Acta Biomed 2009; 80: 166-171

Consensus Statement

A consensus document on the role of breakfast in the attainment and maintenance of health and wellness

Franca Marangoni[1], Andrea Poli[1], Carlo Agostoni[2], Pasquale Di Pietro[2], Claudio Cricelli[3], Ovidio Brignoli[3], Giuseppe Fatati[4], Marcello Giovannini[5], Enrica Riva[5], Giuseppe Marelli[6], Marisa Porrini[7], Carlo Maria Rotella[8], Giuseppe Mele[9], Lorenzo Iughetti[10], Rodolfo Paoletti[1]

[1] Nutrition Foundation of Italy (coordinators) (NFI); [2] Italian Society of Paediatrics (SIP); [3] Italian Society of General Medicine (SIMG); [4] Italian Dietetic and Clinical Nutrition Association; [5] Italian Society of Paediatric Nutrition (SINUPE); [6] Diabetology Medical Association (AMD); [7] Italian Society of Human Nutrition (SINU); [8] Italian Society of Obesity (SIO); [9] Italian Federation of Paediatrician (FIMP); [10] Italian Society of Pediatric Endocrinology and Diabetology (ISPED)

Background and aims

An increasing scientific evidence, obtained in several Countries with different dietary habits, shows that regular breakfast consumption is associated with better health status at any age. Notwithstanding this evidence, both systematic reviews of the literature and statistical investigations on population samples support the notion that the first meal of the day is the most underestimated, and often completely neglected.

According to 47 observational studies on breakfast habits, carried out in the US and in Europe, about 10-30% of children and adolescents regularly skip breakfast. This detrimental practice progressively increases from childhood to adulthood (1).

Data from Eurisko, the leading Italian market research organization, indicate that this issue concerns Italy as well. Although 90% of the population declares that they usually have breakfast, only about 30% eat a quantitatively and qualitatively appropriate meal at the beginning of the day. Every morning, most adults just drink a cup of coffee or a cappuccino. There is an increasing trend towards standing-up and hurried breakfasts, eaten out of home, with little attention paid to the meal composition. A subsequent analysis, made by Eurisko in 2007 on an Italian population sample, confirmed these data and characterized habits, lack of time, and lack of appetite as the main causes for passing over breakfast.

Based on the increased awareness of breakfast and its composition and consumption modalities – in the context of health and wellbeing - the Nutrition Foundation of Italy (NFI) decided to gather a group of experts, representative of the main Italian medical societies dealing with human nutrition. The aim was to prepare a consensus document on the importance of breakfast, based on recent scientific evidence.

Nutritional, functional, and metabolic role of breakfast consumption

After prolonged night fast, breakfast must first provide readily-available energy to allow coping with the morning activities and those of the day. Skipping breakfast may worsen early morning operations, leading to lower rates of intellectual performance and endurance in the case of physical exercise (2-4). In children, adequate breakfast is associated with improved memory performance, attention, ability in problem solving, and better comprehension during reading and listening. Performance is comparatively more efficient not only immediately after consuming breakfast, but also throughout the following hours, as also observed

in adult subjects (1, 5-8). Breakfast may modulate brain function by at least two biological mechanisms: a) by providing the central nervous system with essential nutrients and b) by modulating the efficiency of cognitive processes (9).

Results from controlled trials suggest that regular breakfast consumption also improves several metabolic parameters, mostly associated with cardiovascular risk and – in general - with the overall health status (10, 11). Indeed, regular breakfast consumption is associated with improved insulin sensitivity and higher glucose tolerance during the following meals; reduced circulating LDL cholesterol levels and LDL oxidation; and lower blood triglycerol concentrations (12). The main components of a balanced breakfast (carbohydrates and fibres, mainly supplied by fruits, grains, and cereals) directly improve glucose metabolism and the insulinemic response. The resulting greater sense of satiety is responsible for the lower caloric intake during the following meals (13). The lower cholesterol levels of regular breakfast consumers reported by epidemiological studies have also been related to the elevated provision of fibre obtained with a carbohydrate-based meal, especially if consumed within a diet generally rich in fibres. The lower daily fat intake associated with a balanced diet made of four meals (breakfast included) contributes to the control of lipid metabolism (10, 14).

