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Comment on FR Doc # 2019-12806

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Comment

Re: NESR Complementary Feeding Systematic Review Confirms the Importance of Red Meat, including Beef, as a Source of Micronutrients for Infants and Toddlers

The Beef Checkoff appreciates the opportunity to provide evidence related to the role of red meat, including beef, in healthy dietary patterns for infants and toddlers. The Beef Checkoff is a producer-funded marketing and research program, which includes a significant commitment to supporting nutrition research to better understand beefs role in healthy diets at all stages of life, including the first 24 months.

The Beef Checkoff understands and appreciates the important work of the DGAC, especially evaluating the needs of the B-24 population for the first time. The first 1000 days represent a major period of growth, including the most active period for neurological development, underlining the importance of ensuring good nutrition for this vulnerable population during this critical life stage. In fact, significant research and authoritative groups, such as the American Academy of Pediatrics (AAP), have noted that nutrient deficiencies in this time period could have serious and lifelong consequences, making the new B-24 dietary recommendations even more important.

The AAP has identified several nutrients that particularly affect early brain development and demonstrate a critical or sensitive period in the first 1000 days of life, including protein, zinc, iron, copper, selenium, choline and vitamins B6 and B12. Beef is an excellent source of protein, zinc, B6, B12, selenium, and a good source of choline and heme iron, which is more easily absorbed by the body. As the Committee evaluates the evidence to develop the first Dietary Guidelines for this life stage, its important that nutrient-rich foods, such as beef, are considered for their ability to provide these nutrients, which are critical to proper growth and development.

The attached evidence provides more detail on beefs role in healthy diets during the first 1000 days; for example:

1.) Data from the Feeding Infants and Toddlers Study (FITS) 2016 indicate that iron intakes among older infants and young children have been on a declining trajectory since 2002, in part, because of low consumption of iron-rich foods, specifically declining intake of iron-fortified cereal and limited consumption (~5% of the participants) of iron-rich pured baby-food meats, and other meats many of which, such as beef, are iron rich. Clear guidance regarding the importance of iron-rich foods (such as beef) during complementary feeding is necessary for all older infants and young children, regardless of if an infant is at higher risk for iron insufficiency.
2.) In fact, the Nutrition Evidence Systematic Review (NESR) group recently completed a series of systematic reviews regarding complementary feeding and health outcomes from birth to 24 months, concluding: Strong evidence suggests that consuming complementary foods and beverages that contain substantial amounts of iron, such as meats or iron-fortified cereal, helps maintain adequate iron status or prevent iron deficiency during the first year of life among infants with insufficient iron stores or breastfed infants who are not receiving adequate iron from another source.
3.) Nutrient-rich beefs high-quality protein, iron, and zinc strengthen a balanced diet, complement the nutrients found in plant foods, and enhance the absorption of nutrients, such as iron, in plant foods.

The evidence supporting beefs role in maintaining micronutrient status is strong and there is consistent evidence supporting a role of meat in dietary patterns associated with developmental milestones. The available evidence from randomized controlled trials, along with expert opinion, supports a recommendation of 28 g/day red meat and/or beef in the diets and dietary patterns of older infants and young children. As part of most Americans diets, traditions, and celebrations beef is a foundational food that nourishes and optimizes health at every life stage.

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Attachments (1)

BeefCheckoffComplementaryFeedingComments

View Attachment:

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a contractor to the Beef Checkoff

September 12, 2019

Barbara Schneeman, PhD
Chair, 2020-2025 Dietary Guidelines Advisory Committee

Ron Kleinman, MD
Vice-Chair, 2020-2025 Dietary Guidelines Advisory Committee

CC: 2020-2025 Dietary Guidelines Advisory Committee Subcommittee Members:
Birth to 24 Months; Dietary Patterns; Data Analysis and Food Pattern Modelling; Pregnancy and Lactation
U.S. Department of Agriculture
U.S. Department of Health and Human Services
Brandon Lipps, Deputy Undersecretary for Food and Nutrition Consumer Services

Re: NESR Complementary Feeding Systematic Review Confirms the Importance of Red Meat, including Beef, as a Source of Micronutrients for Infants and Toddlers

Dear Members of the Dietary Guidelines Advisory Committee (DGAC):

The Beef Checkoff appreciates the opportunity to provide evidence related to the role of red meat, including beef, in healthy dietary patterns for infants and toddlers. The Beef Checkoff is a producer-funded marketing and research program, which includes a significant commitment to supporting nutrition research to better understand beef's role in healthy diets at all stages of life, including the first 24 months.

