COMMERCIALIZATION OF UNIVERSITY RESEARCH: VERIFICATION OF BRAUNSCHWEIGER COMPOSITION.

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Summary

Braunschweiger commercially manufactured from liver, jowls and bacon ends from flaxseed-fed hogs contained lower ($P<.01$) percentage (compared to control) of all saturated fatty acids (10:0, 12:0, 14:0, 16:0, and 18:0). Percentage of α-linolenic acid (18:3 n-3) increased ($P<.01$) from 1% to 9.5%, and from 2.3% to 5.3%, comparing control Braunschweiger with that processed from pigs fed 15% dietary flaxseed for 42 and 28 days prior to slaughter, respectively. Percentage eicosapentaenoic acid (20:5 n-3) increased ($P<.01$) from 0.096% to 0.77%, an eight-fold increase in the 42-day flaxseed product, but decreased compared to control in the 28-day flaxseed product. Percentage docosahexaenoic acid (22:6 n-3) also decreased in both flaxseed products. Thus, in this instance, Braunschweiger from flaxseed-fed pork contained relatively high levels of the precursor omega-3 fatty acid (18:3n-3). However, the dietary treatment apparently did not allow the pigs to elongate and desaturate this fatty acid to eicosapentaenoic and docosahexaenoic acids, the more nutritionally important fatty acids for humans.

Introduction

We have previously reported that consumers found Braunschweiger manufactured from hogs which had been fed 15% dietary ground flaxseed for the last 28 or 42 days before slaughter to be equally palatable with Braunschweiger from hogs on a normal diet (Specht-Overholt and Romans, 1992). This Braunschweiger was also used in a human blood lipid study at South Dakota State University and North Dakota State University (Crews et al., 1994). This paper deals with the fatty acid composition of Braunschweiger from pigs on three different feeding regimes- control and 15% dietary ground flaxseed for either 28 or 42 days immediately prior to slaughter. The objective of this study was to verify university research by enlisting cooperating industries to apply our earlier research findings. Another objective was to determine the fatty acid composition of Braunschweiger manufactured by a commercial firm using pork commercially fed, slaughtered and processed.

Materials and Methods

The firm *pnm* (Professional Nutrition Management), Ireton, IA, with farms and herds in South Dakota agreed to feed 130 hogs a diet composed of 15 percent ground flaxseed for the 28 days just prior to slaughter along with 80 controls. John Morrell and Co., Sioux Falls, SD, slaughtered 47 head of flaxseed-fed hogs (F) and 20 controls (C) in the first phase. Fourteen days later, after the remaining hogs had been on feed for 42 days, 40 F and 15 C pigs were slaughtered. Livers from all hogs were saved on the kill floor and along with other pork products were transported to Lee's Meat and Sausage in Tea, SD. Lee's manufactured the Braunschweiger from the livers (50%), jowls (40%) and bacon ends (10%) from the respective dietary groups, plus nonfat dry milk, cure, seasonings. and water. Braunschweiger was stuffed into 1.1 and 2.2 kg chubs.

Chubs were selected randomly from each of the four batches of Braunschweiger (Control 42 days, Flaxseed 42 days, Control 28 days, Flaxseed 28 days). Fifteen individual fat and fatty acid determinations were made from each batch. Slices were homogenized in liquid nitrogen prior to final sampling. Total lipids were extracted using dichloromethane-methanol (9 + 1). Methyl esters were prepared and analyzed by GLC in a Varian Star Model 3400 gas chromatograph (Varian Associates Inc., Walnut Creek, CA) with a flame ionization detector. The separation of fatty acids was effected on a 30 m × .25 mm ID × .20 μm film thickness, Supelco Model SP 2330 (Supelco, Inc., Bellefonte, PA) column. The column was run at 35° C for 5 min,

ramped to 150° C @ 20° C/min, held for 6 min, ramped to 190° C @ 2° C/min, held for 11 min, ramped to 225° C @ 20° C/min, and held for 11 min. Injection was direct, on-column, cold (@ 40° C) and ramped @ 100° C to 225° C. Peak areas were calculated automatically on a Varian GC Star Workstation. Statistical analysis consisted of Analysis of Variance (SAS, 1985) with the four treatments as the main effects, and all sampling error included in the error term.

Results and Discussion

The percentage of total fat in the four Braunschweiger batches is the first entry in Table 1. Although the fat content of each batch is significantly different from all the others, the only really practical difference is between the two 42-day and the two 28-day batches. Wurstmacher Lee Hofer, of Lee's Meat and Sausage, used only the pork from the hogs in each group to make each respective batch. The herd of hogs raised and fed by *pnm* were very lean, and the second two groups (42 days) were leaner than the two 28-day groups. This is shown by carcass data provided by the hog slaughterer, John Morrell & Co. Percent lean, as calculated by a company formula that included fat thickness and loin eye depth, ranked the groups from highest to lowest as follows: Flaxseed 42 days, 55.6%; Control 42 days, 54.9%; Flaxseed 28 days, 54.5%; and Control 28 days, 54.1%. It is logical that the fastest growing end of the herd of hogs would be slightly fatter than the second sort group. This difference in hog composition between groups provides at least partial explanation for the remaining fatty acid composition data in Table 1.

All differences noted in Table 1 are significant at $P<.01$. The statistical analysis included 68 observations, which allowed many small differences to be significant. Thus, only the major changes will be discussed. Braunschweiger commercially manufactured from livers, jowls and bacon ends from flaxseed-fed hogs contained lower percentage (compared to control) of all saturated fatty acids (10:0, 12:0, 14:0, 16:0, and 18:0). Percentage of α-linolenic acid (18:3 n-3) increased from 1% to 9.5%, and from 2.3% to 5.3%, comparing control Braunschweiger with that processed from pigs fed 15% dietary flaxseed for 42 and 28 days prior to slaughter, respectively. Percentage eicosapentaenoic acid (20:5 n-3) increased from 0.096% to 0.77%, an eight-fold increase in the 42-day flaxseed product, but decreased compared to control in the 28-day flaxseed product. Percentage docosahexaenoic acid (22:6 n-3) also decreased in both flaxseed products. Thus, in this instance, Braunschweiger from flaxseed-fed pork contained relatively high levels of the precursor omega-3 fatty acid (18:3n-3). However, the dietary treatment apparently did not allow the pigs to elongate and desaturate this α-linolenic acid to eicosapentaenoic and docosahexaenoic acids, the more nutritionally important fatty acids for humans.

Conclusion

Under commercial conditions, feeding swine a diet containing 15% ground flaxseed for the final 28 and 42 days before slaughter caused Braunschweiger, which was formulated from livers, jowls and bacon ends, to contain elevated levels of α-linolenic acid, the precursor omega-3 fatty acid to eicosapentaenioc and docosahexaenoic acids, normally found in cold-water fish.

Literature

Crews, M.G., Romans, J.R. and Marchello, M.J., (1994). Dietary effects of feeding omega-3 enriched pork products to healthy young men and women. Proc. 55th Flax Institute, pp. 135-142, Fargo, ND, January 26-28.

Specht-Overholt, S.M. and Romans, J.R., (1992). Pork liver: the forgotten variety meat in the U.S. Proc. 38th Internatl. Congress of Meat Sci. and Tech. 2:297-299.

Table 1. Effects of feeding 15 percent dietary flaxseed to market swine for 28 and 42 days preslaughter on fatty acid percentage composition of commercially manufactured Braunschweiger