

MEAT AND MEAT PRODUCT CONSUMPTION AMONG INFANTS IN LATVIA

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Meat consumption during the first year of life is especially important to provide necessary iron requirements. The aim of the study was to assess meat and meat product consumption of Latvian infants during their first year of life, in relation to different factors. Data were collected by interview method using two types of questionnaires: food frequency questionnaires and food diary. The study included a representative sample of infants and toddlers from all regions of Latvia with a target sample of 560 participants. The study included 266 infants: 127 girls, 139 boys, aged from 0 to 12 month. Data were summarised using the Excel software and analysed using the SPSS software. For data analysis two age groups were created: 0–5.9 months and 6–12 months. Consumption was analysed by two parameters: frequency and amount per feeding. Meat products were defined as offal products, sausages, and meat in baby food. Meat was mainly consumed after 6 months of age and by 73% of infants (n = 107). Meat from baby food was consumed only after 6 months and by 23% (n = 34). Sausages and offal products were consumed after 6 months of age. Sausages were consumed by 18% (n = 28) and offal products by 11% (n = 16) of infants. Meat consumption for the majority of infants was introduced after 6 months and was in accordance with recommendations.

Key words: nutrition, infants, meat, offal products, sausages.

INTRODUCTION

The first 1000 days of life, meaning pregnancy, infancy and childhood, are critical periods of rapid physical growth and cognitive and emotional development. Infants are considered a vulnerable group because they have relatively high nutrient requirements per unit body weight. Recent research has declared infancy as a critical period in life, setting the foundation of long-term health and reduced risk for chronic diseases (Caballero *et al.*, 2015).

Breastfeeding is the preferred and recommended form of nutrition for healthy infants during the first 6 months of life as it provides all necessary nutrients (Kramer *et al.*, 2002; Anonymous, 2009; Caballero *et al.*, 2015). After the sixth month, when complementary feeding is introduced, it is important to ensure adequate nutrient intakes in line with infants' nutritional requirements.

When introducing semisolid food into the infant's diet in addition to milk, it is very important to ensure adequate

meat consumption: introduction age, frequency, and consumed amount.

Meat is a nutrient-dense source of high-biological-value protein consumed worldwide. But moreover, a 100 g serving of meat is a concentrated food source of the trace minerals iron, zinc, and selenium. Meat is emphasised as an important source of heme iron, which is highly bioavailable compared with non-heme iron sources found in meat alternatives (e.g., legumes) and iron-fortified cereals (Anonymous, 2014).

Several studies found a positive association between (red) meat, fruit and vegetable intake and iron status in young children (Engelmann *et al.*, 1998; Thane *et al.*, 2000; Cowin *et al.*, 2001; Thorisdottir *et al.*, 2011; Cox *et al.*, 2016). Also differences in the use of foods that have a negative impact on iron status, such as dairy products (containing calcium), high-fibre foods (containing phytates) and tea and coffee (containing polyphenols) may contribute to variations between countries in the prevalence of iron deficiency.

Of the studies performed in the United Kingdom, the only study with a very high prevalence of iron deficiency (ID) (31%) was conducted in 1992–1993. These were the years that the bovine spongiform encephalopathy (BSE) crisis reached its peak in the United Kingdom and the consumption of beef, an important source of iron, fell by 25% (Eussen *et al.*, 2015).

In 2003, the World Health Organisation (WHO) and the Pan American Health Organisation published unified, scientifically based guiding principles for complementary feeding of the breast-fed child. The guidelines recommend introducing complementary foods at 6 months of age while continuing to breast-feed, and that “meat, poultry, fish or eggs should be eaten daily, or as often as possible,” to ensure that the nutrient needs of the child are met (Anonymous, 2003). Canadian recommendations for healthy term infants from 6 to 24 months recommend iron-rich complementary foods such as meat and meat alternatives two or more times a day (Anonymous, 2014).

The aim of the study was to assess meat and meat product consumption of Latvian infants during their first year of life and the association of consumption with different factors. There were several objectives: collect nutritional data, and analyse data by age, children gender, mother’s education, and urbanisation.

MATERIALS AND METHODS

In 2012, with the support of the European Food Safety Authority (EFSA) Institute of Food Safety, Animal Health and Environment, BIOR, initiated cross-sectional research. The objective of the research was to assess nutritional data on the Latvian population throughout all population groups — from 0 to 74 years of age. Data on food products from all food groups, beverages, eating habits, and possible food safety risks were collected. Data collection was started in 2012 and completed in 2014.

Data analysis included records of 266 infants from birth to 12 months: 127 girls and 139 boys. Inclusion criteria were age, gender, and parental consent. Participants of this study were from all Latvian regions. The number of participants from each region was calculated based on birth rates provided by the Central Statistical Bureau of Latvia database. Participants were invited to participate in the study by paediatricians or general practitioners. Parents or primary caregivers of the infants completed a food frequency questionnaire. The study was approved by the Ethics Committee of Rīga Stradiņš University.

