INTRAMUSCULAR FAT AND CHOLESTEROL CONTENT OF CERTAIN CHUCK MUSCLES

Y. I. Choi[1], H. A. Flores[2], J. J. Guenther[3] and K. K. Novotny[4]

Story in Brief

Beef chucks from 4 steer carcasses (U.S. Good, Yield Grade 2) were used to determine the intramuscular fat and cholesterol content of 10 large chuck muscles. There were large variations in intramuscular fat (2.0% - 8.3%) and cholesterol (57.24 mg/100 g - 66.39 mg/100 g) content of the 10 chuck muscles. The low relationship found between intramuscular fat and cholesterol content of raw chuck muscles may not support the general assumption that meat in low fat will have low cholesterol. Further research is needed to determine the influence of cooking on fat and cholesterol contents of chuck muscles.

(Key Words: Chuck Muscles, Cholesterol)

Introduction

The per capita consumption of animal fats and red meats has declined as the concern about diet and health has grown in the United States. In this connection, dietary cholesterol level has received more attention because of its suspected role in developing artherosclerosis (NLSMB, 1983). Because cholesterol was known to be present in a number of foods, including meat, dietary control seemed to be a promising approach toward reducing blood cholesterol, and thereby reducing the risk of heart attack. Few studies, however, have evaluated the cholesterol content of chuck muscles.

The purpose of this study was to determine the intramuscular fat and cholesterol content of 10 large chuck muscles.

Materials and Methods

Beef forequarters were selected from 4 steer carcasses (U.S. Good, Yield Grade 2) at a commercial packing plant. Forequarters were fabricated into wholesale square-cut chucks (NAMP, 1983). Chucks were trimmed of subcutaneousfat and the following 10 chuck muscles were separated: brachiocephalicus and omotransversarius group, (BO); complexus, (CP); deep pectoral, (DP); infraspinatus, (IF); rhomboideus, (RB); serratus ventralis, (SV); splenius, (SL); supraspinatus, (SS); trapezius, (TP); and triceps brachii long head, (TBLO). After the above 10 muscles were trimmed of intermuscular fat, tendon and visible epimysial connective tissue, a portion of each muscle (50 g each) was coarsely ground, then finely ground and thoroughly homogenized with a Sorvall Omnimixer.

Intramuscular fat content of each muscle was determined according to the standard procedures (AOAC, 1980). For cholesterol content of

---

[1]Research Associate, [2]Graduate Assistant, [3]Professor, [4]Laboratory Technician

Table 1. Intramuscular fat and cholesterol content of chuck muscles[f].

	Muscle Rank									
Trait	1	2	3	4	5	6	7	8	9	10
Intra-muscular Fat (%)	SV 8.3[a]	IF 7.7[a]	TP 5.7[b]	RB 5.7[b]	CP 5.0[bc]	SS 4.1[cd]	BO 4.0[cd]	TBLO 3.8[cd]	DP 3.6[d]	SL 2.0[e]
Cholesterol (mg/100g)	SV 66.39[a]	SS 66.12[a]	DP 62.72[b]	TP 61.48[b]	SL 61.41[b]	RB 60.90[bc]	TBLO 60.82[bc]	CP 57.98[cd]	IF 57.44[d]	BO 57.24[d]

[a-e] Means in same row with different superscripts differ (P<.05).

[f] BO=brachiocephalicus and omotransversarius; CP= complexus; DP=deep pectoral;IF=infraspinatus; RB=rhomboideus; SV=serratus ventralis; SL=splenius; SS=supraspinatus; TP=trapezius; and TBLO=triceps brachii long head.

each muscle, total lipid content was extracted by the Folch procedure (Folch et al., 1957) using chloroform-methanol mixture. A 6 ml-aliquot (equivalent to 0.3 g sample) of the lipid extract prepared by the Folch procedure was freed of solvent using a stream of nitrogen. The lipid residue was mixed with 3 ml of ethanol (95%) and saponified by heating with 6 ml of 50% KOH in a water bath at 60 C for 15 min. Distilled water (3 ml) was added to the mixture. The unsaponifiable material was extracted once with 5 ml of hexane. A 3 ml-aliquot (equivalent to 0.18 g sample) of the hexane extract was freed of solvent, as described above, and assayed for cholesterol concentration according to the colorimetric procedure of Bachman et al. (1976) using o-phthaldialdehyde reagent. The results were expressed as mg cholesterol per 100 g of sample (wet weight basis). All determinations were in duplicate. Differences between muscles were analyzed by Duncan's Multiple Range test.

Results and Discussion

There were large variations in intramuscular fat and cholesterol content of 10 chuck muscles(Table 1). For intramuscular fat content of chuck muscles, the SV had the highest value while the SL had the lowest ($P<.05$) value (8.3% vs 2.0%, respectively). For cholesterol content of chuck muscles, the SV showed the highest value while the BO showed the lowest value (66.39 mg/100g vs 57.24 mg/100g, respectively). It had been reported that different muscles in the same animal might differ somewhat in cholesterol concentration and these differences were related to differences in the customary activity of the muscles (Bloor and Snider, 1934). Also, the low correlation between intramuscular fat and cholesterol content ($r=0.07$, $P>.05$) in this study may not support the assumption that meats lower in fat will have lower cholesterol. In fact, Kregel et al. (1986) concluded that no differences in cholesterol content could be attributed to fat content of raw product; therefore, choosing low fat ground beef to lower cholesterol might not be justified.

Literature Cited

AOAC. 1980. "Official Methods of Analysis." Association of Official Analytical Chemists, Washington, D.C.

Bachman, K.C., et al. 1976. Sensitive colorimetric determination of cholesterol in dairy products. JAOAC. 59:1146.

Bloor, W. R. and R. H. Snider. 1934. Phospholipid content and activity in muscle. J. Biol. Chem. 107:459

Folch, J., et al. 1957. A simple method for the isolation and purification of total lipids from animal tissues. J. Biol. Chem. 226:497.

Kregel, K. K., et al. 1986. Cholesterol content and sensory analysis of ground beef as influenced by fat level, heating, and storage. J. Food Sci. 51:1162.

NAMP. 1983. "The Meat Buyer's Guide." National Association of Meat Purveyors, McLean, VA.

NLSMB. 1983. Exploring the known. Meat, diet and health. National Live Stock and Meat Board, Chicago, IL.