Breakfast, appetite, and satiation

Complex carbohydrates usually consumed during breakfast, including bread, toasted bread, biscuits, and ready-to-eat breakfast cereals, affect both the activity and the release of hormones such as gastric inhibitory peptide (GIP), glucagon-like peptide-1 (GLP-1) and colecystokinin (CCK), which differentially affect glycemic levels after meals and, consequently, satiety (15, 16). Balanced breakfasts, which include significant amounts of proteins and lipids (essentially supplied by milk and milk-derived products), also modulate ghrelin secretion and appetite (17). The decrease in blood glucose variations subsequent to the described metabolic changes may help in reducing the feeling of hunger (18). Finally, consumption of food in the early morning, within breakfast, has a marked satiating power *per se*, leading to the control and moderation of the total energy intake throughout the whole day (19).

Breakfast habits and risk of overweight and obesity

The Italian guidelines for a correct nutrition (20) suggest that breakfast should provide about 15-20% of the daily caloric intake (15% if coupled with a mid-morning snack, 20% without between-meals snacks). Contrary to the common knowledge, this amount of calories does not significantly increase the risk of exceeding the total daily recommended energy supply. Indeed, a large number of studies demonstrates that those who habitually have breakfast are less predisposed to overweight and obesity, and that normal-weight adolescents, who often skip breakfast, are as likely to experience an increase of body mass index (BMI) as adults (21-25). Moreover, a prospective study on more than 24,000 boys aged 11-18 yrs., carried out in the US from the '60s, showed that a reduced frequency of breakfast consumption is associated with a significant BMI increase (26). More recent data from the E-MOVO study, on 35,000 Swedish secondary school students (aged 13-16 yrs.), aiming to assess the association between different lifestyle habits and BMI, indicate that skipping breakfast is related to overweight more than alcohol drinking and even more than physical inactivity, in particular among the younger subjects (27). Similar results are provided by prospective studies carried out on adult populations. Among men older than 46 years recruited within the 'Health Professionals Follow-up Study', those regularly consuming breakfast, together with more than three daily meals, exhibited a lower (<5 kg) weight increase during the 10 years follow up (28), as compared to those who skip breakfast. In a British population of both men and women older than 40 years, subjects consuming a high percentage of calories with breakfast had a lower mean BMI and a reduced weight increase during the following 5 years, as compared to men consuming a lower percentage of calories in the same meal (29).

Breakfast, health, and chronic diseases

Epidemiological observations report many favourable metabolic effects of breakfast on lipid profile, glucose tolerance, overweight/obesity, and, consequently, on the reduction of the risk of cardiovascular diseases and type 2 diabetes (30-32). Notably, such effects are more frequently observed when breakfast includes grains and fruit.

However, the most supportive evidence comes from observational studies, whereas only few randomized intervention trials have been published on this topic, mostly lasting for short periods and performed on limited population groups. The vast majority of the intervention studies available thus far is, anyway, consistent with the positive effects of breakfast (particularly if rich in grains and low glycemic index carbohydrates) on the reduction of risk factors for cardiovascular diseases and diabetes, namely glycaemia, insulin levels, cholesterolemia, and overweight (12, 33- 35).

Breakfast and overall quality of the diet

Breakfast consumption may contribute to the control of risk factors for chronic diseases by affecting, both directly and indirectly, the broad composition of the diet. A large number of observational studies indicate that regular breakfast consumers' intake of macro and micro nutrients is more adequate than that of subjects who skip breakfast. The nutritional profile of people regularly consuming breakfast is characterized by higher levels of intake of fibre, calcium, vitamins, and minerals and lower intake of fats, cholesterol, and total calories. Conversely, missing out breakfast is associated with a reduced probability to attain the recommended dietary allowances of specific micronutrients throughout the day, independent of any food fortification effect (10, 36, 37). Since all of the nutrients usually supplied with breakfast are relevant to children and adolescents, those who skip breakfast ingest lower amounts of micronutrients, which are not likely to be supplied by other meals during the day. Data from the Bogalusa Heart Study, for instance, show that most 10-years old children skipping breakfast do not reach 2/3 of the dietary allowances for vitamins A, B6, D, riboflavin, folates, calcium, iron, magnesium, phosphorus, and zinc (38). Also, the total intake of fibre associated with vegetable foods, as fruit and whole grains, is - on average - higher among people who regularly do have breakfast (39).

