

Canada Beef releases a bi-monthly Nutrition Journal Tracker as a summary report of health/nutrition research published that is of significance for beef.

TOPIC	Dietary Guidelines for Young Children
ARTICLE	Scientific Recommendations for Food-Based Dietary Guidelines for 1 to 5 Year-Olds in Ireland
CITATION	Scientific Recommendations for Food-Based Dietary Guidelines for 1 to 5 Year-Olds in Ireland Report of the Scientific Committee. 2020 Food Safety Authority of Ireland
LINK	https://www.fsai.ie/Dietary_Recommendations_1-5_Year_Olds
SIGNIFICANCE	Recognizes red meat as high quality protein and a rich bioavailable source of iron in the diet of 1–5 year-olds and recommends including 30 g of red meat approximately three times a week.

SUMMARY

- Young children have significantly higher nutritional requirements relative to their size, necessitating a focus on quality over quantity.
- International micronutrient intake recommendations do not consider the challenge smaller children face in meeting such requirements due to their low food intake.
- In developing the 'food-first' dietary guidelines, a total of 640 4-day food intake patterns, representing 2,560 days, were developed and analyzed. A vegetarian diet was also modelled.
- The food intake patterns developed provided an adequate intake of most nutrients, except for iron, vitamin D, DHA, and EPA.
- All children aged 1–3 were found to be at risk of inadequate iron intakes.
- A combination of red meat approximately 3 days a week and an iron-fortified breakfast cereal 5 days a week addressed this issue, except for children aged 1–3 years growing at ≤ 25 th percentile level on the WHO growth charts. For these children, a daily additional 4 mg of iron was required.
- The food-based dietary recommendations (also known as healthy eating guidelines) are:
A wide variety of foods should be included in order to increase acceptability of and familiarization with foods that are part of a lifelong healthy diet.
 - Milk is a key food in the diets of 1–5 year-old children. Milk is an important source of a range of nutrients, including protein, and is a critical source of calcium.
 - It is important that children aged 1–5 years are not given more than the recommended amount of milk as a drink, as this reduces intake of solid food and of some nutrients, such as fibre, and may result in iron deficiency anemia.
 - Breads, cereals, potatoes, pastas and rice are an important source of calories and fibre.
 - Breakfast cereals fortified with iron (containing ≥ 12 mg of iron/100 g) and vitamin D help to ensure adequate intake of these nutrients. Vitamin C-containing fruit or vegetables, or a small amount of very well-diluted fruit juice, should also be consumed along with the iron-fortified cereal in order to increase iron absorption.
 - Meat, poultry, fish, eggs, beans, lentils and smooth nut butters are important sources of protein, iron, DHA and EPA.
 - Red meat is a rich bioavailable source of iron in the diet of 1–5 year-olds. Including 30 g of red meat approximately three times a week helps ensure adequate iron intake. However, smaller children (i.e. 1–3 year-olds growing at ≤ 25 th percentile level) will require an additional 4 mg of iron/day.
 - Unprocessed meats (e.g. lean red meat, chicken, fish, etc.) are preferable to processed meats (e.g. ham, sausages, deli meat, etc.), which have high salt and fat content.
 - Fish should be included at least once a week in the diet of 1–5 year-olds. As important sources of DHA, EPA and vitamin D, oily fish can be included up to once a week, or white fish can be eaten twice a week.
 - Eggs, beans and lentils are important sources of non-heme iron and, in the case of beans and lentils, provide soluble fibre. These foods may be used as alternatives to meat, fish and poultry. It is important to include these foods during these early years in order to increase acceptability and familiarization. Vitamin C-containing fruit or vegetables, or a small amount of very well-diluted fruit juice, consumed along with such foods will increase iron absorption from these non-heme sources.
 - Fruit, salad and vegetables are important sources of vitamins and fibre.
 - Small amounts of fruit and vegetables given at different times of the day minimize the risk of overwhelming the child's capacity to consume other foods required for critical nutrients such as iron.
 - Fats, spreads and oils should be used minimally.
 - Foods high in fat, sugar or salt should be limited, as they provide a high proportion of the overall energy requirements of 1–5 year-old children without providing essential nutrients.
 - Supplements
 - Dietary intake of iron is unlikely to be sufficient for smaller 1–3 year-old children (growing at ≤ 25 th percentile level). This report highlights the need for an additional 4 mg of iron/day for 1–3 year-olds growing at ≤ 25 th growth percentile level. This additional iron can be provided through the use of iron-fortified full-fat milks or formula (containing at least 1 mg of iron/100 mL). Alternatively, a low-dose iron supplement providing the RDA for iron (7 mg) can be given 4 days a week.

