

**NOVITA' IN TEMA DI.....**

# **NUTRIZIONE**

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# Il latte materno

Rappresenta l'alimento ideale per il neonato per tutto il primo anno di vita:

- è sicuro dal punto di vista microbiologico
- è bilanciato da un punto di vista nutrizionale
- contiene sostanze immunologicamente attive
- è economico
- è specie-specifico.

**WHO. Global Data Bank on Breastfeeding. Breastfeeding: the best start. Geneva: WHO Nutrition Unit, 1996.**

# PROGRAMMING

Influenza della nutrizione sull'espressione del patrimonio genetico **in periodi critici dello sviluppo** con conseguenze a medio e lungo termine sull'organismo (metabolismo di lipidi e carboidrati, pressione arteriosa, quoziente intelletivo.....)

# **Allattamento al seno e crescita**

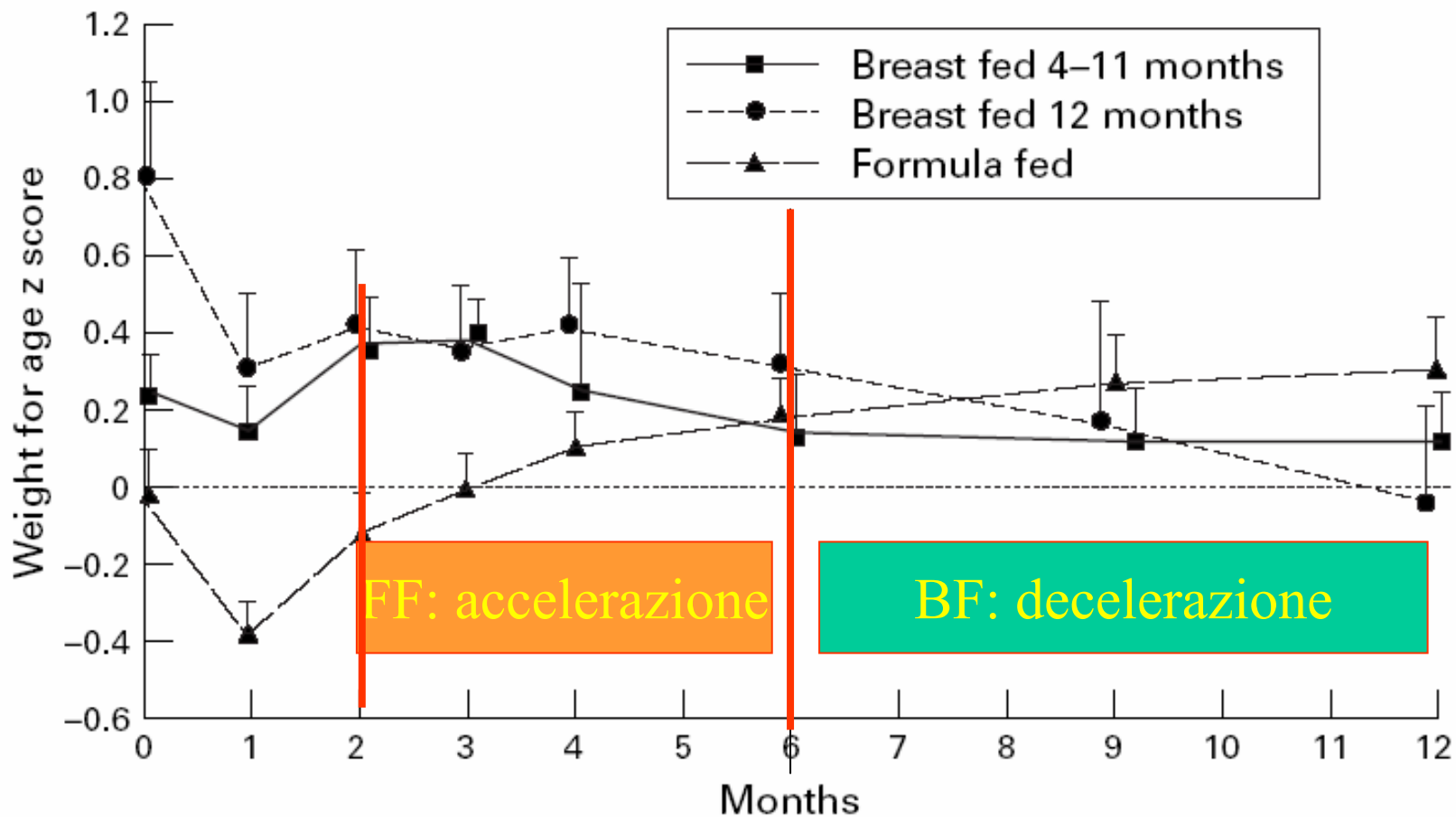
Growth patterns of breast fed and formula fed infants in the first 12 months of life: an Italian study.

Arch Dis Child 1999;81:395-399

C Agostoni, F Grandi, M Giovannini, E Riva, et al.

