

EFFECT OF COUNTRY OF ORIGIN AND COOKING ENDPOINT TEMPERATURE ON THE FLAVOR PROFILE OF BEEF

N. Prieto^{1*}, J. L. Aalhus¹, I. L. Larsen¹, Z. Pietrasik², and N. J. Gaudette²,

¹Lacombe Research and Development Centre, Agriculture and Agri-Food Canada, Lacombe, Canada,

²Food Processing Development Centre, Ministry of Agriculture and Forestry, Leduc, Canada,

*nuria.prietobenavides@canada.ca

I. OBJECTIVES

The aim of this study was to evaluate the effects of country of origin and cooking endpoint temperature on the flavor profile of beef.

II. MATERIALS AND METHODS

Full ribeye primals (*Longissimus thoracis*) were purchased from Australia ($n=18$), Canada ($n=16$), and the US ($n=20$) to represent Meat Standards Australia Grade 4 star mixed grain, Canadian AAA barley, or USDA Choice corn-finished beef steers, respectively. Upon arrival at the Lacombe Research and Development Centre (Agriculture and Agri-Food Canada, Canada), all ribeyes were aged at 2°C until 45 d to equal the aging time incurred during shipping of the Australian product, and subsequently frozen at -35°C until analyses. Two 2.5-cm steaks from each loin were cut, thawed overnight under refrigeration, and randomly grilled to an internal endpoint temperature of either 63°C (rare) or 71°C (medium-well). Steaks were presented in a balanced design to a 9-member trained sensory panel to rate the intensity of aromas ($n=19$), tastes ($n=5$), and flavors ($n=19$) using a 15-cm line scale. Flavor profile data were analyzed using the MIXED model procedure of SAS version 9.4 (SAS Institute Inc., Cary, NC), with the main effects of country of origin and endpoint cooking temperature and their interaction in the model, and panel session and assessor and their interactions included as random effects.

III. RESULTS

Beef identity and buttery flavors were rated higher ($P<0.05$) in Canadian and US compared to Australian steaks, whereas bitter taste and barnyard, liver-like, and rancid flavors were higher ($P<0.05$) in Australian than in both Canadian and US steaks. Canadian steaks presented higher ($P<0.05$) fat-like flavor than Australian and US steaks, whereas brown roasted flavor was higher in US, lower in Australian, and intermediate in Canadian steaks ($P<0.05$). Steaks cooked to a 63°C endpoint presented higher ($P<0.05$) cruciferous aroma, sour taste, and bloody/serummy and sour/dairy flavors and tended ($P<0.1$) to have higher metallic flavor than the 71°C steaks. Steaks cooked at 71°C had higher ($P<0.05$) sweet taste and beef identity flavor and tended ($P<0.1$) to have higher buttery flavor and brown roasted aroma and flavor than the 63°C steaks. There was only one significant interaction between endpoint cooking temperature and country of origin; the 71°C treatment significantly ($P<0.05$) increased the beef identity flavor compared to the 63°C in Canadian steaks, but no cooking endpoint temperature effect was observed for this flavor attribute in either US or Australian steaks.

IV. CONCLUSION

Even after 45 d of aging, trained panelists were able to discern variations in beef taste/flavor intensities arising from production differences in country of origin. Cooking beef steaks to a low endpoint temperature of 63°C resulted in a combination of aromas, tastes, and flavors that may be attributed to limited formation of Maillard reaction products. Increasing endpoint temperature to 71°C lengthened the cooking time and contributed to additional flavor development. Nevertheless, the endpoint temperature increasing from 63°C to 71°C did not enhance umami taste regardless of country of origin, which suggests that higher temperatures/longer cooking times may be required to promote the formation of umami compounds.

Keywords: beef, cooking endpoint temperature, country of origin, flavor