- Another report by the Food Safety Authority of Ireland - Scientific Recommendations for a National Infant Feeding Policy, 2nd Edition - addresses the unique food and nutritional needs of infants in the first year of life. During the first year of life, infants triple their birth weight and double their surface area. Infant feeding plays an important role in growth and development, and can affect health not only during infancy and childhood, but also throughout adolescence and adulthood. The period from conception throughout pregnancy and the first two years of life is now recognised as a critical period for the protection of health and well-being throughout life. Best infant feeding practice includes breastfeeding and complementary foods introduced between 4 and 6 months of age.
- Of particular importance is the prenatal to 3-year interval, as this is a period of rapid brain development, learning, and formation of caregiver-child attachment.
- Saturated fat intake should be kept as low as possible within a nutritionally adequate diet, recognizing that the diet at 1 year is naturally high in saturated fat, but by the age of 5 years saturated fat intakes are approaching the goal of <10% of total energy intake.
- Many modelling approaches for developing food-based dietary guidelines exist worldwide. The approach chosen for the purposes of this work is a modified approach used previously in Canada to develop healthy eating guidelines for the general population aged 2 years and older. (Katamay SW, Esslinger KA, Vigneault M, Johnston JL, Junkins BA, Robbins LG, et al. Eating well with Canada's Food Guide (2007): development of the food intake pattern. Nutrition reviews. 2007;65(4):155-66.)

FOOD INTAKE PATTERNS MEET GOALS FOR HEALTHY EATING

- Energy - adequate, but not excessive, to support healthy growth and protect against overweight/obesity
- Fat - adequate for fat-soluble vitamins but low in saturated fat
- Fibre - adequate but not excessive
- Sugar - minimal amounts added
- Micronutrients - adequate but not excessive
- No added salt
- No processed meat

- Macronutrient daily intake goals:

Age (years)	Average energy kcal/day (total for 04 th - 99.6 th %ile) AR	Protein g/kg body weight (total for 04 th - 99.6 th %ile) RDA	Total fat (% energy) RI
1	757 (569-968)	1.14 (8-15)	35-40
1.5	881 (674-1118)	1.03 (8-15)	35-40
2	988 (755-1261)	0.97 (8-16)	35-40
3	1136 (1005-1293)	0.90 (9-18)	35-40
4	1388 (1223-1593)	0.86 (11-20)	20-35
5	1477 (1286-1726)	0.85 (12-23)	20-35

- Protein is particularly essential for young children, as it supports growth and development. During this time of growth and development, there is a high demand for essential, and sufficient non-essential, amino acids in order to make new tissue protein. Proteins can also be used as an energy source if energy is insufficient. Protein deficiency has been associated with impaired function of the brain in infants and young children, as well as impaired immune system and kidney function. Protein from animal sources is of higher quality than protein from plant sources, because the pattern of amino acids more closely matches what is required by humans.
- Micronutrient daily intake goals:

Age Group (years)	Iron mg/day AR (RDA)	Zinc mg/day AR (RDA)
1-3	5 (7)	3.6 (4.3)
4-6	5 (7)	4.6 (5.5)