Breakfast models

While breakfast, if regularly consumed, is associated with the reduction of various disease risks, emphasis should be placed on the notion that only an overall balanced diet, associated with a healthy lifestyle, may exert positive effects on health and have preventive roles. Nevertheless, considering the positive role of breakfast (*per se* or as marker of healthy lifestyle), dietary recommendations should include all the features affecting the choice and the maintenance of this positive dietary habit in the context of the general diet. Breakfast should be consumed within the family context, with parents acting as positive examples to children and adolescents, and care should be devoted to supportive features such as acceptability, pleasantness, taste, visual impression, and multiple daily choices within a variety of foods.

The development of educational messages promoting breakfast is made more difficult by the observation that most of the published scientific studies has taken into consideration breakfast patterns typical of Anglo-Saxon and North-European lifestyles and habits. This Panel believes that a large number of breakfast models should be encouraged, merging scientific evidence with the dietary traditions typical of Italy. This kind of approach might reinforce breakfast habits, whose benefits seem to exceed those merely associated with its composition.

A particular attention must to be paid to the following points:

1. A balanced intake of nutrients within different breakfast models may be varied throughout an adequate time period (at least one week). Breakfast should not be proposed as a standardized model, since it represents a true meal (similarly to lunch and dinner) which does not follow unique patterns, but changes in composition according to different food choices, ta-

stes, and preferences, all framed within different habits and traditions.
2. The overall dietary balance, including all the daily meals, should be taken into account.
3. The overall nutrient intake should be consistent with the level of physical activity during the day and the individual lifestyle.

The following notions can be derived from these observations:

1. Breakfast is integral part of a balanced dietary pattern. Besides regulating the feeling of hunger and satiety throughout the day, it also needs to meet the metabolic requirements that follow an overnight fast.
2. As a consequence, breakfast must include sources of rapidly available energy together with sources that are more slowly released, in order to prevent hypoglycaemia and hunger and to modulate satiety, both in the following few hours and during the whole day. The optimal model includes carbohydrates with different glycemic indices, as well as proteins and fats, ought to their ability of modulating satiety. The presence of different food items may contribute to a substantial supply of micronutrients. Based on breakfast size, body requirements, exercise level, and general lifestyle a midmorning snack may also be considered.
4. Maintaining breakfast during childhood – as supported by epidemiologic data – is causally associated with a reduced risk of overweight and obesity.
5. Breakfast during childhood and adolescence should be a pleasant occurrence and should be consumed within the family, providing a variety of different dietary choices, as for lunch and dinner.

Specific aspects of breakfast

Milk and milk derivatives (e.g. yoghurt) provide the greater amount of high nutritional quality proteins and of lipids. The choice of partially-skimmed products considerably affects these intakes. Totally-skimmed milk and yoghurt do not seem necessary to meet energy requirements. Fats from breakfast may also be supplied by oven-baked products and by spreads. Both the quality and metabolic effects of dietary fats change according to their degree of lipid saturation. The intake of saturated fats and, in particular, partially hydrogenated *trans* fatty acids requires attention, due to their proven unfavourable effects on health (40, 41).

Chocolate-based products need a separate consideration, because their lipid fraction contains monounsaturated and saturated fatty acids. Among the latter, stearic acid is the major component and has a limited metabolic impact. Since the taste of chocolate increases the pleasantness of breakfast, this could potentially support breakfast habits, also for a longer period of time. Therefore, chocolate-derived foods may reasonably be included in the suggested turnover of breakfast models.

A balanced breakfast should be mainly constituted by carbohydrates, supplying up to 50% of the total energy (20, 42). Together with fruits, cereal-based products (bread, biscuits, toasted bread, and ready-to-eat breakfast cereals) represent the main source of these nutrients. Simple sugars provide rapidly available energy, useful to start the day after the overnight fast. Moreover, complex carbohydrates are slowly released from whole grains and ensure the energetic supply for the following hours (43, 44). Furthermore, in patients who need a strict control of glucose intake (e.g. diabetic patients), increased consumption of slowly absorbed products (such as fiber-rich whole grains) does not seem to affect their glycemic response in the period immediately after the meal (45).

