



Editorial

Foods targeted at infants and guarantees for total quality

*In this media-oriented world we are constantly and incessantly bombarded by concepts that, due to over use, inexact sources of information and the spectacular way in which they are offered, often end up by losing their real meaning and impact. Nowadays, although the word **quality** never ceases to be used and, what is more, in the most diverse contexts, the factors constituting it are almost never mentioned. It has to rely on all the power of its contents in addition to being enhanced by the latest prospects emerging from scientific research.*

*The aim of this issue of **Nutrition and Well-being** is to dwell upon the qualitative requisites required for foods targeted at infants, in the full awareness of the important role played by the quality of food in terms of conditioning the long-term health and well-being of the individual per se and, consequently, that of society as a whole; its validity on a nutritional level and its safety in terms of hygiene-healthcare.*

*Guaranteeing the above mentioned **quality** is the duty and responsibility of various parties and the successful outcome of any initiative depends on the competency, the awareness and the sense of responsibility that the latter invest in pursuing what today is considered a priority objective. The protagonists of this investment are, and will be: the Food Industry which studies, manufactures and launches foodstuffs on the market, particularly those targeted at infants; the Health Authorities, both on a domestic as well as on a community level; Scientific Research; all those involved in various ways and who play different roles in terms of providing consumers with correct information; consumers themselves, whose job it is to make responsible choices when purchasing foodstuffs and who should understand the importance of the correct preservation and preparation of foodstuffs in the home. Amongst its main objectives, Parmalat's philosophy includes the achievement of an "increasingly improved qualitative level of its products" through use of select raw materials, continuous improvement in production processes as well as the study of innovative technologies. Owing to the fact that Parmalat is aware of the role played by nutrition both as regards the psycho-physical development of children as well as the future prevention of a number of pathologies even during adulthood, it dedicates an even greater number of resources and attention to products targeted at infants.*

A.B.

Editor-in-chief: Angelo Borella - Busto Arsizio Court Reg. no. 05/00 of 7/9/2000

Editions: KontroKorrente s.a.s. di T. Caniati & C.

Via Como 7, 22069 Rovellasca (Co) - tel. and fax: 02.96740241 (a.r.)

Graphic and press office: Grafica Luigi Monti s.r.l., 21047 Saronno (Va) - tel. 0296703732

National Press Registration, law 416 of 5.8.1981, at no. 10449 of 19.2.2001

Front page: Pieter Paul Rubens - La Carità - Castello di Weissenstein

Courtesy service: Tel. 02.96740241

Co-ordinated by: Marketing Management Milk and Vegetables Division and Research and Development Management Parmalat

Appropriate, safe infant nutrition

Prof. G. CARAMIA, Honorary Consultant of Pediatrics and Neo-natology, Azienda Ospedaliera Materno Infantile "G. Salesi" Ancona

1. INFANCY: NUTRIENTS AND "PROGRAMMING"

Historically, man has always acknowledged the importance of nutrition in establishing and maintaining an optimum state of health both on a strictly physical and mental level, in general, and, on a cognitive level, in particular.

Confirmation of this was given by Hippocrates (460-377 B.C.) who stated that "Good health implies an awareness not only of man's constitution but also of the power of various foodstuffs either in their natural state or prepared according to his ability" and Leonardo da Vinci (1452-1519) maintained that "A man's life depends on what he eats" thus clearly evidencing the importance of diet throughout one's life. Today, these maxims have evolved into the concept of "programming, according to



"A man's life
depends
on what
he eats"

L. da Vinci

which, a healthy nutritional diet right starting with infancy is useful not only in terms of everyday health but also with a view to preventing future disease. This concept entertains the theory that specific environmental factors, such as nutrition (A. Lucas) may result - especially during critical periods of development, or "critical time windows" - in permanent changes in the structure or functioning of the organism with negative long-term effects. The intake of certain foodstuffs - first by the mother and subsequently by the child - are likely to program not only the quality of an individual's physical and cognitive development but also his/her's future ability or inability to combat the onset of chronic-degenerative pathologies such as, for example, atherosclerosis, hypertension, diabetes, obesity, depression and osteoporosis. Obesity in children (a pathology that is becoming an increasingly serious problem both in Europe and in America) related not only to nutrition, but also to genetic factors, often persists, in 30-60% of cases, into adulthood. This pathology exposes children