- ▣ Iron – essential micronutrient required for almost all metabolic pathways in the body - was identified as a nutrient at risk of inadequacy in this age group. Prolonged iron deficiency in early childhood – with or without anemia – is associated with poorer cognitive, motor and behavioural outcomes, which can persist into adulthood. Iron deficiency has also been suggested to negatively affect growth and immune function in children. Risk of iron overload from dietary sources is negligible in children; however, caution must be taken with iron supplements.
- ▣ Zinc – crucial for growth and development through facilitation of several enzymatic processes and the formation of the structure of proteins and enzymes. It has been reported elsewhere that zinc may be an issue in this age group in terms of dietary intakes exceeding the UL of 7 mg/day. Therefore, the modelling of the food intake patterns included assessment of zinc intakes in order to examine the risk of exceeding the UL and how much the UL could be exceeded by.
- ▣ For the dietary modelling, the 4-day food intake patterns (based on an omnivore diet) were developed for female and male children at each age and percentile meeting energy requirements and food goals.
- ▣ Red meat is recommended for this age group, as it is one of the best sources of bioavailable iron and therefore was included in the dietary modelling.
- ▣ Processed meat, however, is not recommended for this age group for a variety of reasons, such as its high salt content, generally high fat content and its links with colorectal cancer. Processed meat is defined as meat that has been transformed through salting, curing, fermentation, smoking, or other processes in order to enhance flavour or improve preservation, e.g. hot dogs (frankfurters), ham, sausages, bacon and salami. Processed meat contains additives known as nitrites and nitrates which are endogenous forms of N- nitroso compounds, which are known carcinogens. Under EU food law, additives and preservatives present in processed meat are not permitted to be included in foods for young children. These issues notwithstanding, processed meat, in the form of bacon and ham, is widely consumed by 1–5 year-olds in Ireland (40% of 1 year-olds consume about one-third of a portion per day while 69% of 4 year-olds consume half a portion per day). Advice to replace such processed meat with other protein sources is a key recommendation of pediatric and community dietitians involved in providing services for 1–5 year-old children in Ireland. Considering all these issues, processed meat was not included in the dietary modelling of food intake patterns for 1–5 year-old children.
- ▣ ‘Food-first’ approach, as opposed to the use of dietary supplements or fortified milks, since nutrients found in solid foods are generally more bioavailable and easily absorbed by the body.
- ▣ Patterns achieving the nutritional goals were used to identify good food sources of certain nutrients, such as iron and vitamin D. These foods were then included more frequently in the food intake patterns that were providing inadequate amounts of those nutrients.
- ▣ **Modelling results for macronutrients:**
 - Children of smaller body size are most at risk of micronutrient deficiencies, especially iron and vitamin D. Smaller children (≤ 25 th percentile level) with a lower capacity for food intake will be more at risk of failing to meet micro nutrient goals.
 - Protein intakes were well above the requirement per kilogram of body weight per day.
 - At all ages, fat intakes were well within the recommended range.
 - The diet at 1 year of age is naturally high in saturated fat, therefore the saturated fat intakes were in line with expectations.
 - An inverse relationship exists between fat and sugar intakes, and this also extends to saturated fat. This suggests that very low Free Sugar intakes may only be achieved at the expense of higher fat and saturated fat intakes.
 - Overall carbohydrate intakes for 1–3 year-olds tended to be at the lower end of the recommended range, but this increased as age increased.
- ▣ **Modelling results for micronutrients:**
 - Iron (for 1–2 year-olds) and vitamin D (for all children aged 1–5 years) were the problem nutrients where inadequate intakes were identified requiring iterative changes to the food intake patterns.
- ▣ **Adjustments to ensure adequate iron**
 - Two key foods rich in iron were identified from the modelled food intake patterns - red meat and breakfast cereals fortified with iron to a level of ≥ 12 mg/100 g.
 - The first adjustment to increase iron intakes in those aged 1, 1.5 and 2 years involved including a small portion (30 g) of red meat on 2 out of the 4 days modelled (i.e. translating into 3 of 7 days a week). However, this adjustment only increased iron intakes slightly (by approximately 0.3 mg/day on average) and did not resolve the issue.
 - The second adjustment to increase iron intakes involved including an iron-fortified (12 mg of iron/100 g) breakfast cereal (30 g) on 3 out of the 4 days modelled (i.e. translating into 5 of 7 days a week). The inclusion of fortified

Heme iron food sources (portion in g)	Iron (mg) per portion
Ground beef, cooked (30 g)	0.81
Lamb chop (30 g)	0.75
Pork chop (40 g)	0.28
Chicken, roasted (25 g)	0.1
Chicken, leg (30 g)	0.27
Turkey, roasted (25 g)	0.2
Salmon (42 g)	0.14
Fish fingers (25 g)	0.24
Tuna, canned in sunflower oil (25 g)	0.3
Rainbow trout (30 g)	0.12

