

BEEF FACTS:



Nutrition

Parity of Beef with Other Dietary Protein Sources

“Parity” is defined as “the quality or condition of being equal or equivalent; a like state or degree; or equality” (1).

As dietary recommendations become more specific for health and disease conditions or population segments, there are opportunities to demonstrate the effective use of lean beef in a variety of healthful diet plans. Unfortunately, many health professionals and consumers are unfamiliar with the inter-exchangeability (or parity) of lean beef and other dietary protein sources. Recent research, including long-term studies in free-living subjects, has directly compared the effects of lean beef with other protein sources, such as chicken or chicken and fish.

To achieve National Cholesterol Education Program (NCEP) dietary goals (2) for lowering lipid levels, individuals are counseled to choose lean meats over fatty meats (3,4,5). Unfortunately, sometimes this is translated as “reduce the amount and frequency of red meat consumption and substitute fish or skinless poultry for red meat choices”. However, clinical studies evaluating this type of diet change have failed to provide supporting evidence that such changes are warranted. In many cases, such a restriction is unnecessary and may actually deprive individuals of other valuable nutrients found in beef and other red meats. As a result, beef is often consumed in less than adequate amounts in the total diet. Lean beef’s contribution of nutrients such as iron, zinc and B-vitamins is especially noteworthy. In addition, an added benefit of diet plans containing lean beef may include improved acceptance of a lipid-lowering diet due to the greater range of food choices.

Nutrient Composition

Consumers may well be confused about actual food composition (Table 1.), especially regarding fat content. This, in turn, can impact their perception of the role of beef in their diet. The increased availability of leaner cuts of beef and how they compare with poultry and

fish need to be communicated. Many people are surprised to learn that at least seven cuts of beef fall between the skinless chicken breast and thigh in terms of total fat (6).

Meat products are composed of a variety of fatty acids. A 3 oz. serving of cooked, lean beef typically contains more monounsaturated than saturated fatty acids, and a smaller amount of polyunsaturated fatty acids. In poultry, by comparison, the monounsaturates predominate, with levels of saturated and polyunsaturated fatty acids being roughly equal. Fish generally contains more polyunsaturated fatty acids than saturated or monounsaturated fatty acids. Cholesterol levels per serving are roughly equivalent between lean beef and poultry. Levels in seafood vary more widely (7).

The extent to which saturated fatty acids can differ in their effects on blood cholesterol has not always been fully appreciated. For instance, stearic acid, a major portion of the saturated fatty acids in lean beef, has little, if any effect on blood cholesterol levels. However, the perception remains that all saturated fatty acids raise blood cholesterol levels. The neutral effect of stearic acid on blood cholesterol receives little attention, especially in the media. In recent years (8), these effects are being re-evaluated in terms of potential impact on dietary fat recommendations.

Lean Meat as Part of Cholesterol Lowering Diets

Two perspectives should be considered: the effective use of lean beef in cholesterol lowering diets; and, the substitution of chicken/fish for beef related to blood lipid levels?

Previous studies provide supporting evidence that lean meat, such as beef, can be included in cholesterol-lowering diets (9,10). More recent studies have demonstrated that if a blood cholesterol raising effect is noted, it is most likely due to the fat component/trim

Table 1. Comparative Nutrient Values of Selected Lean Beef, Poultry and Fish Products (3-oz. serving, cooked) (Ref. 7).

Food*	Energy kcal	Protein g	Total Fat g	Sat. Fat g	Cholest. mg	Iron mg	Zinc mg	B-1 mg	B-2 mg	Niacin mg	B-6 mg	Folate mcg	B-12 mcg
Beef, composite, lean	184	25.1	8.4	3.2	73	2.5	5.9	0.08	0.20	3.5	0.32	6.8	2.24
Beef, eye of round, rstd.	143	24.6	4.2	1.5	59	1.7	4.0	0.08	0.14	3.2	0.32	6.0	1.84
Beef, top sirloin, brld.	166	25.8	6.1	2.4	76	2.9	5.5	0.11	0.25	3.6	0.38	8.5	2.42
Beef, tenderloin, brld.	179	24.0	8.5	3.2	71	3.0	4.8	0.11	0.26	3.3	0.37	6.0	2.52
Beef, grnd, ex ln, brld.	225	24.3	13.4	5.3	84	2.4	5.5	0.06	0.27	5.0	0.27	9.4	2.18
Chkn, meat only, rstd.	162	24.6	6.3	1.7	76	1.0	1.8	0.06	0.15	7.8	0.40	5.1	0.28
Chkn., brst, meat, rstd.	140	26.4	3.0	0.9	72	0.9	0.8	0.06	0.10	11.7	0.51	3.4	0.29
Chkn., thigh, meat, rstd.	178	22.1	9.3	2.6	81	1.1	2.2	0.06	0.20	5.6	0.30	6.8	0.26
Turkey, meat, rstd.	144	24.9	4.2	1.4	65	1.5	2.6	0.05	0.15	4.6	0.39	6.0	0.31
Flounder, dry heat	99	20.5	1.3	0.3	58	0.3	0.5	0.07	0.10	1.8	0.20	7.8	2.13
Salmon/sockeye, dry heat	184	23.2	9.3	1.6	74	0.5	0.4	0.18	0.14	5.7	0.19	4.3	4.93
Tuna, light, in water	99	21.7	0.7	0.2	26	1.3	0.7	0.03	0.06	11.3	0.30	3.4	2.54