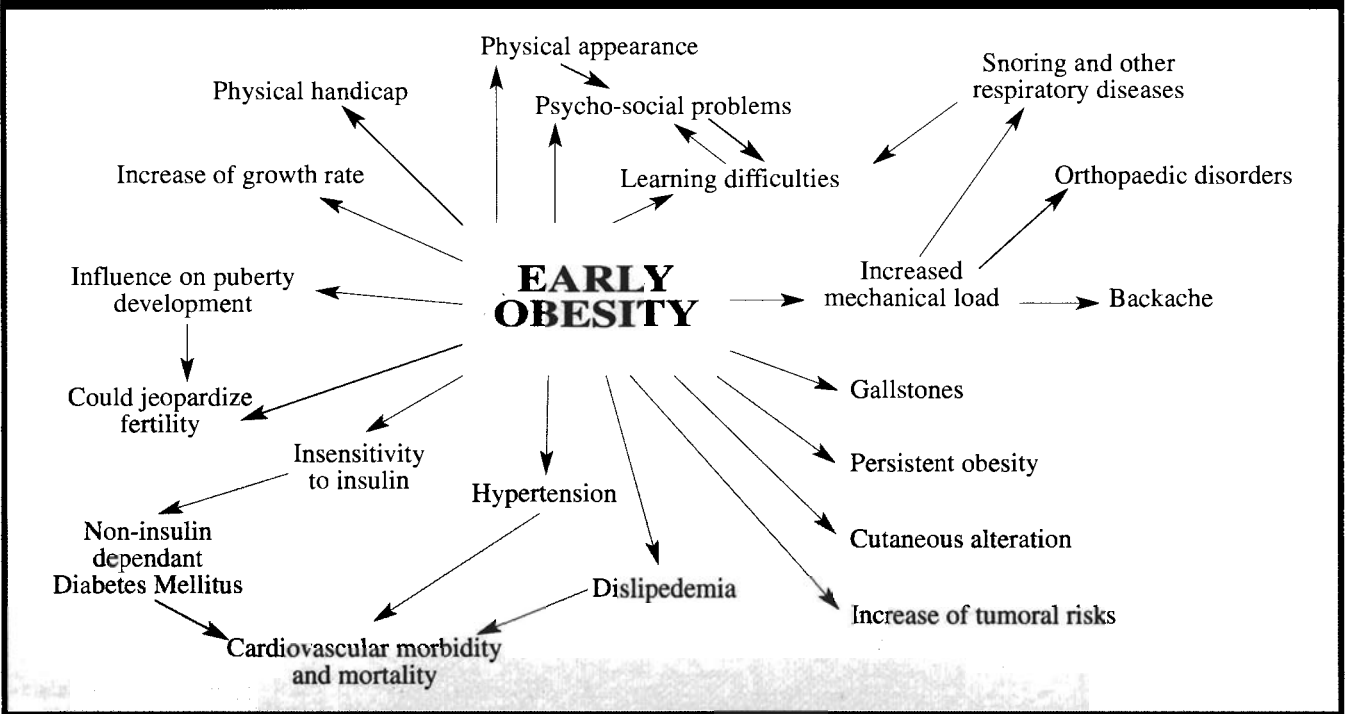
“ Human beings, like other species, show "critical periods" in which they are "sensitive to" nutrition in terms of subsequent outcome on neurological development, learning, behaviour, metabolism, blood pressure and bone mineralization. [...]”

A. Lucas

Nowadays, numerous studies have identified the foetal, neonatal and infancy stages as being particularly significant "critical periods".¹⁻⁴

G. Caramia))

Figure 1. Consequences of early obesity on the individual's general state of health.²⁵



to serious disorders of a metabolic and endocrine nature (Figure 1) with the possible onset in adulthood of cardiovascular disease or diseases of a degenerative⁵ nature (Table 1).