# Growth patterns of breastfed and formula-fed Italian infants: an Italian Study

Agostoni C et al, Arch Dis Child 1999; 81: 395



Dati consistenti con l'unico disegno di studio "randomizzato"

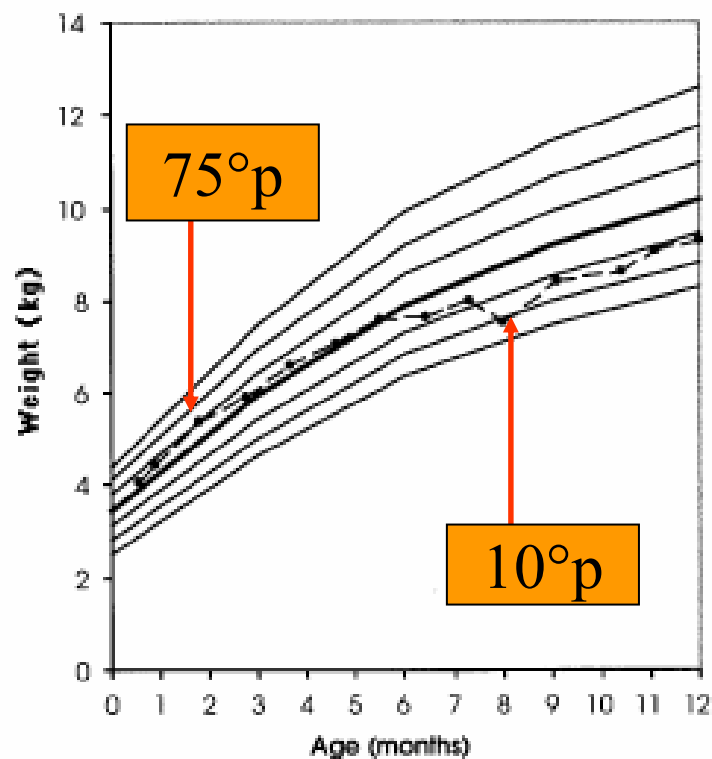
Kramer et al, Pediatrics 2002;110:343

# Weight reference charts for British long-term breastfed infants

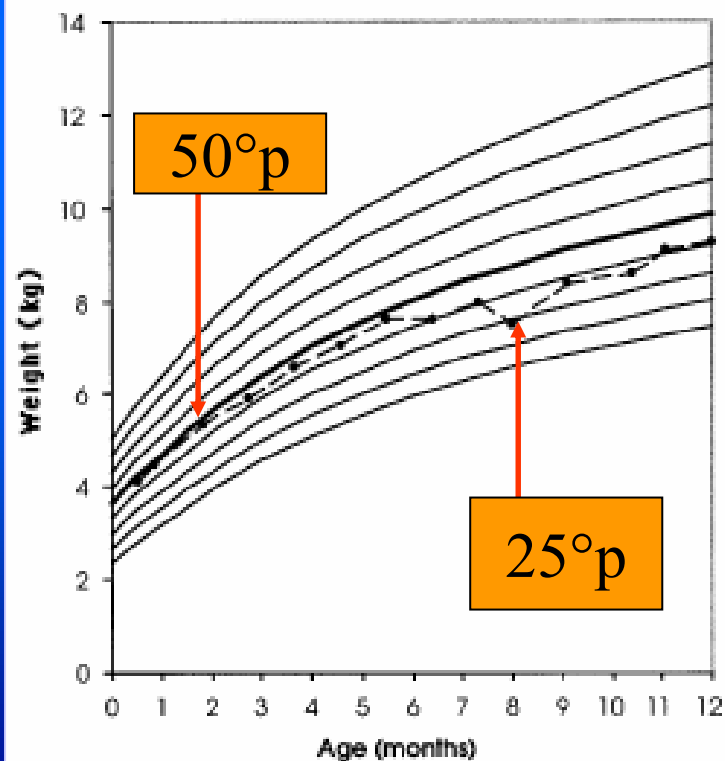
TJ Cole<sup>1</sup>, AA Paul<sup>2</sup> and RG Whitehead<sup>3</sup>

*Centre for Paediatric Epidemiology and Biostatistics<sup>1</sup>, Institute of Child Health, London; Elsie Widdowson Laboratory<sup>2</sup>, MRC Human Nutrition Research, Cambridge; Church End<sup>3</sup>, Weston Colville, Cambridge, UK*