For data analysis two age groups were formed: from birth to 6 months and from 6 to 12 months. Meat and meat products were defined as follows:

- Meat and meat products — sum of meat and meat products (sausages, offal products);
- Meat — veal, beef, pork, lamb, rabbit, game, chicken, duck, goose, turkey;

- Sausages — all kinds of sausages;
- Offal products — kidneys, necks, heart, liver, liver pate, liver sausage, tongue, and blood sausage.

Data was summarised using the Excel software and analysed using the IBM SPSS Statistics 22 software.

A proportion of infants consuming meat or meat products was estimated in subgroups; it was compared by chi-square test or chi-square test for trends, if applicable. A median value was used to describe meat and meat product consumption frequency and consumed amounts. The Mann–Whitney U test was used to compare consumed amounts between male and female infants; whereas consumed amount in regard to mother’s education or place of residence was analysed by Pearson’s chi-square test. Relationship between yearly estimated meat consumption and education of mother was assessed using Spearman’s rank correlation coefficient.

RESULTS

Meat and meat products were analysed in two age groups (Table 1). When analysing separately, meat intake was equal to total meat and meat product consumption. Meat and meat products before 6 months age were introduced only in 3% (n = 3 infants). In the age group over 6 months meat was consumed by 73% (n = 107 infants). The frequency of meat consumption in this age group was more than 1 time per day (median 1.7) and in a significantly different amount — 46 g.

Meat in baby food during the first 6 months of age was not introduced (n = 120). Meat in commercially produced baby food was consumed only after 6 months of age and by 23% of infants (n = 34). Consumption frequency was 1 time per week in the amount of 24 g per feeding.

Meat products — sausages and offal products during the first 6 month of age were consumed only by 1% (n = 1 infant). In the group of infants aged 6–12 months, sausages were consumed by 18% (n = 28) and offal products by 11% (n = 16). Frequency of consumption was relatively low — three times per week or 20 g sausages and two times per month or 10 g offal products.

Gender in association with meat and meat product consumption. No association was found between gender and

Table 1

MEAT AND MEAT PRODUCT CONSUMPTION BY INFANTS IN LATVIA

Product	Age groups	
	0–6 months (n = 120)	6–12 months (n = 146)
Any meat and meat products	3% (n = 3)	73% (n = 107)
Meat	3% (n = 3)	73% (n = 107)
Meat from baby food	0% (n = 0)	23% (n = 34)
Sausages	1% (n = 1)	18% (n = 28)
Offal	1% (n = 1)	11% (n = 16)

meat consumption in this data analyses. Boys of the age from 6 to 12 months consumed meat in 72% (n = 55) cases, and girls of the same age in 74% (n = 52 infants) cases ($p = 0.794$).

Mother's education in association with meat and meat product consumption. No significant relationship was found between meat consumption and mother's education level ($p = 0.662$). The level of mother's education was classified in three groups: university degree, secondary education, and primary or lower education. Meat consumption among infants over 6 month of age was accordingly 72%, 75%, and 78%. However, an insignificant trend was found in estimated yearly meat consumption and mother's education. Meat was consumed in almost the same percent of cases but mothers with primary or lower education gave their children a smaller amount of meat in estimated yearly terms. University degree mothers on an annual basis fed 26 kg of meat, secondary education mothers — 21 kg, but primary or lower education mothers — only 9 kg ($p = 0.093$).

Urbanisation and meat consumption. There was no significant relationship found between urbanisation and meat consumption. In Rīga and Rīga District, 71% (n = 45) of infants aged 6 to 12 months consumed meat, in other cities — 71% (n = 35), and in rural districts — 79% (n = 27) ($p = 0.443$) (Table 2).

Table 2

URBANISATION AND MEAT CONSUMPTION IN THE AGE GROUP FROM 6 TO 12 MONTHS

	Total number of infants in this group	Infants who consume meat
Rīga and Rīga District	63	71% (n = 45)
Other cities	49	71% (n = 35)
Rural districts	34	79% (n = 27)

DISCUSSION

Nutritional recommendations on feeding infants differ between authorities and European countries. Also there is no precise information at which age exactly, what kind of meat should be introduced and consumed, as well as how much meat should be consumed per day or week during the first year of life (Anonymous, 2003; 2009; 2013; Virtanen *et al.*, 2016; Prell *et al.*, 2016).

The EFSA recommends that complementary foods should be introduced into the diet of infants between 4 and 6 months, with one (breast) milk meal being gradually replaced by complementary food every month. A vegetable–potato–meat puree (20–30 g meat) is recommended as one of the first complementary foods in order to ensure a sufficient iron supply (Anonymous, 2013). The World Health Organisation recommends introducing complementary foods at 6 months of age. Meat, poultry, fish or eggs should be eaten daily, or as often as possible (Anonymous, 2003; 2009). According to Finnish nutritional guidelines, meat should be introduced between 4 and 6 months of age.