Non-heme iron food sources (portion in g)	Iron (mg) per portion
Iron-fortified (12 mg/100 g) breakfast cereal (30 g)	3.6
Baked beans (80 g)	1.1
Egg (60 g)	1.2
Omlette (25 g)	1.8
Tofu (40 g)	1.4
Macaroni & cheese (100 g)	0.42
Red kidney beans (30 g)	0.60
Ren lentils (30 g)	0.72
Chilli bean and lentil stew (50 g)	1.1
Falafel (30 g)	0.87
Hummus (30 g)	0.57

breakfast cereal at this level had a more significant effect, increasing average iron intakes by almost 1 mg/day, despite being a non-heme source of iron.

- The combination of including both red meat on 2 out of the 4 days (i.e. 3 of 7 days a week) and an iron-fortified (12 mg of iron/100 g) breakfast cereal (30 g) on 3 out of the 4 days (translating into 5 of 7 days a week) was modelled. However, this combination did not resolve the iron issue for children aged 1–3 years growing at the lower percentiles, i.e. ≤ 25 th percentile level.
- For 1 year-olds, the use of a follow-up formula fortified with iron (1 mg/100 mL with an average consumption of 442 mL/day), along with the inclusion of an iron-fortified (12 mg/100 g) cereal (30 g) 5 days a week and red meat (30 g) 3 days a week, resulted in adequate iron intakes (above the AR and at or above the RDA) for all children.
- The use of young child formula fortified with iron (1.2 mg/100 mL with an average consumption of 330 mL/day) for 1.5, 2 and 3 year-olds resulted in adequate iron intakes for all children.
- **Approaches to address iron inadequacy in smaller children aged 1–3 years (those growing along ≤ 25 th percentile level):**
 - An additional 4 mg of iron/day, through the use of an iron-fortified milk, was included in the food intake patterns of smaller children (i.e. 1–3 year-olds growing at ≤ 25 th growth percentile level) and this resulted in adequate intakes for all children.
 - Adequate iron intakes in these smaller children were also achieved by the inclusion of a supplement providing the RDA for iron (7 mg) 4 days a week.
- Iron is frequently inadequate in children with autism, Down syndrome and those with other special needs.
- **Vegetarian diets**
 - Food intake patterns included vegetarian protein sources such as eggs, cheese, beans, peas, lentils and tofu.
 - Breast milk was used up to 2 years of age and low-fat cow's milk from 3–5 years of age.
 - Adequacy of iron intake was the main focus of this phase of modelling.
 - Food intake patterns modelled provided comparable iron intakes to the omnivore patterns; iron intakes were in adequate for children aged 1–2 years growing at ≤ 25 th growth percentile level.
 - Recommend a low-dose iron supplement providing the RDA for iron (7 mg) 4 days a week, or, alternatively, an iron-fortified milk, would ensure adequate iron intakes for those on a vegetarian diet.
 - Parents should seek advice from a dietitian before embarking on any type of vegetarian diet for their child.
- Historically, it was generally accepted that non-heme iron, found in vegetables and cereal-type foods, was less well absorbed than heme iron found in red meat. However, a recent European Food Safety Authority (EFSA) report on Dietary Reference Values (DRVs) for iron considers that DRVs do not need to be derived for vegetarians as a separate population group. However, the bioavailability of iron from European vegetarian diets is not substantially different than in diets containing meat.
- Food preferences are partially genetic. Twin studies demonstrate high heritability for protein food preferences, and moderate heritability for fruit, vegetable and desserts. Genetic effects dominated for vegetables, fruit and protein preferences, whereas environmental effects dominated for starches, dairy and snacks preferences. Environments play a stronger role in consumption of energy-dense, nutrient-poor foods.

COMMENTS

Adequate protein and iron intakes are important in early childhood to ensure healthy physical growth and development. As one of the best dietary sources of high quality protein and bioavailable heme iron, including beef regularly in the diets of growing children makes nutritional sense. Irish public health guidelines recommend the inclusion of 30 grams of red meat 3 x weekly.

Iron fortified foods and supplements are used to top up dietary shortfalls.