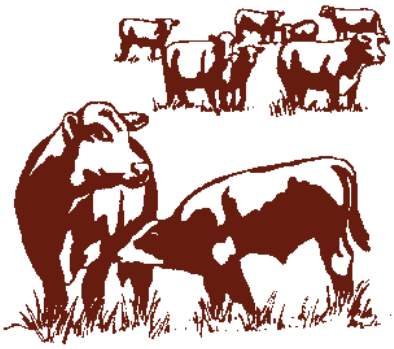
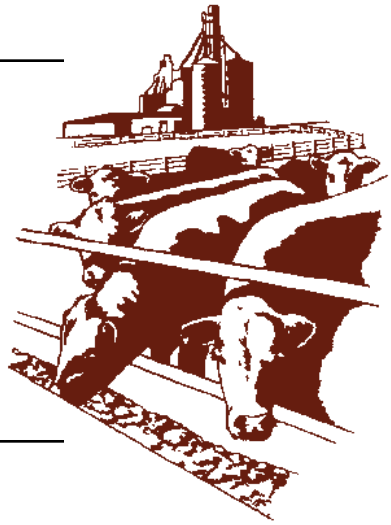


Beef Cattle Handbook



BCH-11200 Product of Extension Beef Cattle Resource Committee

Facts From The Meat Board: Product Technology

Series No. FS/PT 007
"Conventional," "Natural" and "Organic" Beef: No Scientific Differences

The American food supply is often described as the safest in the world by scientific and industry experts. Even so, beef producers continue their efforts to increase safety and consumer confidence.

The U.S. Department of Agriculture, which monitors beef for violative residues of antibiotics and other animal drugs, considers the residue violation rate to be virtually zero. This holds true for all beef, although some marketers have positioned "natural" or "organic" beef as superior to "conventional" beef in terms of safety.

Consumer Confusion

Most U.S. consumers are not knowledgeable enough of the chemistry or microbiology involved to make reasoned judgments about the relative safety of "natural," "organic" and "conventional" beef. The general public is susceptible to misinformation and it is in this regard that consumer confusion can arise.

Consumer concern regarding the safety of the U.S. food supply ebbs and flows, depending largely upon the amount of attention being paid by the media to food safety issues at given points in time. In 1989, stories about Alar in apples and cyanide in grapes heightened consumer awareness of potential food-borne hazards and caused front-page coverage of the issue in Time and *Newsweek* under the headlines "How Safe is Our Food?" and "Is Your Food Safe?" Numerous other stories appear daily.

As a result, the issue of food safety often leads to confusion because of the language barrier created when the scientist seeks to explain the issue to the consuming public.

Monitoring of Beef Safety

When necessary, producers use: (a) drugs and vaccines to alleviate pain and prevent diseases in cattle, (b) pesticides to prevent insects or parasites from chewing the animal's skin, robbing it of nutrients or drinking its blood, (c) antibiotics to prevent diarrhea, foot rot or liver abscesses, and (d) growth promotants to increase the animal's rate of gain, efficiency of growth and leanness. The use of any or all of these health and performance aids is predicted upon calculated risks that include: (1) belief, that the cost of administering the health or performance aid will be lower than the value received by the producers for the animals' enhanced performance, live-weight gain or by-product value, and (2) trust and scientific evidence, that no harmful residues of the health or performance aid will exist when the consumer eats the meat from the animal.

The federal government provides assistance in this regard, monitoring and reporting annually, the incidence of violative chemical residues in meat and poultry through the national Residue Program (USDA, 1993) and the incidence of pesticide residues in all domestic and imported foods via the Total Diet Study (FDA, 1991). Various other elements of the scientific community periodically study this issue and, for example, release reports indicating that the level of pesticides in the diet of U.S. citizens is extremely low and represents a negligible health risk (NAS, 1987). The National Residue Program of the USDA Food Safety and Inspection Service (FSIS) determined in 1993 that illegal levels of 42 chemicals in eight classes of animal drug and pesticide compounds occurred in only 0.26 percent of the 39,128 livestock and poultry samples tested (USDA, 1994).

"Natural" and "Organic" Beef

There is some confusion in the market as to what the terms "natural" and "organic" mean when applied to food, and meat in particular. Both terms imply a difference from conventional meat. "Natural" meat (USDA, 1982) has been minimally processed and contains no artificial flavoring, coloring, chemical preservatives or other synthetic ingredients. A definition that allows all conventionally prepared fresh beef to be labeled "natural." After the future implementation of a USDA-National Organic Program, the "organic" meat label will indicate those products that are derived from animals raised on certified organic farms and processed by certified handlers in ways that minimally impact the environment (Kinsman, 1994). The program requirements adhered to by producers and processors, and verified by third party certifiers, will assure the consumer of the authenticity of an organic label. There are no apparent visual differences between "conventional," "natural" and "organic" meats. A price differential exists between these several designated kinds of meat.