Tanner-Whitehouse



Breast fed





# WHO Anthro 2005.Ink

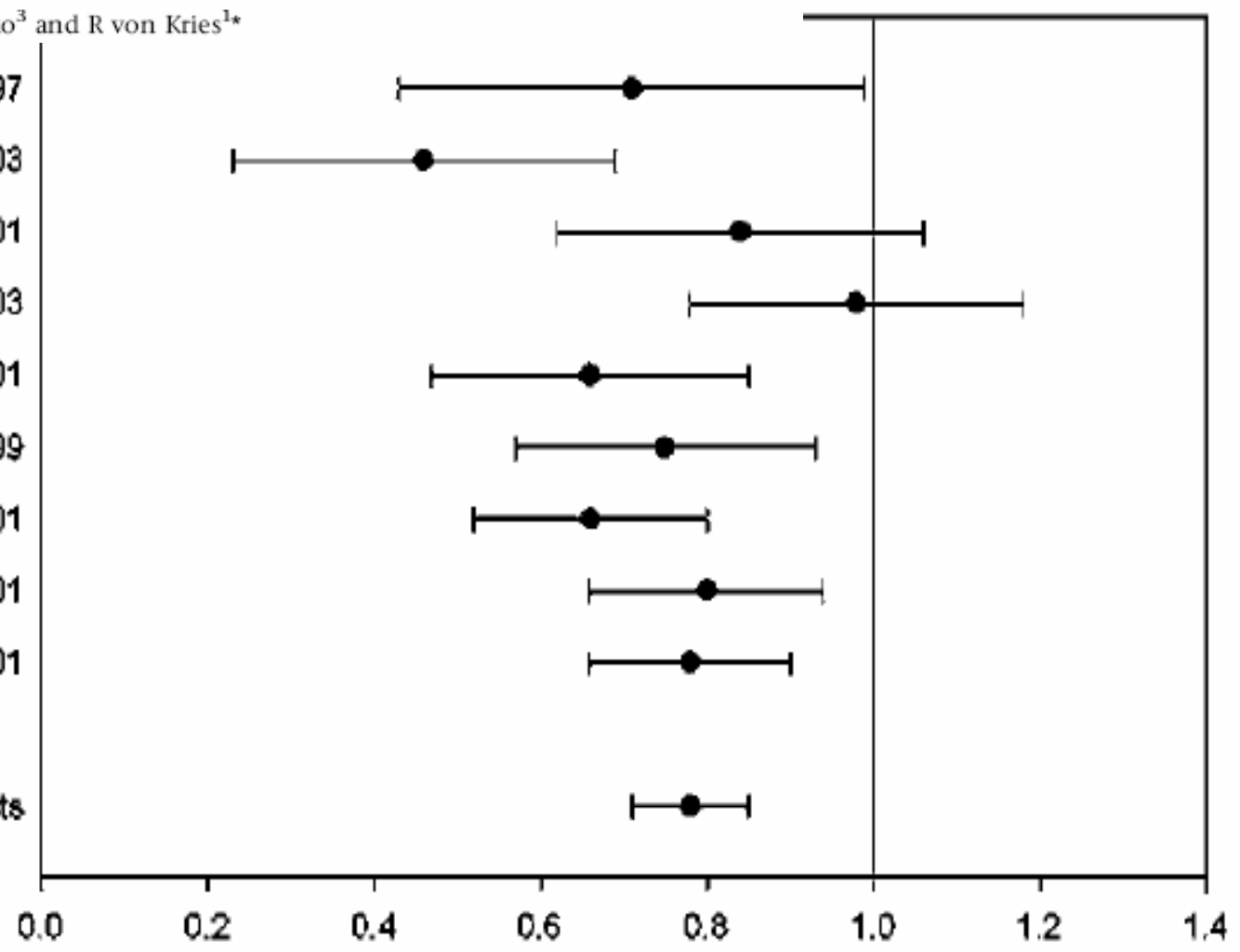
<http://www.who.int/childgrowth/en/>

# REVIEW

## Breast-feeding and childhood obesity—a systematic review

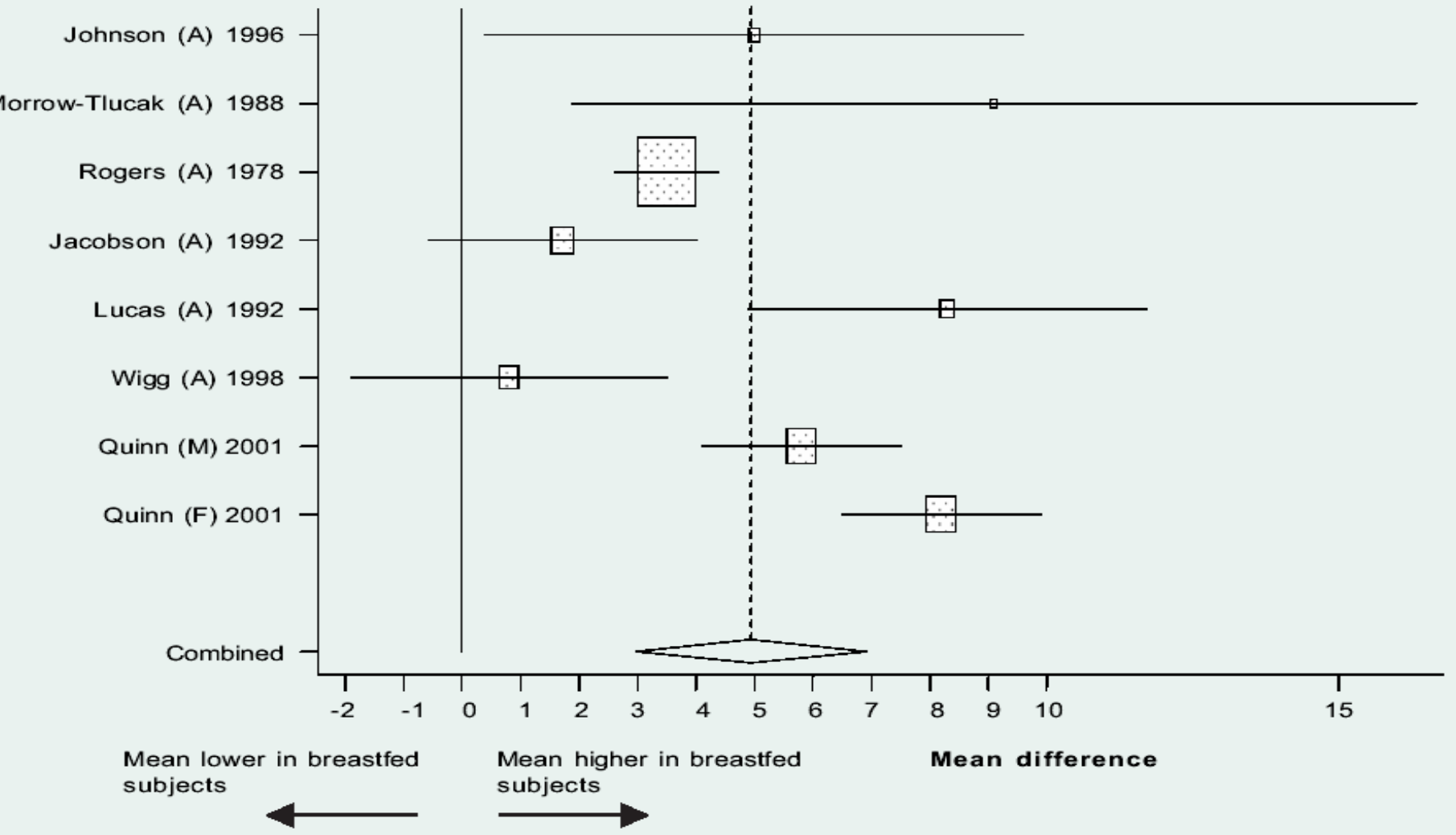
S Arenz<sup>1</sup>, R Ruckerl<sup>2</sup>, B Koletzko<sup>3</sup> and R von Kries<sup>1\*</sup>

- O'Callaghan 1997
- Bergmann 2003
- Hediger 2001
- Li 2003
- Poulton 2001
- von Kries 1999
- Liese 2001
- Toschke 2001
- Gillman 2001
- AOR fixed effects





**Figure 5.1.** Mean difference in cognitive development scores and its 95% confidence interval between breastfed and non-breastfed subjects in different studies. Whether the estimate was for males (M), females (F) and all (A) is indicated in parenthesis



ULTIMA METANALISI OMS DEL 2007

# Latte materno e componenti bioattivi

- Basso apporto proteico, migliore qualità proteica, azoto non proteico-aminoacidi liberi
- Oligosaccaridi
- Polinsaturi a lunga catena, acido linoleico coniugato
- Ormoni (leptina.....)
- Molecole immunologicamente attive

# Le innovazioni

- Proteine:  
riduzione quantitativa,  
modifica qualitativa

Crescita  
Prevenzione dell'obesità

- Lipidi:  
inserimento LCPUFA,  
trigliceridi strutturati (Beta-palmitato)

Sviluppo

Assorbimento,  