Within this framework, the interaction between organism and nutrition assumes the semblance of an exposure to **active principles** which, like **natural medicaments**, can influence not only the individual's state of health but also his/her well-being and psycho-physical equilibrium during each stage of his/her life^{6,7}. The concept of nutritional programming not only opens up new horizons in terms of research but also interesting prospects in terms of prevention and therapeutic initiatives.⁸

It therefore goes without saying that the concept of the quality of foodstuffs targeted at infants continues to acquire increasing importance vis-à-vis an optimal outcome for all age groups.^{23,24}

Table 1. Consequences of childhood obesity in adulthood.²⁵

PERSISTENCE OF EARLY CO-MORBIDITY
ADULT OBESITY
CARDIOVASCULAR PATHOLOGIES
DEGENERATIVE PATHOLOGIES

In particular, a quality foodstuff must comply with specific characteristics not only in terms of nutritional adequacy but also as regards safety from a point of view of hygiene and healthcare.



$$\text{NUTRITIONAL VALIDITY} + \text{SAFETY RELATED TO HYGIENE AND HEALTH CARE} = \text{QUALITY OF FOODSTUFFS}$$

2. NUTRITIONAL VALIDITY OF FOODSTUFFS TARGETED AT INFANTS

When referring to the nutritional value of a diet, it is necessary to underline the need to include all the essential components, macronutrients and micronutrients, necessary not only for regular functioning but also to ensure homeostasis of organs and tissues. A balanced diet does not necessarily only mean that it contains

these components but rather that the latter are present in balanced quantities. These quantities also depend, to a large extent, on both the age group of the consumers in question – infants, children, adolescents, adults and the elderly all have different needs – and on the physiologic status – period of growth, puberty, pregnancy, breast-feeding – as well as on the presence of possible pathological conditions – psycho-physical degeneration, diabetes, obesity, kidney failure, hypertension, etc. As can be seen, the complexity of this task leaves no room for easy simplifications or superficiality. The important role played by micronutrients – vitamins and

minerals – to ensure correct homeostasis has by now been validated as has the indispensable protective function performed by anti-oxidising substances capable of neutralizing the free radicals of oxygen of exogenous or endogenous origin. Out of the micronutrients, the importance of glucides (as an indispensable source of energy and as the precursors of numerous bio-molecules) and proteins (as molecules having a structural function, acting as bio-catalysts, for transportation and intra-extra cellular communication purposes including many others as well) is by now well known.⁹ As regards lipids or “fats”, the awareness of their implication in encouraging – through interaction with each individual’s genetic make-up – the onset of numerous pathologies (hyperlipidemia, atherosclerosis, cardiovascular diseases) has recently resulted in the demonization of this category of nutrients

“ When prescribing a diet, the doctor must bear in mind: quantity, type and consistency of food and times when this should be eaten, how many times a day and where.

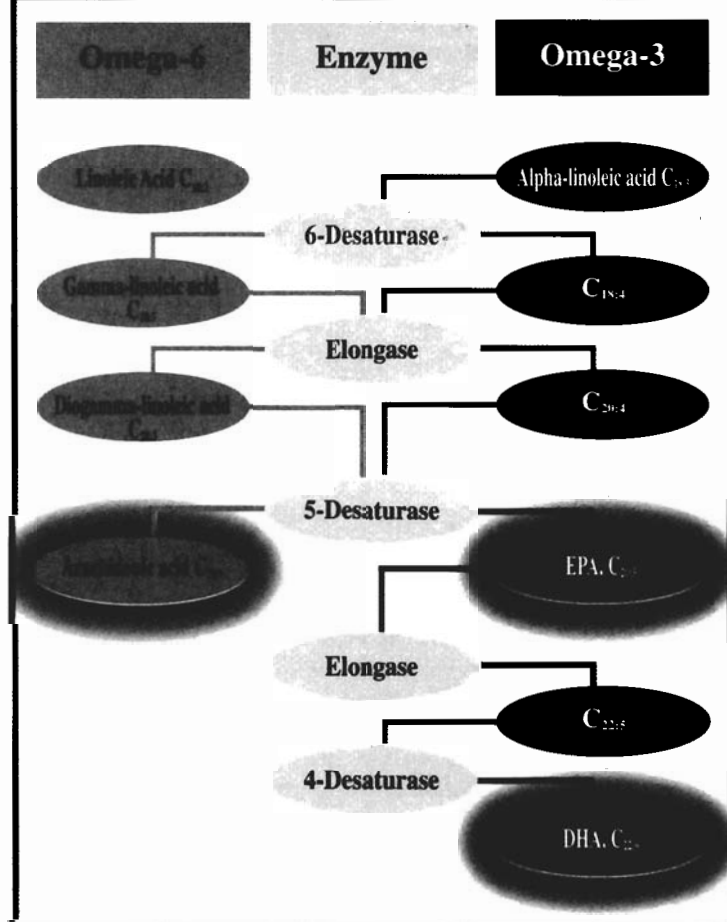
...health-care rule, Salerno parchment, LVIII, Della Prescrizione della Dieta - Diet Prescription (11th-12th century)

