tend to adjust for energy reduction. The authors advocate for further, large-scale studies of the effects of macronutrient substitutions on children's food intake.

Tucker LA, Seljaas GT, Hager RL. Body fat percentage of children varies according to their diet composition. *J Amer Diet Assoc* 1997;97:981-6.

This study examines the association between diet composition and body fat percentage in children. Results indicate that total energy intake and fat intake are positively associated with adiposity, but that carbohydrate intake is inversely associated with adiposity. The relationships between carbohydrate and fat intakes and body fat percentage were independent of the influence of total energy intake, gender, physical fitness and parental body mass index.

Consumer Views

Naturally, children select foods that taste good. Parents of young children are concerned about feeding them adequately, to ensure that they grow and develop properly and to provide the energy required to play and learn. Given the fact that sweet foods appeal to a child's palate from a very early age, are parents comfortable that sugar and sweetened foods can play a part in a healthy diet for their children? A survey conducted in 1998 by Tandemar Research, for the Canadian Sugar Institute provided some insight into this question (1).

A majority of parents responding to this survey readily agree that "sugar in moderation is all right for children", but only 22% of these parents are equally comfortable with the idea that "sugar makes a wider variety of healthy foods acceptable to children and adults alike". More than half of these parents are at least somewhat concerned about sugar causing tooth decay. Despite some very convincing scientific evidence to the contrary (2), which has received support from agencies such as the United Nations Food and Agriculture Organization and the World Health Organization (3), more than one third of these parents still firmly believe that sugar causes hyperactivity. Curiously, less than one quarter of these parents feel strongly that this is a problem with their own children.

The bottom line is that many parents remain confused about the role of sugar in healthy eating for their children. However, most feel that sugar is an acceptable part of their children's diets, when used in moderation.

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