sviluppo osseo

- Modulazione della flora enterica:

probiotici,  
prebiotici,  
latti fermentati

Prevenzione gastroenteriti,  
funzionalità intestinale,  
prevenzione allergie,  
modulazione immunitaria → prevenzione IVAS

## Medical Position Paper

# Global Standard for the Composition of Infant Formula: Recommendations of an ESPGHAN Coordinated International Expert Group

\*Berthold Koletzko,<sup>1</sup> †Susan Baker, ‡Geoff Cleghorn, §Ulysses Fagundes Neto, ||Sarath Gopalan,  
¶Olle Hernell, #Quak Seng Hock, \*\*Pipop Jirapinyo, ††Bo Lonnerdal, ‡‡Paul Pencharz,  
§§Hildegard Pzyrembel,<sup>2</sup> |||Jaime Ramirez-Mayans, ¶¶Raanan Shamir, ##Dominique Turck,  
\*\*\*Yuichiro Yamashiro, and †††Ding Zong-Yi

# Le formule non possono ricopiare la composizione biochimica del latte materno

Data on the composition of human milk of healthy, well-nourished women can provide some guidance for the composition of infant formulae, but gross compositional similarity is not an adequate determinant or indicator of the safety and nutritional adequacy of infant formulae. Human milk composition shows remarkable variation. Moreover, there are considerable differences in the bioavailability and metabolic effects of similar contents of many specific nutrients in human milk and formula.

