



Australian Government  
National Health and Medical Research Council



# final report

Project Code: D.MHN.0700  
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Date published: December 2011

PUBLISHED BY  
Meat and Livestock Australia Limited  
Locked Bag 991  
NORTH SYDNEY NSW 2059

## Infant feeding guidelines for health workers

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

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## Preface

Meat and Livestock Australia (MLA) is a marketing and research delivery company for all sectors of the red meat industry (beef, sheep and goat meat). We are primarily funded by levies on farmers and government contributions for our extensive research and development portfolio.

Meat and Livestock Australia supports the need for Infant Feeding Guidelines for health workers to support optimum infant nutrition, health and development. We welcome the opportunity to contribute to the development of dietary recommendations relating to red meat. For the MLA, it is important that Australian red meat makes a positive contribution to healthy eating.

## Comments in this submission relate specifically to:

### 9.4 Practical aspects of this guideline

#### 9.4.1 What foods should be introduced?

We support the following principles indicated in this section:

1. Recommendation to introduce iron-containing foods at around six months of age
2. Emphasis on introducing a variety of nutrient-dense foods
3. Need for increasing and varying food texture

We support the focus on iron and zinc and the need for bioavailable sources of iron:

*“Micronutrient deficiencies, especially of iron and zinc, can develop because of breastmilk’s inability to meet requirements in the later half of infancy. If infants are exclusively breastfed after six months, iron stores are likely to become depleted if a bioavailable source of iron from complementary foods is not provided.” p. 127*

We support the need to introduce iron-containing foods at around six months of age:

*“Introduction of spoon foods at around six months (22-26 weeks) should start with iron containing foods.” p. 130.*

We support lack of need for recommendations on order for introducing solids:

*“Other than recommending the use of iron-rich first foods, there are no recommendations on the order of introduction of foods or the number of new foods that can be introduced at a time”. (p. 131)*

We note inclusion of the following references:

1. Referral to dietary patterns providing nutrient requirements described in the *New Modelling System for Australians* to inform the revision of the *Australian Guide to Healthy Eating* (p.125). The draft document indicates 4 serves of red meat for infants 7 to 12 months (NHMRC, 2010).
2. *Nutrient Reference Values for Australians* indicating nutrient requirements for the 6 to 12 month age group. The EAR for both iron and zinc considers the bioavailability of the diet. For iron, the EAR is based on absorption of about 18% from a mixed western diet including animal foods and about 10% from a vegetarian diet for iron. The higher absorption of zinc from animal than plant

foods is indicated. Consequently, for both iron and zinc, higher requirements are indicated for vegetarian infants (NHMRC, 2006).

For consistency, we therefore recommend including the following advice regarding the introduction of solids:

1. Advice on selecting bioavailable food sources of iron, including:
  - consumption of red meat 4 times a week from 6 months of age
  - use of a good source of ascorbic acid in the same meal to increase absorption of non haem iron in largely plant-based or vegetarian diets.
2. Advice on bioavailable food sources of zinc.

For consistency, we recommend amending advice on p.130 to reflect there are no recommendations on the order of introduction of foods (as indicated on p.131) as follows:

1. Introduction of spoon foods at around six months (22-26 weeks) should start with iron-rich foods, including iron containing foods. Advice to parents should emphasize the best first foods to achieve a regular and adequate source of iron with an emphasis on more absorbable (haem) sources.

We note that our recommendations are consistent with the approach taken by Health Canada in “Nutrition for Healthy Term Infants: Recommendations from Birth to Six Months (Draft):

*“Iron containing foods are recommended as the first foods to help meet the nutrient requirements of the rapidly growing infant. Iron from meat sources is better absorbed than iron from non-meat sources. Meat is also an important source of zinc in the diet of older infants.” section 9.2 (Health Canada, 2011)*

Similarly, we also recommend the approach taken by Health Canada in providing practical advice on serving meat and alternatives as a first food to a six month-old infant.

## **Supporting evidence**

### **1. Prevalence of iron and zinc deficiency**

Since iron and zinc deficiency often co-exist, strategies have been proposed to address both iron and zinc requirements (WHO, 1998).

Whilst there is widespread prevalence of zinc and iron deficiency in developing countries, there is limited evidence for developed countries. A high percentage of infants with biochemical evidence of marginal zinc and iron status were reported in a US study (Krebs, 2006). Whilst evidence on iron and zinc status in Australian infants is lacking, these findings may be relevant for Australia where early childhood feeding recommendations are similar.

Food-based strategies are preferred because they are more sustainable, more likely to address more than one micronutrient deficiency and also more likely to be well absorbed. In addition, food-based strategies facilitate the transition to family meals (WHO, 1998).

### **2. Red meat is a good source of iron and zinc**

It is recognised that animal products are required to meet iron and zinc needs in infants (WHO, 1998; Leroy, 2007).

A positive association between meat (Karr, 1996; Thane, 2000; Michaelsen, 1995; Thorsdottir, 2002; Taylor, 2004) and haem iron (Mira, 1996) and iron stores has been reported in young children and infants. The association between flesh foods (meat, fish and poultry) and iron stores is explained by their haem iron content and so called MFP factor that increases absorption of non haem iron.

A positive association has also been reported between meat intake and zinc status (Krebs, 2006; Krebs, 2000). The quantity of total dietary zinc and phytate are principal determinants of the quantity of absorbed zinc. Further research is required on the amount of absorbed zinc for diets differing in phytate:zinc molar ratios in order to determine the optimal EAR for infants and toddlers (Hambidge, 2008).

Red meat, such as beef has a higher haem iron content (2.12mg/100g) than pork (1.1mg/100g), fish (0.50mg/100g) and chicken (0.26mg/100g) (Schonfeldt, 2011).