The Beef Checkoff understands and appreciates the important work of the DGAC, especially evaluating the needs of the B-24 population for the first time. The first 1000 days represent a major period of growth, including the most active period for neurological development, underlining the importance of ensuring good nutrition for this vulnerable population during this critical life stage. In fact, significant research and authoritative groups, such as the American Academy of Pediatrics (AAP), have noted that nutrient deficiencies in this time period could have serious and lifelong consequences,[1] making the new B-24 dietary recommendations even more important.

The AAP has identified several nutrients that "particularly affect early brain development and demonstrate a critical or sensitive period" in the first 1000 days of life, including protein, zinc, iron, copper, selenium, choline and vitamins B6 and B12.[1] Beef is an excellent source of protein, zinc, B6, B12, selenium, and a good source of choline and heme iron, which is more easily absorbed by the body.[2,3] As the Committee evaluates the evidence to develop the first Dietary Guidelines for this life stage, it's important that nutrient-rich foods, such as beef, are considered for their ability to provide these nutrients, which are critical to proper growth and development.

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Funded by
the Beef Checkoff.

The attached evidence provides more detail on beef's role in healthy diets during the first 1000 days; for example:

1.) Data from the Feeding Infants and Toddlers Study (FITS) 2016 indicate that iron intakes among older infants and young children have been on a declining trajectory since 2002, in part, because of low consumption of iron-rich foods, specifically declining intake of iron-fortified cereal and limited consumption (~5% of the participants) of iron-rich puréed baby-food meats, and other meats "many of which, such as beef, are iron rich".[5] Clear guidance regarding the importance of iron-rich foods (such as beef) during complementary feeding is necessary[18] for all older infants and young children, regardless of if an infant is at higher risk for iron insufficiency.
2.) In fact, the Nutrition Evidence Systematic Review (NESR) group recently completed a series of systematic reviews regarding complementary feeding and health outcomes from birth to 24 months, concluding: "Strong evidence suggests that consuming complementary foods and beverages that contain substantial amounts of iron, such as meats or iron-fortified cereal, helps maintain adequate iron status or prevent iron deficiency during the first year of life among infants with insufficient iron stores or breastfed infants who are not receiving adequate iron from another source."[7,8]
3.) Nutrient-rich beef's high-quality protein, iron, and zinc strengthen a balanced diet, complement the nutrients found in plant foods,[29] and enhance the absorption of nutrients, such as iron, in plant foods.

The evidence supporting beef's role in maintaining micronutrient status is strong[8] and there is consistent evidence supporting a role of meat in dietary patterns associated with developmental milestones.[35,36,37] The available evidence from randomized controlled trials, along with expert opinion, supports a recommendation of 28 g/day red meat and/or beef in the diets and dietary patterns of older infants and young children (See Table 2).[4, 9-16] As part of most Americans' diets, traditions, and celebrations[38,39,40,41] beef is a foundational food that nourishes and optimizes health at every life stage.[42]

Thank you for the opportunity to share the attached evidence on the role of beef as a nutrient-rich first food for infants and toddlers.

Shalene McNeill

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Re: NESR Complementary Feeding Systematic Review Confirms the Importance of Red Meat, including Beef, as a Source of Micronutrients for Infants and Toddlers

The American Academy of Pediatrics (AAP) has **identified several nutrients that "particularly affect early brain development and demonstrate a critical or sensitive period" in the first 1000 days of life.[1] Among these nutrients are protein, zinc, iron, copper, selenium, choline and vitamins B6 and B12.[1]** Beef is an excellent source of protein, zinc, B6, B12, selenium, and a good source of iron and choline.[2] Beef is one of the best sources for heme iron, which is more easily absorbed by the body than non-heme iron found in plant foods.[3] **The AAP has noted that a deficiency of these key nutrients during the first 1000 days of life may be associated with long-term neurodevelopmental consequence.[1]**