# Quale “riferimento” usare?



Therefore, the adequacy of infant formula composition should be determined by a comparison of its effects on physiological (e.g. growth patterns), biochemical (e.g. plasma markers) and functional (e.g. immune responses) outcomes in infants fed formulae with those found in populations of healthy, exclusively breast-fed infants.

Riferimento: non la composizione biochimica del latte materno ma la crescita ed i marker biochimici e funzionali dell'allattato al seno

# FORMULE STANDARD

(formule starting, formule di inizio, formule 1)

Component	Unit	Minimum	Maximum
Energy	kcal/100 ml	60	70
Proteins			
Cows' milk protein	g/100 kcal	1.8*	3
Soy protein isolates	g/100 kcal	2.25	3
Hydrolyzed cows' milk protein	g/100 kcal	1.8†	3
Lipids			
Total fat	g/100 kcal	4.4	6.0
Linoleic acid	g/100 kcal	0.3	1.2
α-linolenic acid	mg/100 kcal	50	NS
Ratio linoleic/α-linolenic acids		5:1	15:1
Lauric + myristic acids	% of fat	NS	20
Trans fatty acids	% of fat	NS	3
Erucic acid	% of fat	NS	1
Carbohydrates			
Total carbohydrates‡	g/100 kcal	9.0	14.0

†Formula based on hydrolyzed milk protein with a protein content less than 2.25 g/100 kcal should be clinically tested.

# Effects of $\alpha$ -lactalbumin–enriched formula containing different concentrations of glycomacropeptide on infant nutrition<sup>1–3</sup>

Olaf Sandström, Bo Lönnerdal, Gitte Graverholt, and Olle Hernell

**Design:** We compared breastfed infants and infants fed standard formula or  $\alpha$ -lactalbumin–enriched formulas (25% of protein) with glycomacropeptide accounting for 15% or 10% of the protein. The protein content of each formula was 13.1 g/L. Ninety-six infants

**Conclusions:** Compared with standard formula-fed infants, infants fed formula with a modified protein composition had growth patterns more similar to those of breastfed infants. All formula-fed groups had plasma amino acid concentrations similar to or higher than those of breastfed infants. This indicates that the protein content of  $\alpha$ -lactalbumin–enriched formula can be further reduced, which should be evaluated. *Am J Clin Nutr* 2008;87:921–8.



# LATTOFERRINA

1. Regolazione della omeostasi marziale
2. Difesa contro infezioni microbiche
3. Attività antinfiammatoria
4. Regolazione della crescita e della differenziazione cellulare
5. Attività antineoplastica

# Ferro: 0.3 – 1.3 mg/100 kcal

Livelli di assunzione più bassi (rispetto a precedenti indicazioni) sufficienti per i fabbisogni del lattante

Tassi di assorbimento del ferro più elevati dalle moderne formule, e comparabili a quelli del ferro dal latte materno (15-20%)

Col livello minimo proposto si calcola un assorbimento 4-10 volte superiore comunque rispetto all'allattato al seno

Rischi potenziali associati ad assunzioni di ferro elevate: minore tasso di crescita in lunghezza, incidenza più elevata di diarrea e (marginalmente) di infezioni respiratorie alte

Incremento di ferro nei depositi → rischio ossidativo?

Many potential new ingredients, not mentioned in the IEG recommendations, are presently investigated as possible future additions to infant formulae: Probiotics, prebiotics (nondigestible oligosacharides), structured triglycerides, recombinant proteins (e.g. lactoferrin), enzymes (e.g. bile salt stimulated lipase), hormones (e.g. insulin), growth factors, polyamines

...altri?

Optional ingredients	Unit	Minimum	Maximum
Taurine	mg/100 kcal	0	12
Total added nucleotides	mg/100 kcal	0	5
Cytidine 5'-monophosphate (CMP)	mg/100 kcal	0	2.5
Uridine 5'-monophosphate (UMP)	mg/100 kcal	0	1.75
Adenosine 5'-monophosphate (AMP)	mg/100 kcal	0	1.5
Guanosine 5'-monophosphate (GMP)	mg/100 kcal	0	0.5
Inosine 5'-monophosphate (IMP)	mg/100 kcal	0	1.00
Phospholipids	mg/100 kcal	0	300
Docosahexaenoic acid*	% of fat	0	0.5

\*If docosahexaenoic acid (22:6n-3) is added to infant formula, arachidonic acid (20:4n-6) contents should reach at least the same concentration as DHA. The content of eicosapentaenoic acid (20:5n-3) should not exceed the content of docosahexaenoic acid.