whose function in the human organism in general and, in that of children, in particular, is, contrary to common belief, extremely important.

Bearing in mind the well known risk correlated to an excessive intake of certain types of lipids, it is necessary to remember that, in any case, some fatty acids, such as linoleic acid and α -linoleic acid, respectively progenitor of the ω -6 and ω -3 series, are essential, or rather, cannot be synthesized endogenously and therefore have to be assimilated by diet.¹⁰

Linoleic acid can be found in animal and vegetable fats and α -linoleic acid in vegetable oils (especially olive and soya oils), in fish and in some large-leaved greens. These two fatty acids are subjected, in the organism, to a series of reactions catalysed by elongase and desaturase enzymes, resulting in the production of essential molecules such as those found in the ω -3 series,

Figure 2. Biosynthesis of long chain PUFA.



eicosapentaenoic acid (EPA; C_{20:5}) and decosaesaenoic acid (DHA; C_{22:6}) and in the ω-6 series, arachidonic acid (AA; C_{20:4}) (Figure 2, page 4). Owing to the fact that there is a certain amount of competition between the precursors of the two series for the enzymes mentioned, and the biosynthesis of the long chain PUFA is often insufficient, it goes without saying how important it is that foodstuffs provide not only the precursors (linoleic and α-linoleic acid) but also the long chain PUFA.^{11,12} Among the latter, those belonging to the omega 3 series can be found, above all, in the fat of some fish (tuna fish, salmon and herring in particular) unlike those of the omega 6 series which are chiefly found in animal and vegetable fats. As a result, the ratio in which these nutrients are provided to our organism (approximately 20:1) is far removed from the ideal one (5:1), owing to the fact that the majority of Italians do not include enough fish in their diets. Knowledge about this subject has increased rapidly as demonstrated by the results that emerged during the International Congresses on omega 3, organized by Professor N. Frega of the Università degli Studi in Ancona, meaning that, today, we are aware that the PUFA not only influence the physical and neurophysical development of a child^{13,14} but also have biological effects both on a structural – by acting on the permeability, the fluidity and the cellular membrane function, in particular of the synaptic and retinic ones – and metabolic level by modulating, for example, the processes involved in platelet aggregation, in cardiovascular activity^{11,12,15}, in immunity and in inflammation^{16,17}. On a metabolic level, the ω-3 PUFA reduce tryglyceridemia as well as having a preventive function on atherogenesis through a reduction of the synthesis of LDL, a reduction of the fraction of cholesterol linked to VLDL and an increase in the fraction linked to HDL.¹⁵ Their impact on the course of infection, the result of transplants and some forms of neoplasia have been detected.¹⁸

3. SAFETY OF FOODSTUFFS TARGETED AT INFANTS FROM A POINT OF VIEW OF HYGIENE AND HEALTH-CARE

“ The safety of a foodstuff is a component of its quality.”¹⁹

In Italy the quality of foodstuffs has been guaranteed since 1962 by a general policy law and by a vast series of specific regulations pertaining to various types of foodstuffs. The same rules guaranteeing the healthiness and safety of foodstuffs have been applied to the manufacturing of infant foods and dietetic products for more than thirty years.²⁰