Iron deficiency is the single most common nutrient deficiency in the developing world and is common in the United States among infants and young children.[4, 5] Data from the Feeding Infants and Toddlers Study (FITS) 2016 indicate **that iron intakes among older infants (6-11.9 months of age) have been on a declining trajectory since 2002.[5]** In 2008, 12% of older infants participating in FITS consumed less than the Estimated Average Requirement (EAR) for iron; this percentage is now estimated to be 18% of older infants failing to meet the EAR for iron.[5] Data from the National Health and Nutrition Examination Survey (NHANES) for the period 2009-2012 report similar findings with 10% of older infants not meeting the EAR for iron.[6] Declining consumption of key iron-rich foods among older infants and young children, including beef and iron-fortified cereal are, at least in part, responsible.[5]

Most recently, the Nutrition Evidence Systematic Review (NESR) group completed a series of systematic reviews (SR) regarding complementary feeding and various health outcomes from birth to 24 months of age.[7] In the SR titled *"Types and Amounts of Complementary Foods and Beverages and Micronutrient Status: A Systematic Review"* [NESR Micronutrient SR], NESR concluded that **"Strong evidence suggests that consuming complementary foods and beverages that contain substantial amounts of iron, such as meats or iron-fortified cereal, helps maintain adequate iron status or prevent iron deficiency during the first year of life among infants with insufficient iron stores or breastfed infants who are not receiving adequate iron from another source.** However, the benefit of these types of complementary foods and beverages for infants with sufficient iron stores, such as those consuming iron-fortified infant formula, is less evident."[8]

NESR reached their conclusion for iron from an evidence-base predominated by randomized controlled trials (RCTs) where meat types and intakes were independently evaluated and clearly defined.[8] Specifically, all RCTs but one[9] provided beef, alone[10-12] or in combination with lamb and pork (n=3), or

poultry (n=1).[13-16] RCT evidence supports biological causality and allows for quantification of dose-response relationships.[17] The majority of RCT evidence reported in the NESR Micronutrient SR supports specific type (beef, lamb, and pork) and amount intake (ave. 28 g/d; range 8-56 g/day; See Table 2) recommendations for meat in the complementary diet of older infants and young children.

Clear guidance regarding the importance of iron-rich foods during complementary feeding is necessary[18] **for all** older infants and young children, regardless of if an infant is at higher risk for iron insufficiency, as suggested by the NESR SR conclusions. In fact, the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition European (ESPGHAN) notes, "Although there are theoretical reasons why different complementary foods may have particular benefits for breast-fed or formula-fed infants, attempts to devise and implement separate recommendations for breast-fed and formula-fed infants are likely to be confusing and is therefore not recommended."[19] Educating caregivers about the importance of iron-rich foods in complementary feeding is important and can be accomplished by increasing clinician awareness about declining iron intake[18] and providing clear guidance via the Dietary Guidelines for Americans.[5] Regarding the need to raise awareness among clinicians for the importance of meat in the diet of U.S children, FITS researchers note that it **"…is imperative that they emphasize the importance of iron, recognizing the very low intake of iron-rich meats and the declining use of iron-fortified infant cereal among young children in the US as strong reasons to recommend iron-rich and iron-fortified complementary foods."[18]**

This statement by the FITS researchers is in contrast to a recent technical report from the AAP endorsing fish as an important protein source in the diets of children.[20] The AAP report provides a nutrient profile table of over 20 fish and shellfish species compared to seven other animal protein sources. While the AAP has endorsed red meat as an important source of heme iron for infants and children ages 0-3 years[4] and recognized iron among a list of 15 critical nutrients for neurocognitive development[1], only three of these nutrients (protein, iron, n-3 LCPUFA) are considered in the AAP's comparison table[20] of animal proteins. In an effort to fully examine the nutritional comparability of fish to other animal protein sources, we have recreated the AAP report table to include copper, zinc, selenium, B6, B12, choline, and folate (see Table 1). In addition, in keeping with 2015-2020 DGAC guidance,[21] leaner animal protein options were added to compare to those originally included in the AAP report. When considering a broader array of critical nutrients, the evidence in Table 1 below demonstrates that, **compared to the highest fish source of iron listed in the AAP Fish Technical Report (i.e. Atlantic sardines canned in oil with bones), fresh lean beef provides on average less calories, total fat, and cholesterol while providing comparable iron and choline, more than 3 times the zinc, and double the B6 per 100g serving.** While Atlantic sardines canned in oil with bones do provide more B12, selenium, copper and