Medical Position Paper

Probiotic Bacteria in Dietetic Products for Infants:  
A Commentary by the ESPGHAN Committee on Nutrition

ESPGHAN Committee on Nutrition: \*Carlo Agostoni, †Irene Axelsson, ‡Christian Braegger, §Olivier Goulet, ||Berthold Koletzko, #Kim F. Michaelsen, \*\*Jacques Rigo, ††Raanan Shamir, ‡‡Hania Szajewska, §§Dominique Turck, and ||||Lawrence T. Weaver

## Prebiotic Oligosaccharides: A Comment

ESPUGHAN Comm  
§Berthold Kc  
\*\*Raa

\*University of Milano, Milan, Italy; §Ludwig-Maximilians-University, Munich, Germany; ¶The General Hospital of Haifa, Haifa, Israel

- Currently there are only limited published data on the evaluation of prebiotic substances in dietetic products for infants. Therefore, no general recommendation on the use of oligosaccharide supplementation in infancy for preventive or therapeutic purposes can be made.
- During the time of their administration prebiotic oligosaccharides in dietetic products have the potential to increase the total number of bifidobacteria in feces and to soften stools.
- There is no published evidence of other clinical benefits of adding prebiotic oligosaccharides to dietetic products for infants.
- The available data on the oligosaccharide mixtures in infant formulae do not demonstrate adverse effects.
- Validated clinical outcome measures of prebiotic effects in infants should be characterized in further well-designed and carefully conducted randomized controlled trials with relevant inclusion/exclusion criteria and adequate sample size. Such trials should also define the optimal quantities, types and intake durations and safety of different oligosaccharides.
- Further evaluation is required before the general use of prebiotics in premature infants and/or infants with special conditions (e.g., immune deficiency).

## Prebiotic Oligosaccharides: A Comment for Infants: A Comment on Nutrition

†Olivier Goulet,  
‡Jacques Rigo,  
§Turck

†Hospices de la Pitié-Salpêtrière, Paris, France; ‡University of Frederiksberg, Copenhagen, Denmark; §Meyer Children's Hospital, Lille, France

# Non linee guida ma commento.....

*Journal of Pediatric Gastroenterology and Nutrition*

16:99-110 © 2008 by European Society for Pediatric Gastroenterology, Hepatology, and Nutrition and  
North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition

## Medical Position Paper

# Complementary Feeding: A Commentary by the ESPGHAN Committee on Nutrition

ESPGHAN Committee on Nutrition: \*Carlo Agostoni, †Tamas Decsi, ‡<sup>3</sup>Mary Fewtrell,  
§Olivier Goulet, ¶Sanja Kolacek, ||<sup>1</sup>Berthold Koletzko, \*\*<sup>3</sup>Kim Fleischer Michaelsen,  
††Luis Moreno, ‡‡John Puntis, §§Jacques Rigo, ¶¶Raanan Shamir, |||<sup>2</sup>Hania Szajewska,  
\*\*\*Dominique Turck, and †††Johannes van Goudoever

Exclusive breastfeeding for about 6 months is a desirable goal.

In any case, CF should not be introduced in any infant before 4 completed months (17 weeks) and all infants should start CF by 6 months (26 weeks).

Although there are theoretical reasons why different complementary foods might benefit breast or formula-fed infants, to devise and implement separate recommendations for the introduction of solid foods for breast fed and formula fed infants may present practical problems.



- Dietary schedules in most countries take origin from cultural factors and available foods.
- The composition of diet during the complementary feeding period, as well as the type of milk feeding, may have health effects not just in the short-term, but also in the medium and long-term