In many studies using breakfast models typical of Anglo-Saxon and North-European lifestyles, the intake of whole grain-based, ready-to-eat breakfast cereals has been associated with benefits in terms of prevention of chronic diseases (32, 46). Adolescents and adults consuming ready-to-eat breakfast cereals have higher carbohydrate and reduced dietary intake of fats (as percentage of total calories), and consume macronutrients (in particular iron with fortified cereals) at levels nearest the recommended ones (47, 48), also indirectly improving the consumption of milk and calcium (49). Indeed, an appropriate breakfast model should include milk or yoghurt, providing calcium.

This effect is nutritionally relevant, because of the tendency of children to exclude milk in favor of foods with poorer nutritional profiles. According to an ISTAT report (50), one out of five Italian children stops consuming milk starting from 6 years of age, thus excluding from the diet this important source of calcium, which is essential for growth.

Conclusions

Considerable evidences, mainly derived from epidemiological studies, but also supported by few intervention trials, confirm the role of breakfast as part of a healthful and balanced diet, and suggest that its benefits may be partly immediate and partly mediated by the macro and micro nutrients supplied with this meal. The regular consumption of breakfast providing about 15-20% of the daily caloric intake is associated with a higher likelihood to reach the recommended dietary levels of some micronutrients and with a reduced risk of developing obesity, cardiovascular events, and diabetes, possibly by controlling some of their risk factors. Children and adolescents who regularly have breakfast also exhibit short-term improvement in school performance.

Grain-derived products such as bread, biscuits, toast bread and ready-to-eat breakfast cereals should provide the major proportion of carbohydrates. Milk and milk-derived products - within a balanced breakfast - represent the main sources of proteins, lipids, and some micronutrients.

An appropriate turnover of different breakfast models might favor the regular consumption of complete breakfasts, extending its favorable effects to both the psyco-physic efficiency and the feeling of satiety in the next hours, concomitantly contributing to a general protective effect on health.

References

1. Rampersaud GC, Pereira MA, Girard BL, Adams J, Metzl JD. Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. *J Am Diet Assoc* 2005; 105: 743-60.
2. Cueto S. Breakfast and performance. *Public Health Nutr* 2001; 4: 1429-31.
3. Vermorel M, Bitar A, Vernet J, Verdier E, Coudert J. The extent to which breakfast covers the morning energy expenditure of adolescents with varying levels of physical activity. *Eur J Clin Nutr* 2003; 57: 310-5.
4. Fanjiang G, Kleinman RE. Nutrition and performance in children. *Curr Opin Clin Nutr Metab Care* 2007; 10: 342-7.
5. Bellisle F. Effects of diet on behaviour and cognition in children. *Br J Nutr* 2004; 92 (Suppl 2): 227S-32S.
6. Mahoney CR, Taylor HA, Kanarek RB, Samuel P. Effect of breakfast composition on cognitive processes in elementary school children. *Physiol Behav* 2005; 85: 635-45.
7. Benton D, Parker PY. Breakfast, blood glucose, and cognition. *Am J Clin Nutr* 1998: 67 (suppl): 772S–8S.
8. Smith AP. Breakfast cereal consumption and subjective reports of health. *Int J Food Sci Nutr* 1999; 50: 445-9.
9. Pollitt E, Mathews R. Breakfast and cognition: an integrative summary. *Am J Clin Nutr* 1998; 67: 804S-13S.
10. Ruxton CH, Kirk TR. Breakfast: a review of associations with measures of dietary intake, physiology and biochemistry. *Br J Nutr* 1997; 78: 199-213.
11. Affenito SG. Breakfast: a missed opportunity. *J Am Diet Assoc* 2007; 107: 565-9.
12. Farshchi HR, Taylor MA, Macdonald IA. Deleterious effects of omitting breakfast on insulin sensitivity and fasting lipid profiles in healthy lean women. *Am J Clin Nutr* 2005; 81: 388-96.
13. Blom WA, Stafleu A, de Graaf C, Kok FJ, Schaafsma G, Hendriks HF. Ghrelin response to carbohydrate-enriched breakfast is related to insulin. *Am J Clin Nutr* 2005; 81: 367-75.
14. Matthys C, De Henauw S, Bellemans M, De Maeyer M, De Backer G. Breakfast habits affect overall nutrient profiles in adolescents. *Public Health Nutr* 2007; 10: 413-21.
15. Druce M, Bloom SR. The regulation of appetite. *Arch Dis Child* 2006; 91: 183-7.
16. Bornet FR, Jardy-Gennetier AE, Jacquet N, Stowell J. Glycaemic response to foods: impact on satiety and long-term weight regulation. *Appetite* 2007; 49: 535-53.
17. Foster-Schubert KE, Overduin J, Prudom CE, et al. Acyl and total ghrelin are suppressed strongly by ingested proteins, weakly by lipids, and biphasically by carbohydrates. *J Clin Endocrinol Metab* 2008; 93: 1971-9.
18. Ceriello A, Esposito K, Piconi L, et al. Oscillating glucose is more deleterious to endothelial function and oxidative stress than mean glucose in normal and type 2 diabetic patients. *Diabetes* 2008; 57: 1349-54.
19. Cho S, Dietrich M, Brown CJ, Clark CA, Block G. The effect of breakfast type on total daily energy intake and body mass index: results from the Third National Health and Nutrition Examination Survey (NHANES III). *J Am Coll Nutr* 2003; 22: 296-302.
20. INRAN Linee guida per una sana alimentazione italiana (2003)
21. Affenito SG, Thompson DR, Barton BA, et al. Breakfast consumption by African-American and white adolescent girls correlates positively with calcium and fiber intake and