folate per 100 g serving than fresh lean beef, they also contain the contaminant methyl mercury (MeHg)[20] and are considered a choking hazard for older infants and young children.[22] **In fact, all remaining fish identified contain less iron, zinc, B6, and choline, compared to fresh lean beef, and most, particularly tuna, contribute substantially more MeHg than sardines** (Table 1). The limited familiarity and accessibility of fish compared to beef also precludes the potential substitution of fish as the primary protein source for older infants and young children. Specifically, cost, lack of competence in preparing, fear of bones, choking risk, general dislike, and allergic sensitization, are barriers to fish as a meaningful source of critical nutrients in the complementary diet.[23-26] While there is insufficient evidence to confirm an association between consuming fish or shell fish during complementary feeding, meat is not a common allergen and evidence is suggestive (limited) that consumption of meat during the first year of life is not associated with increased risk of allergic disease.[27] **Thus, beef and fish are not interchangeable protein sources of critical neurodevelopmental nutrients in the complementary diet.**

Similarly, animal and plant proteins are not interchangeable in the complementary diet for maintenance of micronutrient status. As regards iron, for example, heme iron from meat is estimated to be 25% bioavailable, while that found in iron-fortified foods is estimated to be 10% bioavailable.[28] **Nutrient-rich beef's high-quality protein, iron, and zinc strengthen a balanced diet, complement the nutrients found in plant foods,[29] and enhance the absorption of nutrients, such as iron, in plant foods**.[28] Despite the endorsement of vegetarian diets as healthful for infants and young children,[30, 31] **a recent systematic review of vegetarian diets in children found insufficient evidence "…to draw firm conclusions on the health benefits or risks of present-day vegetarian type diets on the nutritional or health status of children and adolescents in industrialized countries."[32]** Regarding iron, the researchers found iron deficiency was reported in more than half of studies of vegetarian children and other studies reported lower or similar biomarkers of iron status.[32] As such, regarding meatless complementary diets, medical experts note that while "…a similar intake of most nutrients and protein can be achieved…", "…there is a higher risk of deficiency of individual nutrients, such as iron, zinc and DHA."[33] Similarly, with regards to micronutrient status and fruits and vegetables in complementary feeding, NESR found insufficient evidence to determine the relationship between these plant-based foods and iron status.[8]

Finally, given the role of beef in maintaining micronutrient status of infants and young children, the role of beef in promoting cognitive development has been considered. The NESR SR regarding complementary feeding and developmental milestones reports, based on observational studies, that **"…positive associations between dietary patterns emphasizing vegetables and meats during the**

complementary feeding period, and intelligence quotient (IQ) between ages 4 - 8.5y. However, a conclusion could not be drawn due to low generalizability and heterogeneity in exposures, observed effects, and potential confounding."[34] While none of the observational studies considered in this NESR SR specifically identified red meat or any of the individual sub-types, all consistently found a developmental benefit for at least one time point of interest associated with meat-related dietary patterns.[35-37]

The evidence supporting a role of beef in maintenance of micronutrients status is strong [8] and there is consistent evidence supporting a role of meat in dietary patterns associated with developmental milestones.[35-37] The **available evidence, along with expert opinion, supports a recommendation of 28 g/day red meat and/or beef in the diets and dietary patterns of older infants and young children** (See Table 2).[4, 9-16] As part of most Americans' diets, traditions, and celebrations[38-41] beef is a foundational food that nourishes and optimizes health at every life stage.[42]

Table 1 – Recreated AAP Report Table 2 –Animal Protein Nutrients (per 100g) - In Order of Iron content – revised and updated to include AAP 1000 days Critical Nutrients and Leaner Options*