# Complementary feeding: what

MONTHS

0

3

6

9

12

**Human milk**

**Starting formula**

**Follow-on formula**

**Cereals**

**Fruits and vegetables**

**Meat**

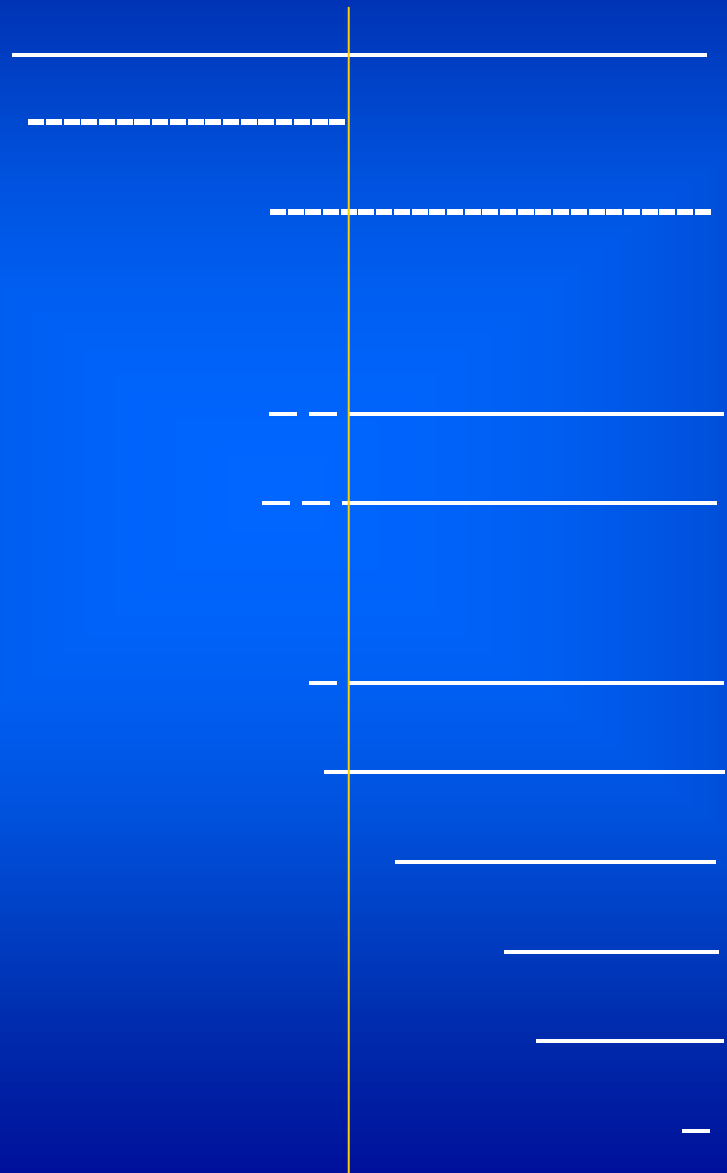
**Cheese**

**Fish**

**Legums**

**Egg's yolk**

**Egg's white**



A traditional,  
*updated* schedu

# A timing for the introduction of potentially allergenic foods?

Taking into account the available data on delaying or eliminating specific foods and also the potential wider nutritional consequences, there is no convincing scientific evidence that avoidance or delayed introduction of potentially allergenic foods, such as fish and eggs, reduces allergies, either in infants considered at-risk for the development of allergy, or in those not considered to be at risk .

# IRON

The available literature does not show a causal relationship between *moderate* IDA and impaired cognitive development, even if such an association is plausible based on studies of the role of iron in brain development and function. Until further knowledge is available, measures should be taken to prevent iron deficiency, for example, promoting exclusive breast-feeding, using iron-fortified formula when formula is required, postponing introduction of whole cow milk until the end of the first year of life, and promoting iron-rich complementary foods.

ESPGHAN CoN, 2002

It is acceptable to add small volumes of cows' milk to complementary foods, but it should not be used as the main drink before 12 months

ESPGHAN CoN, 2008

# Low fat diet > 2-3 yrs of age: The case of whole cow's milk

There are considerable differences between countries in recommendations on the age at which cows' milk with reduced fat intake can be introduced.

The main consideration has been that low fat milk might limit energy intake and thereby growth.

The ESPGHAN Committee concluded in 1994 that fat intake should not be actively reduced before the age of 3 years but no lower limit for fat content was suggested

The preferential use of cows' milk with a reduced fat content (1.5-2%) was recommended from 2-3 years of life onward

# Gluten

- Both early (<4 months) and late ( $\geq 7$  months) introduction of gluten should be avoided
- Gluten should be introduced gradually whilst the infant is still breast-fed.
- Avoiding early (<4 months) introduction of gluten in at risk infants may also reduce the risk of developing diabetes.

# Special dietary habits

- If infants and young children are on a vegetarian diet, it is important that the diet include a sufficient amount (about 500 ml) of milk and dairy products.
  - During the first years of life a vegan diet (one with no animal products) is dangerous because of the risk of B12 deficiency which can seriously affect neuro-cognitive development, and it should be discouraged.

# I tempi ed i modi del divezzamento quali certezze?

1. Iniziare il divezzamento almeno oltre il quarto mese compiuto

2. Introdurre solidi mentre la mamma allatta puo' ridurre il rischio di patologie su base immune (diabete di tipo 1 e celiachia) ed ha effetti positivi per la prevenzione dell'obesità e la promozione dello sviluppo psico-intellettuale ottimale

3. Non ci sono evidenze scientifiche convincenti che la graduale introduzione di alimenti in base al potenziale allergizzante abbia effetti preventivi positivi



# Possibili raccomandazioni (?)

- Latte materno anche durante il divezzamento
- Se il latte materno viene a mancare introdurre una formula adeguata dal punto di vista nutrizionale e funzionale
- Schemi di introduzione di alimenti diversificati per allattati al seno ed artificialmente  
(es. iniziare con la carne nell'allattato al seno per l'apporto di ferro e zinco, con i vegetali nell'allattato artificialmente per modulare l'assunzione di proteine ed energia)
- Proseguire l'assunzione di latti a ridotto contenuto proteico fino a 24 mesi