negatively with body mass index. *J Am Diet Assoc* 2005; 105: 938-45.
22. Roblin L. Childhood obesity: food, nutrient, and eating-habit trends and influences. *Appl Physiol Nutr Metab* 2007; 32: 635-45
23. Dubois L, Girard M, Potvin Kent M, Farmer A, Tatone-Tokuda F. Breakfast skipping is associated with differences in meal patterns, macronutrient intakes and overweight among pre-school children. *Public Health Nutr* 2008; 18: 1-10.
24. Timlin MT, Pereira MA, Story M, Neumark-Sztainer D. Breakfast eating and weight change in a 5-year prospective analysis of adolescents: Project EAT (Eating Among Teens). *Pediatrics* 2008; 121: e638-45.
25. Vanelli M, Iovane B, Bernardini A, et al. Breakfast habits of 1,202 northern Italian children admitted to a summer sport school. Breakfast skipping is associated with overweight and obesity. *Acta Biomed* 2005; 76: 79-85.
26. Siega-Riz AM, Popkin BM, Carson T. Trends in breakfast consumption for children in the United States from 1965-1991. *Am J Clin Nutr* 1998; 67(suppl): 748S-756S.
27. Croezen S, Visscher TL, Ter Bogt NC, Veling ML, Haveman-Nies A. Skipping breakfast, alcohol consumption and physical inactivity as risk factors for overweight and obesity in adolescents: results of the E-MOVO project. *Eur J Clin Nutr* 2009; 63: 405-12.
28. van der Heijden AA, Hu FB, Rimm EB, van Dam RM. A prospective study of breakfast consumption and weight gain among U.S. men. *Obesity* 2007; 15: 2463-9.
29. Purslow LR, Sandhu MS, Forouhi N, et al. Energy intake at breakfast and weight change: prospective study of 6,764 middle-aged men and women. *Am J Epidemiol* 2008; 167: 188-92.
30. Kaplan GA, Seeman TE, Cohen RD, Knudsen LP, Guralnik J. Mortality among the elderly in the Alameda County Study: behavioral and demographic risk factors. *Am J Public Health* 1987; 77: 307-12.
31. Liu S, Sesso HD, Manson JE, Willett WC, Buring JE. Is intake of breakfast cereals related to total and cause-specific mortality in men? *Am J Clin Nutr* 2003; 77: 594-9.
32. Kochar J, Djoussé L, Gaziano JM. Breakfast cereals and risk of type 2 diabetes in the Physicians' Health Study I. *Obesity* 2007; 15: 3039-44.
33. Keim NL, Van Loan MD, Horn WF, Barbieri TF, Mayclin PL. Weight loss is greater with consumption of large morning meals and fat-free mass is preserved with large evening meals in women on a controlled weight reduction regimen. *J Nutr* 1997; 127: 75-82.
34. Kleemola P, Puska P, Vartiainen E, Roos E, Luoto R, Ehnholm C. The effect of breakfast cereal on diet and serum cholesterol: a randomized trial in North Karelia, Finland. *Eur J Clin Nutr* 1999; 53: 716-21.
35. Warren JM, Henry CJ, Simonite V. Low glycemic index breakfasts and reduced food intake in preadolescent children. *Pediatrics* 2003; 112: e414.