Red meat, such as beef and lamb, are higher in zinc (7.0mg/100g and 4.5mg/100g respectively) than pork (2.9mg/100g), chicken (1.6mg/100g) and fish (0.6mg/100g) (NUTTAB, 2010).

Several studies indicate that beef is a predictor of iron and zinc stores:

- A study in non-pregnant premenopausal women found that consumption of red meat five times a week was more efficacious for body iron stores than consumption of lacto-ovo-vegetarian foods, or the flesh of chicken and fish (Worthington-Roberts, 1998).
- Beef has also been shown to be a positive predictor of both iron stores and zinc pool sizes in premenopausal women, whereas bran breakfast cereals was a negative predictor (Yokoi, 2007).
- An intervention study has shown that daily consumption of red meat prevented the decline in iron stores that can occur during the second year of life. Each additional gram of red meat consumed was associated with a 0.6% higher serum ferritin concentration (Szymlek-Gay, 2009).

Ascorbic acid is a well established enhancer of non-haem iron absorption. Advice on improving the bioavailability of non-haem iron, particularly in predominantly plant-based diets, is recommended. However, it is important to note that sufficient ascorbic acid (25mg ascorbic acid) must be consumed in the same meal as the non haem iron source to improve absorption (Allen, 2008, WHO, 1998). To achieve this amount of ascorbic acid will require the addition of 46ml orange juice to an infant meal. However, recommending fruit juice must be balanced against risk of tooth decay and childhood obesity.

### **3. Red meat as an iron-rich first food**

A US study showed that it is feasible to introduce beef as a first complementary food from 5 months of age. The study compared pureed beef with iron-fortified infant cereal as the first complementary food from 5 to 7 months of age and found that beef improved zinc intake and was associated with greater increase in head circumference from 7 to 12 months and a trend for a higher behaviour index at 12 months in the beef group (Krebs, 2006).

The benefit of beef compared to iron-fortified cereal was not only in the absolute amount of zinc intake, but also in terms of the amount of zinc absorbed. Jalla reported that beef resulted in a 16-fold greater amount of absorbed zinc compared to iron-fortified infant rice cereal (Jalla, 2002).

#### **4. Frequency of red meat consumption in infants**

An Australian study in toddlers found that the consumption of red meat fewer than four times per week was significantly associated with iron depletion (Karr, 1996).

These findings are consistent with the dietary patterns for infants 7 to 12 months providing nutrient requirements described in the *New Modelling System for Australians* to inform the revision of the *Australian Guide to Healthy Eating* which suggest red meat 4 times per week (30g/serve of beef, lamb, veal, pork) and 3.5 times a week for toddlers 13 to 23 months.

Analysis of dietary intake from 471 infants in the Nourish and South Australian Infants Dietary Study (SAIDI) suggest intake of red meat is low.

Of the 231 infants (24 hour recall data) aged 6 months or more but less than 12 months, 8.7% (n=20) consumed red meat and 11% (n=25) consumed other protein foods. Mean intake (based on 3 days of intake) was 14g for pure cuts; 26g for processed meats such as sausages, patties, meatballs, rissoles; 32g from dishes with red meat as a major component; 56g from dishes with red meat as minor component; and 87g from infant foods containing <10% meat (weights for mixed dishes represent the total weight of the dish eaten and not the meat only).

By 12 to 15 months of age, of 818 with 24 hour recall data, 298 (36%) consumed red meat and 481 (59%) consumed other protein sources. Of the 600 infants with 3 day intake data (n=600), most ate red meat on 1 of the 3 days (n=221) and only 55 ate red meat on all 3 days. Red meat was primarily eaten as mixed dishes with serve sizes, on average, 30g (Data supplied by A/Prof A Magarey and Prof L Daniels).

These findings support those reported in a Canadian cross-sectional study which found that by 3 months, 83% of infants were already consuming infant cereals whereas by 8 months, only 33% were consuming red meat. Mean iron intakes were below the daily recommended intake (Friel, 2010). Similarly, a US study found that recommendations regarding iron intake among breastfed infants were not being followed by a substantial proportion of mothers (Dee, 2011).

#### **5. Practical advice on cooking meat**

Evidence from consumer research commissioned by Meat and Livestock Australia indicates that mothers are not confident cooking red meat for their babies. Anecdotal evidence from child health nurses supports this finding. It would therefore be useful to provide advice on how to cook red meat for babies, in particular, on how to achieve the right texture. This information is available in a resource developed by Meat and Livestock Australia in consultation with child health nurses, dietitian and using insights from market research and the expertise of home economists to meet this demand. It is available [http://www.themainmeal.com.au/NR/rdonlyres/DD264113-651E-41C1-8804-999FC141A7E5/0/FC2257\\_MLA\\_Brochure\\_FINAL\\_2011\\_WEB.pdf](http://www.themainmeal.com.au/NR/rdonlyres/DD264113-651E-41C1-8804-999FC141A7E5/0/FC2257_MLA_Brochure_FINAL_2011_WEB.pdf)

### **Conclusion**

There is good evidence that the bioavailability of dietary iron and zinc are important determinants of iron and zinc status. Animal products, particularly red meat, are important sources of bioavailable iron and zinc.

There is some evidence that infants are not meeting recommendations for red meat required to meet iron requirements. Whilst evidence is lacking regarding implications of current dietary choices on iron and zinc status in Australia, there is some evidence to suggest that low meat intakes may contribute to marginal iron and zinc status.

Advice on selecting bioavailable iron and zinc dietary sources is required to ensure prevention of iron and zinc deficiency in infants and to prevent the decline in iron stores that can occur in the second year of life.

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