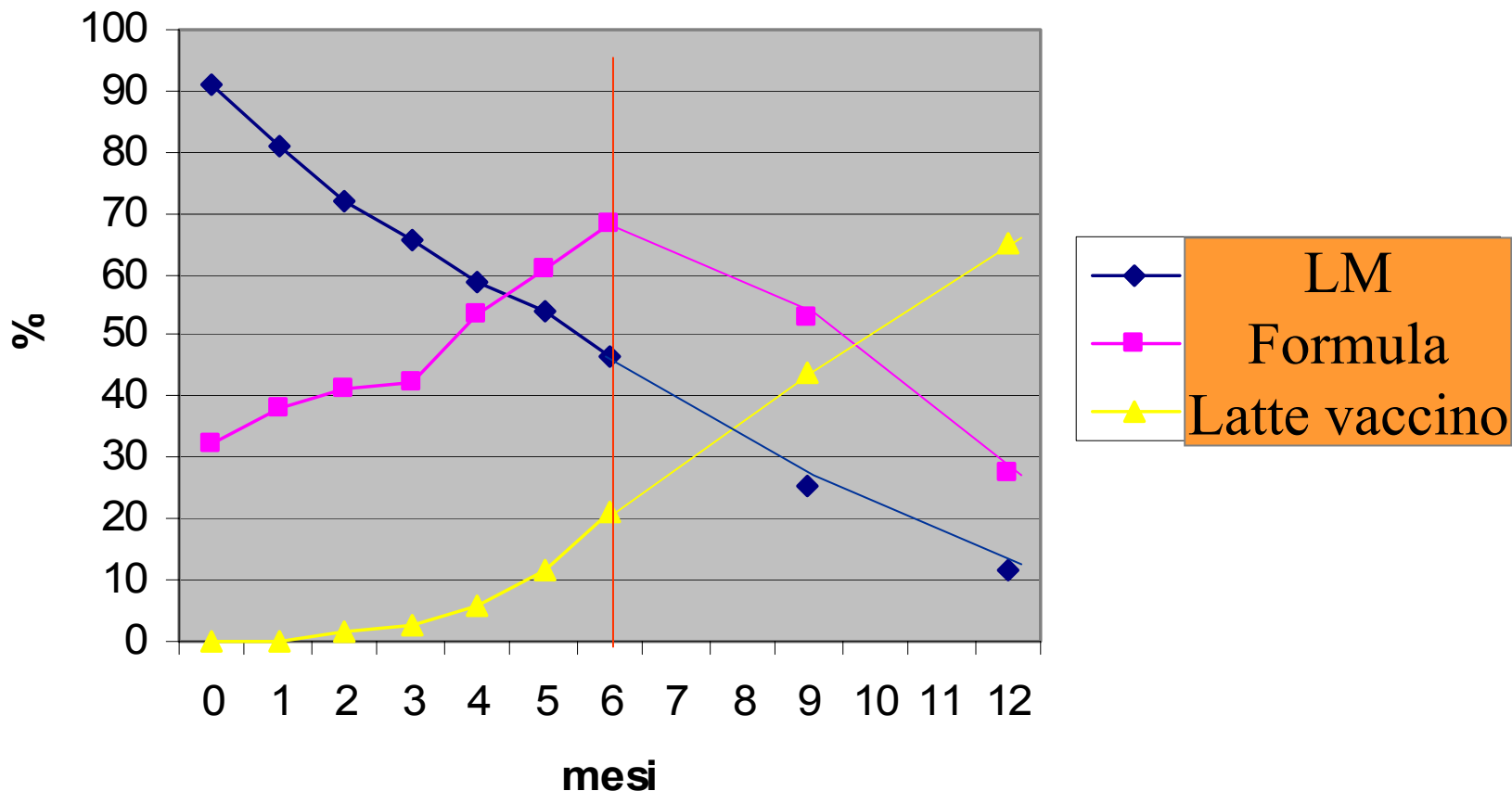
Latte vaccino dal 12° (24°?) mese

Eccesso proteico (futuro sviluppo di obesità?)

Deficit di ferro (scarso contenuto, poco assorbito, associato a microemorragie intestinali)

# Assunzione di latte nei primi 12 mesi in Italia- Puer Project

Giovannini M et al, Acta Paediatr 2003; 92: 357



500 ml latte vaccino = 18 grammi proteine

= 7.20% energia in una dieta di 1000 kcal

*The child is the father of the man.*

*Pediatricians should be more interested in adult disease.*

L.T. Weaver

**Il pediatra deve conoscere la scienza della nutrizione e deve svolgere un ruolo fondamentale quale garante dell' alimentazione del bambino, non solo ai fini di un sua adeguata crescita, ma a salvaguardia del suo potenziale di sviluppo e delle condizioni metaboliche associate al più favorevole “outcome a lungo termine”, relativo alla qualità della vita e al benessere fisico e psichico**



*Grazie per l'attenzione*