36. Stanton JL Jr, Keast DR. Serum cholesterol, fat intake, and breakfast consumption in the United States adult population. *J Am Coll Nutr* 1989; 8: 567-72.
37. Nicklas TA, Bao W, Webber LS, Berenson GS. Breakfast consumption affects adequacy of total daily intake. *J Am Diet Assoc* 1993; 93: 886-91.
38. Nicklas TA, Reger C, Myers L, O'Neil C. Breakfast consumption with and without vitamin-mineral supplement use favorably impacts daily nutrient intake of ninth-grade students. *J Adolesc Health* 2000; 27: 314-21.
39. Lang R, Jebb SA. Who consumes whole grains, and how much? *Proc Nutr Soc* 2003; 62: 123-7.
40. Hunter JE. Dietary trans fatty acids: review of recent human studies and food industry responses. *Lipids* 2006; 41: 967-92.
41. Mozaffarian D, Willett WC. Trans fatty acids and cardiovascular risk: a unique cardiometabolic imprint? *Curr Atheroscler Rep* 2007; 9: 486-93.
42. Preziosi P, Galan P, Deheeger M, Yacoub N, Drewnowski A, Hercberg S. Breakfast type, daily nutrient intakes and vitamin and mineral status of French children, adolescents, and adults. *J Am Coll Nutr* 1999; 18: 171-8.
43. Truswell AS. Cereal grains and coronary heart disease. *Eur J Clin Nutr* 2002; 56: 1-14.
44. Björck I, Elmståhl HL. The glycaemic index: importance of dietary fibre and other food properties. *Proc Nutr Soc* 2003; 62: 201-6.
45. Clark CA, Gardiner J, McBurney MI, Anderson S, Weatherspoon LJ, Henry DN, Hord NG. Effects of breakfast meal composition on second meal metabolic responses in adults with Type 2 diabetes mellitus. *Eur J Clin Nutr* 2006; 60: 1122-9.
46. Djoussé L, Gaziano JM. Breakfast cereals and risk of heart failure in the physicians' health study I. *Arch Intern Med* 2007; 167 (19): 2080-5.
47. Galvin MA, Kiely M, Flynn A. Impact of ready-to-eat breakfast cereal (RTEBC) consumption on adequacy of micronutrient intakes and compliance with dietary recommendations in Irish adults. *Public Health Nutr* 2003; 6: 351-63.
48. Barton BA, Eldridge AL, Thompson D, et al. The relationship of breakfast and cereal consumption to nutrient intake and body mass index: the National Heart, Lung, and Blood Institute Growth and Health Study. *J Am Diet Assoc* 2005; 105: 1383-9.
49. Song WO, Chun OK, Kerver J, Cho S, Chung CE, Chung SJ. Ready-to-eat breakfast cereal consumption enhances milk and calcium intake in the US population. *J Am Diet Assoc* 2006; 106: 1783-9.
50. ISTAT. Stili di vita e condizioni di salute, 2005.

Accepted: April 22th 2009
Correspondence: Lorenzo Iughetti, MD
Dept. of Paediatrics
University of Modena and Reggio Emilia
Via del Pozzo 71
41100 Modena, Italy
E-mail: iughetti.lorenzo@unimore.it