Comments: Dear Dr. Lunn:

The Beef Checkoff appreciates the opportunity to submit scientific evidence to the Office of the Report on Carcinogens (RoC) in response to its September 9, 2016, Federal Register (80 FR 62513-14) request for information regarding the possible evaluation of consumption of red meat, processed meat, and meat cooked at high temperatures for future editions of the Report on Cancer (RoC).

In response to the request for recently published, ongoing, or planned studies related to evaluating cancer outcomes, we submit the following non-exhaustive list of relevant scientific literature published within the past 5 years, and ongoing and planned studies:

*Ongoing and planned studies funded by the Beef Checkoff
Title: Development and validation of gas chromatography mass spectrometry methodologies for the assessment of polycyclic aromatic hydrocarbons and heterocyclic amines in beef. As described by the researchers (Legako, J. and co-workers), the objective of this project is to validate methodologies for measurement of polycyclic aromatic hydrocarbons (PAH) and heterocyclic amines (HCA) in beef. The researchers propose the use of gas chromatography mass spectrometry (GC-MS) due to its relatively cheaper operation costs and greater availability to other researchers.

Title: Beef as a Component of a Healthy Dietary Pattern in Cancer Survivors. As hypothesized by the researchers (Clinton, S. and co-workers), overweight and nutritionally stressed cancer survivors who actively participate in a 6-month intensive intervention comparing a DGA /AICR approach or a DGA / AICR based diet plus beef will both show improved body composition and successfully maintain a healthy dietary pattern and physical activity effort over time and that regular consumption of lean beef may favorably impact specific nutritional outcomes.

Title: Heme and mechanisms of carcinogenicity. The researchers (Kruger, C. et al.) will conduct a weight of evidence, systematic review studies investigating proposed mechanisms of dietary heme ingestion on initiating or promoting colorectal cancer. Mechanisms to be reviewed will include genotoxicity,
catalytic formation of N-nitroso compounds and cytotoxicity due to lipid peroxidation end-products, as outlined by the investigators.

Title: Evaluation of the relative risks due to consumption of red meat compared to other common food items. The investigators (Zagmutt, F. and Costard, S.) aim to determine preliminary, baseline estimates of relative exposure to hypothesized carcinogenic factors through consumption of selected food items (including red meat); 2) Identify other important potential health risks caused by red meat substitutes; 3) Identify data sources and knowledge gaps. This will also include a broad overview of data and corresponding gaps that would be necessary to perform a traditional dose-response assessment of HCAs & PAHs.

Title: Association between Red Meat Consumption and Colon Cancer: A Systematic Review of Experimental Results Turner, N and Lloyd, S. are completing a systematic review of the available evidence to determine the availability of plausible mechanistic data linking red and processed meat consumption to CRC risk. Turner and Lloyd have found fifty-nine studies using animal models or cell cultures that met specified inclusion criteria, most of which were designed to examine the role of heme iron or heterocyclic amines (HCAs) in relation to colon carcinogenesis. Turner and Lloyd note that most studies used greatly elevated levels of meat or meat components as compared to those found in human diets. Turner and Lloyd note that, although many of the experiments used semi-purified diets designed to mimic the nutrient loads in current westernized diets, most did not include potential biologically active protective compounds present in whole foods. Turner and Lloyd note that, because of these limitations in the existing literature, there is currently insufficient evidence to confirm a mechanistic link between the intake of red meat as part of a healthy dietary pattern and CRC risk.

*Recent Publications Related to Exposure Assessment Complications for Red Meat, Processed Meat and Meat Cooked at High Temperatures:


Alomiraha, H., Al-Zenkia, S., Al-Hootia, S., Zaghloul, S.,


Kitts, D. D., Chen, X. M., Broda, P. (2012). Polyaromatic hydrocarbons of smoked cured muscle foods prepared by Canadian Tl&amp;apos;ast&amp;apos;en and Llheidli T&amp;apos;enneh first nation


National Food Institute, Technical University of Denmark. (2016).
Mechanisms behind cancer risks associated with consumption of red and processed meat. ISBN 978-87-93109-82-7. Available at www.food.dtu.dk


Meta-Analyses of Epidemiologic Studies regarding Meat and Cancer Risk


Bylsma LC, Alexander DD. A review and meta-analysis of prospective studies or red and processed meat, meat cooking methods, heme iron, heterocyclic amines and prostate cancer. Nutr J 2015;14:125.

Epidemiological Studies Estimating HCA/PAH Intake from Meat Using CHARRED and Reporting Cancer Risk


Barbir, A., Linseisen, J., Hermann, S., Kaaks, R., Teucher, B.,


*Epidemiological Studies of Heme Iron Intake and Cancer Risk


Surya, R., Helies-Toussaint, C., Martin, O., et al. (2016). Red meat and colorectal cancer: Nrf2-dependent antioxidant response contributes to the resistance of preneoplastic colon cells to


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