No specific amount or frequency is mentioned (Virtanen *et al.*, 2016). German nutritional guidelines support early meat introduction in an infant's diet. They recommend starting complementary feeding at 4 to 5 months onward. A mixture of vegetables, potatoes, and meat should be given as the infant's first semisolid food (with oily fish instead of meat one or two times per week). These recommendations are supported by the statement that early consumption of meat, liver, and fish is associated with thriving growth and good cognitive development later on in childhood (Prell *et al.*, 2016). However, Latvian recommendations differ significantly and meat is recommended to be introduced only after 8 months of age. This study shows that the majority of parents follow those recommendations and include meat on a daily basis in an infants' diet in significant amounts only after 6 months of age. However, much more detailed data analyses should be carried out to determine if parents delay meat introduction in feeding infant.

Commercially produced baby food consumption in comparison with German statistics is low — only 23% of infants. In Germany, commercial complementary food is common: 55% of 6 to 12-month old infants consume commercial complementary food instead of homemade meals and 60% consume the vegetable-potato-meat meal in the form of commercial jars (Mesch *et al.*, 2014).

In Brazil, a study on maternal factors associated with dietary patterns of infants highlighted that the higher the maternal educational level and household income, the higher the consumption of meat, viscera, and eggs (Soteroa *et al.*, 2015). However, no such relationship was found in this study among Latvian infants.

There is some scientific evidence of a male predominance with iron deficiency anaemia during infancy (Antunes *et al.*, 2012). Differences in meat consumption by gender could be one of influencing factors. However, in this study there was no relationship found between meat consumption and gender.

CONCLUSION

This study showed that meat introduction in an infant's diet was according to recommendations and started only after 6 months of age. Meat was consumed in a sufficient amount for the necessary heme iron. The only concern was that about 27% of 6- to 12-month-aged infants did not consume meat during the period of this study.

There was no significant relationship between meat consumption and mother's education, urbanisation, or infant's gender. However, a statistically insignificant relationship was observed for estimated total yearly meat consumption and mother's education, where the consumed meat amount was significantly higher for infants whose mothers had a higher level of education.

There is much evidence that meat is an important source of several macro and micronutrients essential for infant devel-

opment, but less information on recommendations. Despite the fact that meat is consumed in a significant amount for the majority of infants, clear and detailed guidelines on meat introduction and consumption are still needed for parents and health care professionals.

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GAĻAS UN GAĻAS PRODUKTU PATĒRIŅŠ LATVIJĀ DZĪVOJOŠIEM ZĪDAIŅIEM

Gaļas ieviešana uzturā pirmajā dzīves gadā ir ļoti svarīga, lai uzņemtu pilnvērtīgas olbaltumvielas un dzelzi. Pētījuma mērķis ir noskaidrot gaļas un gaļas produktu patēriņu Latvijā dzīvojošiem zīdaiņiem, kā arī patēriņa saistību ar dažādiem faktoriem. Uztura dati ievākti, izmantojot intervijas metodi. Izmantotas divu veidu anketas: pārtikas produktu patēriņa biežuma anketa un uztura dienasgrāmata. Pētījums iekļauj zīdaiņu un mazbērnu reprezentatīvu izlasi no visiem Latvijas reģioniem, kopā — 560 respondenti. Pētījumā iekļauti 266 zīdaiņi: 127 meitenes, 139 zēni vecumā no dzimšanas līdz 12 mēnešiem. Dati apkopoti *Excel* programmā un analizēti *SPSS* programmā. Datu analīzei zīdaiņi ir iedalīti divās vecuma grupās: no 0 līdz 5,9 mēnešiem un no 6 līdz 12 mēnešiem. Patēriņš analizēts pēc diviem parametriem: biežuma un vienas ēdienreizes apjoma. Gaļas produkti definēti kā subprodukti, desas, rūpnieciski pagatavota bērnu pārtika. Gaļa galvenokārt tiek uzņemta pēc 6 mēnešu vecuma, to patērē 73% zīdaiņu (n = 107). Gaļu kā rūpnieciski pagatavotu bērnu pārtiku patērē tikai pēc 6 mēnešu vecuma — 23% zīdaiņu (n = 34). Cisiņus un subproduktus uzturā lieto pēc 6 mēnešu vecuma. Cisiņi ieviesti 18% zīdaiņu (n = 28) un subprodukti 11% zīdaiņu (n = 16) uzturā. Lielākajai daļai zīdaiņu gaļa tiek ieviesta uzturā pēc 6 mēnešu vecumā, kas ir saskaņā ar rekomendācijām.