P. Aureli ☺)

Nowadays, Institutions and industry have reached the conclusion that to produce safe, high quality products it is not sufficient to check the finished product. It is also necessary to organize a control programme throughout the entire production cycle owing to the fact that a product is always the result of a long chain of events starting from the fields and ending up on the table. This is the modern concept of quality management which is extremely important not only as regards infant food but also for everything defined under the term foodstuff. This philosophy was also taken into account by the EEC and expressed in the *White Book on food*



A product is always the result of a long chain of events starting from the fields and ending up on the table.



safety²¹ one of whose main priorities is to provide consumers with correct information by making an appeal for more transparency on all levels pertaining to food safety policies. Furthermore, by the end of 2002, the same commission will nominate an independent European food Authority to guarantee the safety of foodstuffs throughout member countries.

The key role played by industry which studies, produces and launches foodstuffs on the market was recently underlined by professor P. Aureli (Istituto Superiore di Sanità) during the 8th National Congress of the Study Group of Hospital Paediatrics²⁰:

The industry [...] must ensure that raw materials come from safe sources, work according to “ good working practices ” using a quality system based on the evaluation of critical points (HACCP) [...].

*In other words each food company is obliged by the new community rules, to complete a control programme related to its own production cycle, correctly identifying critical points, safety limit (critical limit), monitoring and corrective procedures.*²⁰

Naturally, in addition to assessing the risk on the part of industry, it is essential that, as indicated by professor Aureli during the course of the aforementioned Paediatric

Congress (♦page 6), consumers also have a correct perception. The risk linked to foodstuffs is basically correlated to the presence of polluting factors of a microbial, chemical and biological nature and to substances and modifications of the foodstuff itself that have not been clinically tested. A study promoted by OMS²² highlighted the non-correspondence between perceived and actual risks,



already a problem some fifteen years ago, deriving, in all probability, from a lack of scientific objectivity and the way in which information is communicated by the mass media.

In a recent interview, Professor P. Aureli once again underlined the following: "...nowadays, one has reached a point whereby consumers are no longer able to distinguish between real hazards, represented, in certain circumstances, by microbiological (pathogens) and chemical (antibiotics, pesticides, hormones, heavy metals, dioxins and micro-oxins) contaminants and perceived hazards, associated with the presence of substances and organisms authorized by specific regulations (additives, colorants; etc.). This climate of mistrust has resulted in the

involvement, just or unjust, of dairy products as well, thus diminishing the positive reputation which they enjoyed for centuries..."²⁶

Correct information, not only in terms of nutrition but also safety allows the consumer to choose the foodstuffs best suited to his/her "diet" in an aware and responsible manner: this is particularly important as regards products targeted at children. In short, the well-being of the organism is the expression of a "health programme" that starts from infancy and which is implemented by means of a diet that is as natural as possible which industry makes available to everyone thanks to the use of modern, cutting-edge technologies.

◆ *...Consumers' acute perception regarding nutritional risks is, in all probability, linked to a lack of their quantification. The low or high qualification of a nutritional risk is too much of a general claim to instil confidence in consumers.*

At present, the acceptable levels established for some contaminants, residues (pesticides, additives, antibiotics) and toxins are based on the quantitative evaluation of risk and, consequently, the application of the HACCP system to these risks in the production cycle results in the end product being guaranteed as highly safe. The quantitative analysis of a risk is a complex procedure that takes place in various stages, including the evaluation of the dosage/ response to the hazard envisaged as well as the qualitative-quantitative evaluation of the degree of consumer exposure.

In conclusion, these new instruments currently being used by the entire food chain and by the Authorities in charge of supervision can only result in the implementation of nutritional safety and consequently a reduction in food-related diseases. However, in order to ensure that these expectations are not partially thwarted, it is important that the consumers themselves begin to obtain information and learn more about the hazards inherent in certain foodstuffs as well as implementing correct habits pertaining to the handling and preservation of foodstuffs in the home.²⁰

