Programming Power of Complementary Feeding

Programming for a Healthy Life by Complementary Feeding?
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Complementary Feeding and Immunity
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Complementary Feeds in Ex-Premature Infants
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Key Messages

Complementary feeding practices could potentially influence later health outcomes by programming effects, but also by lasting effects on food preferences, appetite, and eating behaviour.

Delaying the introduction of complementary feeding until the age of 4 months may protect against later obesity and possibly against allergy and the development of coeliac disease, with little evidence that timing is influential beyond this age.

A high protein intake during the complementary feeding period may be associated with an increased obesity risk.

Complementary feeding (CF) practices could potentially influence later health outcomes by a number of mechanisms including programming effects, but also by lasting effects on food preferences, appetite, and eating behaviour.

Traditional weaning practices such as feeding to comfort the infant and forced feeding, as well as our taste and flavour preferences, evolved to be suitable in conditions where food was scarce. They are not appropriate for modern obesogenic environments, and this may result in later problems such as distinguishing hunger from other distress cues, ignoring satiety signals, and preferring unsuitably sweet, energy-dense foods. However, although there is a clear genetic component to aspects of taste, flavour preferences, and appetite, parents and caregivers can modify environmental influences. For example, innate preferences for sweet flavours and dislike of bitter flavours can be modified by exposures during pregnancy and early infancy from breast milk but also from infant formulas; and these preferences can persist with continued exposure to a flavour [1, 2]. Parenting behaviour can also have positive effects on infant feeding practices and growth. A recent systematic review concluded that the most promising interventions for reducing the risk of overweight and obesity in infancy and early childhood are those that focus on diet and responsive feeding, including education on recognising infant hunger and satiety cues and non-food management of infant behaviour [3]. Twin studies suggest that some aspects of infant appetite are highly heritable, including eating speed and satiety [4], whilst appetite is probably causally related to weight gain [5]. This raises the intriguing possibility that it may be possible to identify individuals who are at risk of over-eating in an obesogenic environment and intervene to prevent adverse outcomes.

The evidence that ‘nutritional’ aspects of CF – the timing and content of foods – influence later health outcomes is limited in quantity and quality but suggests that delaying the introduction of CF until the age of 4 months may protect against later obesity [6] and possibly against allergy and the development of coeliac disease, with little evidence that timing is influential beyond this age (7–9). Few studies have examined later outcomes in relation to specific nutrients or foods during the CF period, although there is concern that a high protein intake during this period could increase obesity risk [9].

CF practices vary markedly between and within countries. Given the complex interplay between nutrition, feeding behaviour, and psychological factors during this period, a holistic approach is required; a ‘one size fits all’ approach is not feasible or sensible given the variation between infants, their environments, and their cultural factors.

References

The correct age to introduce complementary food that will result in oral tolerance has been debated for decades (Fig. 1). Recommendations to delay introduction of allergenic foods such as milk, egg, and peanut were made in 2000 [1] but then retracted in 2008 [2]; both statements were based on sparse firm data. Over the last several years, though, observational studies demonstrated that earlier introduction of highly allergenic foods might prevent the onset of allergies to them [3-5]. Recently, the landmark study Learning Early About Peanut (LEAP) was published [6]. LEAP is the first large randomized controlled trial (RCT) to investigate the timing of peanut introduction.

LEAP was performed in the UK in a cohort of 640 high-risk infants, defined as having severe eczema and/or egg allergy, who were randomized either to peanut introduction early between the age of 4-11 months versus peanut avoidance until the age of 5 years. At study entry, 542 infants had negative skin prick tests (SPT) to peanut, while 98 infants had SPT wheal diameters between 1 and 4 mm (minimally SPT positive). A total of 76 children were excluded prior to randomization based on a peanut SPT >5 mm and were presumed peanut allergic. After 5 years of peanut protein consumption of 2 g thrice weekly or avoidance, food challenges were performed. An intention-to-treat analysis showed that 17.2% of the children in the peanut avoidance group compared to 3.2% of the children in the peanut consumption group developed food challenge-proven peanut allergy, corresponding to a 14% absolute risk reduction and a relative risk reduction of 80%.

