CHOLESTEROL CONTENT OF RAW AND COOKED BEEF RIB STEAKS

S. K. Duckett[1], L. D. Yates[2], D. G. Wagner[3], H. G. Dolezal[4] and S.G. May[1].

Story in Brief

Cholesterol content was quantified on 48 ribeye steaks, both raw and cooked, from steers serially slaughtered at 28 d intervals (0-196d). Cooking a 3.6 oz. raw steak with a total cholesterol content of 53.41 mg, approximated a 2.3 oz. steak with a total cholesterol content of 63.35 mg. On both the raw and cooked longissimus muscle, time-on-feed affected cholesterol values when calculated on a wet weight basis. However, when cholesterol content was calculated on a dry weight basis to alleviate the relationship between fat and moisture, time-on-feed did not affect the cholesterol content of the longissimus muscle. These results suggest that cholesterol values are highly dependant on moisture content of the product. Cholesterol content, both raw and cooked, differed between the quality grades. Cooking increased the cholesterol content 54 percent in the longissimus muscle over that of raw. However, this is not an increase in the actual amount of cholesterol during cooking but is the result of an increased concentration of cholesterol due to the loss of moisture and to the loss of some fat that incurred during cooking.

(Key Words: Beef, Cholesterol)

Introduction

Dietary cholesterol intake still remains a major concern for the health conscious household. These concerns stem from recommendations by the American Heart Association and others to limit dietary cholesterol intake to 300 mg or less per day. Recent research (Marshall, et. al., 1989 a & b) has indicated that the cholesterol content of foods may be overestimated by the current methodologies employed for cholesterol analysis (primarily colorimetric analyses). For these reasons, a new, gas chromatographic cholesterol assay (Duckett, et al., 1992) was used to determine and report the cholesterol content of raw and cooked beef rib steaks.

[1]Graduate Assistant [2]Assistant Professor [3]Regents Professor and Department Head [4]Associate Professor

Materials and Methods

Forty eight steaks from the longissimus muscle (LM) of steers serially slaughtered at 28 d intervals (0-196 d) were used to determine cholesterol content. Steaks were trimmed of all exterior fat and then cut in half. The lateral half was analyzed raw while the dorsal half was cooked to an internal temperature of 158^{o}F, a medium degree of doneness. Organic solvents were used to extract the neutral lipid fraction. From this extract, free cholesterol in the muscle was quantified using a gas chromatographic procedure (Duckett, et al., 1992). The General Linear Model of SAS was used to detect significant differences due to time-on-feed, quality grade and cooking.

Results and Discussion

Cholesterol content, on a wet weight basis, for both raw and cooked LM with respect to time-on-feed (TOF) are reported in Table 1. The average cholesterol content was 44.5 and 82.6 mg/3 oz. for raw and cooked LM, respectively. The USDA Ag Handbook 8-13 lists the cholesterol content of ribeye steak to be 50 and 75 mg/3 oz., respectively, for raw and cooked. Cholesterol content on a wet weight basis was affected ($P<.08$) by advancing TOF. However when cholesterol values were calculated on a dry weight basis to alleviate the differences in moisture content, these differences disappeared

Table 1. Cholesterol content of beef rib steaks.

TOF (d)	Cholesterol (mg/3 oz.) Raw	Cooked
0	43.31^{ab}	75.90^{ab}
28	40.93^{ab}	72.92^{a}
56	43.65^{ab}	77.12^{ab}
84	37.83^{a}	78.75^{ab}
112	44.38^{ab}	87.38^{bcd}
140	50.14^{bc}	95.06^{d}
168	52.47^{c}	92.90^{cd}
196	43.32^{ab}	81.10^{abc}
Average^{d}	44.51	82.63
SEM	1.78	4.36

^{abc} Means with different superscripts in the same column differ ($P<.05$).
^{d} Cook differs from raw ($P<.05$).

(P>.05). Thus it appears that the differences in cholesterol content with TOF were mainly attributed to differences in moisture content of the steaks since there was no difference detected on a dry weight basis.

Comparing the cholesterol content of the different quality grades (Table 2) revealed that cholesterol content differed (P<.01) among the grades. In the raw tissue, the cholesterol content in the LM of standard grade was lower (P<.01) than that of choice or select grades, with choice and select not being different (P>.05) from each other. When calculated on a dry weight basis, the difference between the grades in cholesterol content disappeared (P>.05). Rhee and co-workers (1982) also observed a lower (P<.05) cholesterol content of LM from standard grade, on a wet basis when compared to all other grades and no differences (P>.05) in the grades on a dry basis. After cooking, the cholesterol content in the LM (wet weight basis) from the select and standard grades was lower (P<.05) than that from the choice grade. When calculated on a dry weight basis, cholesterol content was lower (P<.07) in the select grade when compared to choice and standard grades. Conversely, Rhee and co-workers (1982) could detect no differences between the different grades on a cooked basis.

When comparing raw and cooked values, the cholesterol content of the cooked LM are 54 % higher (P<.05) than those of the raw LM. Wheeler, et al. (1987) and Rhee, et al. (1982) observed increases of 27% and 38-65%, respectively, in the cholesterol content of cooked LM. However, this is not an increase in the actual amount of cholesterol during cooking but rather a result of an increased concentration of the cholesterol in the LM due to the loss of moisture and to the loss of some fat during cooking. In this study, cooking 3.6 oz. of raw LM with a total cholesterol of 53.4 mg approximated 2.6 oz. of cooked LM with a total cholesterol of 63.4 mg. When cholesterol content is expressed per g of dry matter (dm) to exclude the moisture lost during cooking, the raw LM contained 2.41 mg/g dm compared to only 1.6 mg/g dm for cooked LM. As such, there is a loss of some of the cholesterol during cooking, probably in the fat drippings.

Table 2. Cholesterol content of the LM from the different quality grades.

	Cholesterol (mg/3oz.)	
Quality Grade	Raw	Cook
Choice	45.63[b]	89.83[b]
Select	45.53[b]	76.46[a]
Standard	41.00[a]	74.86[a]
SEM	2.59	3.05

[ab] Means with different superscripts in the same column are different (P<.05).

These results indicate that the moisture content of a food can have a great influence on its reported cholesterol value. Thus, there is great need to establish a standard means of reporting cholesterol values so as not to be fooled by moisture differences when comparing different food products. With the mandatory food labeling law going into effect in 1993, this could present a major problem in the cholesterol labeling of food products. The red meat industry must get involved in helping to establish the labeling laws to stay competitive in the future.

Literature Cited

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