References

1. Lucas A. Influence of neonatal nutrition on long term outcome. Nestle Nutrition workshop series, 32 Raven Press 1993: 183-196.
2. Lucas A. Programming by early nutrition: an experimental approach. J Nutr 1998, 128 (2 Suppl): 401 S-406S.
3. Mendez MA, Adair LS. Severity and timing of stunting in first two years of life affect performance on cognitive tests in later childhood. J Nutr 1999, 129 (8): 1555-62.
4. Pollitt E, Gorman KS, Engle PL et al. Nutrition in early life and the fulfillment of intellectual potential. J Nutr 1995, 125 (4 Suppl.): 1111S-1118S.
5. Giovannini M. Nutrizione pediatrica: dal passato al presente. Pacini Editore Medicina; 2 (Monografia): 13-16.
6. Berdanier CD. Nutrient-gene interaction. Present knowledge in nutrition. 7th ed. 1996: 574-580
7. Clarke SD, Abraham S. Gene Expression: nutrient control of pre and post transcriptional events. Faseb J 1992, 6: 3146-3152.
8. Caramia G, Cocchi M, Frega N. Recenti progressi in nutrizione. Progress in Nutrition 2000, 2: 25-41.
9. Caramia G, Frega N, Mozzon M et al. Aspetti nutrizionali e condizioni clinico-patologiche: attualità e possibilità terapeutiche Atti XVIII^o Congr. Inter. "Bambino: Progetto Salute 2001" Ancona 2001; 278-295
10. Caramia G, Nobilini A. Il ruolo degli acidi grassi essenziali in età pediatrica. Fano Pediatrica 1990: 49-55.
11. Cocchi M., Turchetto E. Acidi grassi polinsaturi e sviluppo perinatale. Progress in Nutrition 1999, 1: 3-27
12. Caramia G. Gli acidi grassi essenziali in neonatologia e pediatria. Atti Congresso Nazionale Acidi Grassi Polinsaturi ω-3. Progress in Nutrition 1999, 1: 3-4; 49-58.
13. Warthon B. Food for the brain. Bambino: Progetto Salute 1991: 44-51.
14. Carlson SE. The role of omega 3 and omega 6 fatty acids in development and general Health. Bambino: Progetto Salute 1999: 286-291.
15. Dyerberg J, Bang HO, Stoffersen E et al. Eicosapentaenoic acid and prevention of thrombosis and atherosclerosis. Lancet 1978, 11: 117-119.
16. Caughey GE, Matzioris E, Gibsons RA et al. The effect on human tumor necrosis factor alpha and interleukin 1beta production of diets enriched in ω-3 fatty acids from vegetable oil or fish oil. Am J Clin Nutr 1996, 63: 116-122.
17. Engstgrom K, Luostarinen R, Saldeen T. Whole blood production of thromboxane, prostacyclin and leukotriene B4 after dietary fish oil supplementation in man: effect on vitamin E. Prostaglandins, Leukotrienes and Essential Fatty Acids 1996, 54: 419-425.
18. Fernandez G, Venkatraman JT. Role of omega-3 fatty acids in health and disease. Nutr Res 1993, 13: 19-45.
19. Aureli P. HACCP e valutazione dei rischi per la sicurezza alimentare. II Conferenza Nazionale sull'educazione alimentare, Roma
20. Aureli P. L'importanza dell'autocontrollo nell'industria alimentare. 8^o Congresso Naz. del Gruppo di Studio di Pediatria Ospedaliera, Napoli 2000.
21. Commissione delle Comunità Europee. Libro bianco sulla sicurezza alimentare. Bruxelles, 12.01.2000
22. OMS, Chitwood 1989
23. Agostoni C., Riva E., Trojan S..Docosahexaenoic acid status and developmental quotient of health term infants. Lancet 1995; 346: 638-639
24. Agostoni C., Riva E., Dietary fatty acid and cholesterol in the first 2 years of life. Prostagl. Leukotr. Essent. Fatty Acids 1998; 58: 33-37.
25. Wabitsch M., Overweight and obesity in European children: definition and diagnostic procedures, risk factors and consequences for later health outcome. European J. of Pediatrics, 159/13, 2000, S8-13.
26. Aureli P., Convegno Sicurezza e tracciabilità degli Alimenti: latte, yogurt e formaggi freschi. Milano 26-9-2001