* Abbrev.: rstd. => roasted, brld. => broiled, grnd. => ground, ex ln => extra lean, brst => breast

of beef, not the lean muscle tissue. The overall conclusion is that lean beef need not be eliminated and can easily fit into a cholesterol-lowering diet (11,12).

Using well-controlled diets, studies demonstrated that lean beef could be used in a NCEP Step I Diet and was effective in lowering plasma total cholesterol (TC) and low density lipoprotein cholesterol (LDL-C) (13). Free-living hypercholesterolemic men were fed their usual diet for 3 wks, a stabilization diet for 5 wks and a test diet (with 3 oz. cooked beef, 8% fat) for 5 wks. Total cholesterol decreased by 7.6%, and LDL-C decreased by 9%.

Earlier studies compared blood lipid effects of beef protein versus plant proteins, in normolipidemic men; hyperlipoproteinemic men and women; and men consuming prudent diets, one allowing lean meat and the other based on a lacto-ovo-vegetarian diet. These studies have shown that a reduction in blood lipid levels can be achieved when subjects consume a low-fat diet containing a moderate amount of lean meat (including lean beef) (14,15,16).

Interchangeability of Beef and Poultry/ Fish on Blood Lipid Levels

Dietary recommendations for red meat (including lean beef) consumption often follow a similar pattern: reduce total fat intake, reduce saturated fat and cholesterol intake, and substitute fish, poultry without skin and lean meats for fatty meats. However, in practice, this is often interpreted as "substitute chicken/fish for red meat" (4,5,13). Thus, there is merit in determining whether or not blood lipid levels improve when such substitutions are made (Table 2).

Flynn (17) evaluated blood lipids in 129 normal-cholesterolemic adults fed diets containing either beef or fish/poultry. Within self-selected diets, subjects were

asked to incorporate 5 oz. of beef or poultry/fish into their diets for 3 months. They also ate one egg daily to equalize cholesterol intakes. After 3 months the subjects crossed over to the other diet. No differences were found in TC or high-density lipoprotein cholesterol (HDL-C) for either men or women during the dietary periods. Of interest in women, serum triglyceride (TG) levels were significantly increased when on the fish/poultry diet, but not on the beef diet.

These results were supported by early work of Scott et al (18) who compared the blood lipid effects of lean beef versus chicken/fish in 46 men with borderline high cholesterol levels. The test diet contained either lean beef or chicken/fish and provided less than 30% of calories from fat and less than 5-6% of calories from saturated fat. TC and LDL-C levels were not different between dietary meat sources; however, HDL-C levels decreased on the chicken/fish diet. This study showed no advantage for substituting chicken/fish for lean beef within the context of a low-fat diet. In this study, when the total fat level of the diet was reduced to 30% of calories, the source of the fat made little difference.

Since these and other studies (19,20) did not control all elements of the diet, it was not possible to attribute the specific impact of specific dietary meat treatments on lipid levels. Thus, Scott conducted a second study, which utilized well-controlled diets in hypercholesterolemic men (13). Free-living men (n=38) consumed their usual diet for 3 wks, a stabilization diet for 5 wks, and lean beef or chicken, as part of a NCEP Step I diet for 5 wks. All food during the test period was provided to the subjects.

Lean beef and chicken were interchangeable, with both diets producing significant decreases in average TC and LDL-C. TC, HDL-C, LDL-C and TG changes were not statistically different between beef and chicken.

Table 2. Blood Lipid Effects of Lean Beef vs. Lean White Meats (P/F).

Ref.	Sex	Blood Lipids	Diet	Blood Lipid Effects
17	M/F	Normal	Beef	No effects.
	M	Normal	P/F	No effects.
	F	Normal	P/F	TG increased with P/F.
18	M	Borderline High	Beef	No changes in TC, LDL-C & HDL-C.
			P/F	No changes in TC & LDL-C; HDL-C decreased.
13	M	Borderline High	Beef	Significant decrease in TC & LDL-C.
			Chicken	Significant decrease in TC & LDL-C. No significant differences between beef & chicken in changes of TC, HDL-C, LDL-C, TG.
21	M/F	Mild-Moderate Elevation	Beef or Chicken/Fish	Significant decrease in TC & LDL-C and significant increase in HDL-C. Responses between beef and chicken/fish nearly identical for all lipid values.