Based on these LEAP data, allergy, pediatric, and dermatology organizations from around the world formulated a consensus statement that recommended early introduction of peanut (between 4 and 11 months of age) into the diet of high-risk infants in countries where peanut allergy is prevalent in order to prevent peanut allergy [7]. The organizations further recommended that certain high-risk infants, such as those with early-onset severe eczema or IgE-mediated food allergy, might benefit from evaluation to diagnose possible food allergy prior to peanut introduction. The National Institutes of Health and an expert panel are developing more formal guidelines for peanut allergy prevention.

More RCTs investigating early versus delayed food introduction will be published in the coming years that will shine light on other major food allergies (Table 1), as the specific time for introduction may be different for different foods and at-risk patients. A clear paradigm shift, though, has occurred, now backed by data, that earlier complementary food introduction is better for allergy prevention.

References
Complementary Feeds in Ex-Premature Infants

Premature infants are a diverse population whose nutritional needs, developmental maturity, and long-term outcomes are different from those of term infants. Introduction of complementary feeds is a critical step in the advancement of feeding in preterm infants to avoid growth delay and important nutrient deficiencies. Developmental readiness rather than chronological age should be considered as an important factor to introduce complementary feeds.

Premature infants (23–37 weeks) are a special group of the population whose nutritional requirements are different from those of term infants, especially for energy, protein, long-chain polyunsaturated fatty acids, iron, zinc, calcium, and selenium. Optimal nutritional intake is very important in these infants from birth until infancy to provide appropriate growth, especially head growth, which may have an impact on the long-term neurodevelopmental outcome and linear growth. Associated comorbidities such as feeding problems, gastrointestinal reflux, and respiratory compromise may delay the introduction of complementary foods in premature infants.

Complementary foods refer to nutrient- and energy-containing solid or semi-solid foods (or liquids) fed to infants in addition to human milk or formula [1]. Introduction of complementary feeds is considered to be a critical step in the infants’ diet which can affect growth and may have long-term health consequences [2].

The American Academy of Pediatrics (AAP) and the World Health Organization recommend exclusive breastfeeding for the first 6 months of age, with the introduction of complementary foods and continued breastfeeding thereafter, and the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition recommends the introduction of complementary foods no earlier than 4 months and no later than 6 months of age [3–5].

Early introduction of complementary foods has been linked to rapid weight gain, obesity, diabetes mellitus, allergies, and atopic disease. Nevertheless, late introduction of complementary foods may lead to inadequate nutritional status and compromised immune development [6–10].

The selection of complementary foods should be based on the preterm infant’s need for balanced energy source from protein, carbohydrate, and fat, especially long-chain polyunsaturated fatty acids, iron, and zinc. The common practice in the United States is to introduce iron-fortified cereals, followed by fruits or vegetables, with later introduction of meat [1]. Signs of developmental readiness for solid foods in infants are a reduced tongue thrust reflex and the ability to hold the head up well, to sit in a stable supported position, to open the mouth, and to lean forward towards the spoon [8]. Parents should choose a first food that provides the required nutrients and also helps meeting energy requirements. Solid foods should not be introduced before 6 months of age as solid food introduction at an earlier age may delay the introduction of solid food earlier than term infants [2].

Parents should introduce one ‘single-ingredient’ new food at a time and should not introduce other new foods for at least 3–5 days. By 7–8 months of age, infants should be consuming foods from all food groups. Whole cow’s milk should not be introduced until 12 months of age, and fruit juice should not be offered before 6 months and its intake after that should be limited. Foods rich in zinc and iron should be included in complementary foods such as red meat, poultry, and fish [11]. The AAP encourages the consumption of meats, vegetables with higher iron content, and iron-fortified cereals for infants and toddlers between 6 and 24 months of age [1]. Parents should prepare homemade complementary foods in a safe and healthy manner.

The literature suggests that, given the lack of consensus and insufficient evidence, the decision to introduce preterm infants to solids/complementary foods should be made on an individual basis, considering postmenstrual age, nutritional status and requirement, and developmental readiness, especially motor development [7–11].

Key Messages

- Premature infants are a diverse population whose nutritional needs, developmental maturity, and long-term outcomes are different from those of term infants.
- Introduction of complementary feeds is a critical step in the advancement of feeding in preterm infants to avoid growth delay and important nutrient deficiencies.
- Developmental readiness rather than chronological age should be considered as an important factor to introduce complementary feeds.

References:

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