Food Source [USDA Nutrient Database ID#]	Iron (mg)	Zinc (mg)	Kcal	Protein (g)	Total fat (g)	Sat fat (g)	Chol (mg)	DHA + EPA (mg)	B12 (µg)	B6 (mg)	Choline (mg)	Selenium (µg)	Copper (mg)	Folate (µg)	MeHg (mg/kg)
Sardine, Atlantic canned in oil, *with bone* [175139]	2.9	1.3	208	25	11	2	142	1480	8.9	0.2	75	53	0.2	10	0.079
96% lean ground beef[**]	**2.41**	**5.16**	**129**	**22**	**4.0**	**1.8**	**61.0**	**NR**	**2.25**	**0.4**	**72**	**18**	**0.1**	**5**	**NR**
Eggs [339003]	1.8	1.3	143	6	5	3	186	58	0.89	0.2	294	31	0.1	47	0
Shrimp (shellfish) [475343]	1.62	NR	85	20	1	0	161	61	NR	NR	NR	NR	NR	NR	0.053
Sirloin steak, trimmed to 1/8” fat [168726]	1.61	3.6	201	20	13	5	75	0	1.05	0.6	85	23	0.1	11	ND
Clams (shellfish) [174214]	1.6	0.6	86	15	1	0	30	107	11	0.01	65	31	0.05	5	0.028
Tuna (light or skipjack, canned in water) [171986]	1.5	0.8	116	26	1	0	30	281	3	0.4	NR	80	0.05	4	0.118
Bologna (beef) [172012]	1.3	1.9	299	11	26	10	57	4	1.2	0.2	30	12	0.05	3	ND
Bologna (low fat, beef) [168101]	**1.0**	**1.8**	**204**	**12**	**15**	**5.5**	**44**	**0**	**1.4**	**0.2**	**53**	**12**	**0.03**	**5**	**NR**

Food Source [USDA Nutrient Database ID#]	Iron (mg)	Zinc (mg)	Kcal	Protein (g)	Total fat (g)	Sat fat (g)	Chol (mg)	DHA + EPA (mg)	B12 (µg)	B6 (mg)	Choline (mg)	Selenium (µg)	Copper (mg)	Folate (µg)	MeHg (mg/kg)
Tuna (albacore, canned in water) [175158]	1.0	0.5	128	24	3	1	42	862	1.2	0.2	29	66	0.04	2	0.328
Halibut (Pacific) [174200]	0.8	0.4	91	19	1	0	49	194	1.1	0.5	62	46	0.02	12	0.261
Tuna (yellowfin) [175159]	0.8	0.4	109	24	1	0	39	100	2.1	0.9	65	91	0.04	2	0.143
Salmon (wild) [173688]	0.8	0.5	187	20	12	2	61	1150	1.2	0.4	NR	36	0.04	30	0.067
Chicken leg no skin [173619]	0.8	1.8	120	19	4	1	91	32	0.6	0.4	49	21	0.06	4	
Rainbow trout (wild) *BONES* [175154]	0.7	1.1	119	20	3	1	59	587	4.4	0.4	NR	13	0.1	12	0.344
Blue Crab (shellfish) [174204]	0.7	3.5	87	18	1	0	78	549	9.0	0.2	NR	37	0.7	44	0.110
Chicken breast with skin [171474]	0.7	0.8	172	21	9	3	64	30	0.3	0.5	67	17	0.04	4	0
Chicken leg with skin [172378]	0.7	1.5	214	16	16	4	79	14	0.6	0.3	42	18	0.05	4	0

*Originally reported proteins providing less than 0.7 mg iron per 100 g not included; revised to include Zinc, B12, choline, selenium, copper, iodine as not originally provided; **bold text** indicates added source to demonstrate lean option; *italicized text* indicates choking hazard) Original table included calcium and Vitamin D, these were removed to accommodate copper and selenium, i.e. nutrients demonstrating a critical/sensitive period

**From USDA Ground Beef Calculator https://ndb.nal.usda.gov/ndb/beef/show

Table 2. Description of randomized controlled trial evidence used by NESR to examine the relationship between consuming meat as a complementary food and micronutrient status of older infants and young children

Study	**Intervention**	**Amount of Intervention**
Dube et al., 2010 (15)	High Meat Group: Beef or Poultry meals Low Meat Group: Beef or Poultry meals	20-29 g/day (mean = 24.5 g)
Engelmann et al., 1998 (16)	Low Meat Group: Beef, pork, lamb, turkey, or cod High Meat Group: Beef, pork, lamb, turkey, or cod	10 g/day 27 g/day
Krebs et al., 2006 (11)	Meat Group: pureed beef	28 g/day
Krebs et al., 2012 (12)	Meat Group: pureed beef, 1-2 jar/day	28-56 g/day
Krebs et al., 2013 (10)	Meat Group: pureed beef, 1-2 jar/day	28-56 g/day
Makrides et al., 1998 (13)	High-iron weaning diet group: advice to offer red meat (beef and lamb)	30-40 g/week
Szymlek-Gay et al., 2009 (14)	Meat Group: red meat (beef, lamb, liver) 2 portions/day	56 g/day
Yeung et al., 2000 (9)	Treatment Group: Pureed meat, 1-2 jars/day	Amount not specified

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