Long-Term, “Real-World” Diets

To extend the findings of Scott et al (13) and “test” the results in a “real-world” situation, a long-term study was designed and carried out at three clinical research centers (21). Two hundred mildly hypercholesterolemic subjects were recruited. Six oz. of lean red meat (primarily beef) or lean white meat (primarily poultry/fish) were incorporated into a NCEP Step I diet, 5-7 days per week for 36 weeks. At least 80% of total meat con-

Table 3. Serum Lipid Values (mg/dL) at Baseline and Over a 9-Month Treatment Period (21).

Lipid	Baseline ¹	Treatment Period - Av. ²	Mean % Change
TC			
Lean Beef	238	236	-1.0 +/-0.6
Chicken/Fish	240	235	-1.8 +/-0.6
LDL-C			
Lean Beef	157	154	-1.7 +/-0.7
Chicken/Fish	160	155	-2.9 +/-0.8
HDL-C			
Lean Beef	51	53	2.3 +/-0.8
Chicken/Fish	50	52	2.4 +/-0.7
TG			
Lean Beef	150	147	1.3 +/-2.6
Chicken/Fish	149	146	-0.5 +/-2.1
Total/HDL-C			
Lean Beef	4.9	4.7	-2.8 +/-0.9
Chicken/Fish	5.0	4.8	-3.7 +/-0.8

¹ Average of weeks -4, -2, -1.

² Average of weeks 4, 12, 20, 28, 36.

sumption was lean red or lean white meat based on random assignment.

Over the 36-week treatment period, TC and LDL-C levels decreased and remained 1-3% below baseline levels on both the lean beef and lean chicken/fish treatments. HDL-C increased approximately 2% from baseline in both treatment groups. There was no significant difference in response between the lean beef and lean chicken/fish diets. Further comparisons and details from this study are provided in Table 3.

This recent multi-site study extended the findings from the 1994 short-term study with highly controlled feeding situations (13). Participants were free-living adult volunteers with mild hypercholesterolemia, for whom the use of a NCEP Step I Diet would be appropriate therapy. The participants were counseled, but were free to make their own choices regarding food selection (within the constraints of the particular meat treatment they were assigned) and preparation over a 9 month period. In the multi-site study the results support the view that lean red meat (beef) and lean white meats can be equally effective in reducing blood lipid levels with lipid-lowering diets. Furthermore, the potential exists to improve long-term dietary adherence by increasing food choices, if both lean beef and lean white meats are “allowed” (21).

Research Confirms Lean Beef’s Role in Lipid Lowering Diet Plans

Lean beef can be effectively incorporated into low-fat diet plans designed to lower blood cholesterol levels. This has been demonstrated in short term, well-controlled feeding studies (13) as well as in long-term studies (up to 9 months) with free living subjects, counseled to self-select diets which include lean beef (21). In addition, these studies have demonstrated that lean beef can be interchangeable with lean white meats, if recommended guidelines for a NCEP Step I Diet are followed. Recommended strategies for reducing the total fat intake from meat (red or white) include selecting lean cuts of meat, trimming visible fat from retail cuts, choosing low-fat cooking methods and eating moderate portions (approximately 6 oz. per day) (22). Further, to meet overall dietary guidelines, recommendations include eating a balanced diet, choosing lower-fat foods from all food groups to reduce total fat and saturated fat intakes, and eating several servings of fruits, vegetables and grains/cereal daily.

Parity of Beef in Other Diet Plans

This review has focused on the “parity” of lean beef and “white” meats (primarily chicken/fish) in low-fat diets designed to reduce blood cholesterol levels. How-

ever, there are potentially many other diet plans where lean beef is fully equivalent to other protein sources. Examples could include: calorie controlled or weight reduction diets, diets for muscle/fitness training, diets to control/moderate type II diabetes, diets to moderate kidney stone formation, etc. Often, the main criteria focus on meeting the overall dietary recommendations for fat, saturated fat, protein and carbohydrate. Lean beef, as the meat group/protein source, can usually be included at recommended levels. With leaner beef being available, consumers should be aware that their food choices can, and should, include beef.

Summary

Lean beef can be included in a low-fat diet plan, such as the NCEP Step I diet, to lower blood cholesterol levels. Lean beef can be just as effective as lean white meats (poultry/fish) in such diets over extended periods of time and in free-living individuals. The inclusion of lean beef, a nutrient dense food, supplies significant amounts of high-quality protein, iron, zinc and B-vitamins (thiamin, riboflavin, B6 and B12) for each 100 calories provided. As an added "plus", the "parity" of lean beef (with lean white meat) is significant and greatly increases food choices and may improve long-term dietary adherence to lower-fat diet plans.

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This fact sheet was developed by the National Cattlemen's Beef Association as part of a coordinated effort with State Beef Councils and the Beef Board.