In efforts to position "natural" beef uniquely in the marketplace, some marketers have argued that the term connotes beef from cattle raised in specific geographic locations on uncontaminated land, never treated for disease or illness, containing no additives, and with an unique taste, (*Boston Globe,* 1991). The primary problem with such ads is that they have the potential to raise consumer questions regarding the safety and wholesomeness of the generic beef supply (Wilkinson, 1991).

Scientifically Evaluating the Differences

A memorandum (ECD No. 90-22-EEC), sent by the FSIS on March 29, 1990, to packing plants in the U.S. that were approved for export by the European Economic Community (EEC), detailed guidelines involved with the 1990 EEC Residue Testing Program for meat, and described "an expanded Residue Testing Program" consisting of five requirements; requirement four cited ten "residue compounds" (compound classes or elements) for which residue levels must be determined for meat to be exported to EEC countries (Fetzner, 1990). For dairy and beef breeding cows as well as for feedlot steers and heifers, the "residue compounds" were listed as: (a) diethylstilbestrol, (b) zeranol, (c) thyrostat(s), (d) trenbolone acetate, (e) melengestrol acetate, (f) tranquilizer(s), (g) beta-blocker(s), (h) lead, (I) cadmium, and (j) clenbuterol (Fetzner, 1990)

The FSIS does not monitor all of the compounds for which the EEC requires testing (a through j, above). In addition, the FSIS does not report separately the residue monitoring results for samples from cattle raised under difference management systems (i.e. "conventional," "natural," "organic"). The Cattlemen's Beef Promotion and Research Board provided funds for determining the incidence of chemical residues in beef tissues to the National Live Stock and Meat Board, who awarded funding to conduct two such studies to the Center for Red Meat Safety at Colorado State University.

Study I Results

The first of the studies conducted by the Center For Red Meat Safety involved muscle, fat, kidney and liver. The

Table 1. Aggregated Results of Testing Samples of Muscle, Fat, Liver and Kidney From Cattle of Five Kinds for Residues of Five Classes of Chemicals.

	Samples with Violative Residues of Total Tests Performed				
Kinds of Beef (Cattle Sources)	Anabolic Steroids (N=5)	Heavy Metals (N=2)	Stress Reducers (N=3)	Thyrostats: Sulfa-Drugs (N=6)	C.H.C. & O.P. Pesticides[f] (N=25)
Organic[a]	0 of 60	0 of 24	0 of 36	0 of 72	0 of 75
Natural[b]	0 of 60	0 of 24	0 of 36	0 of 72	0 of 75
Conventional[c]	0 of 160	0 of 64	0 of 96	0 of 192	0 of 200
Realizer[d]	0 of 60	0 of 24	0 of 36	0 of 72	0 of 75
Cull Cow[e]	0 of 60	0 of 24	0 of 36	0 of 72	0 of 75
TOTAL	0 of 400	0 of 160	0 of 240	0 of 480	0 of 500

[a] *Steers and heifers raised with no health or performance aids; no pesticides used on land or livestock.*

[b] *Steers and heifers raised with no health or performance aids; pesticides can be used on land and livestock.*

[c] *Steers and heifers raised with us of health or performance aids; pesticides can be used on land and livestock.*

[d] *Steers and heifers raised with use of health or performance aids; pesticides can be used on land and livestock; slaughtered earlier than planned because they are chronically ill or not gaining in the feedlot.*

[e] *Mature cows raised or maintained with use of health or performance aids; pesticides can be used on land and livestock; includes both beef and dairy cows.*

[f] *Chlorinated hydrocarbon and organophosphate*

Source: Smith et al. (1994). Journal of Muscle Foods 5:271-284.

tissues were collected from steers, heifers and cows at eight packing plants in four States and included "organic," "natural," "conventional," "realizer" (chronically ill) and "cull cow" cattle. Results of that study (Smith et al., 1994) are presented in Table 1. There were three sets of four samples (muscle, fat, liver and kidney) from "organic" steers and heifers, three sets of four samples from "natural" steers and heifers, eight sets of four samples from "conventional" steers and heifers, three sets of four samples from "realizer" (chronically ill) steers and heifers, and three sets of four samples from "cull cow" (both beef and dairy cattle). Analyses revealed no violative residues of anabolic steroids or xenobotics (diethylstilbestrol, zeranol, trenbolone acetate, melengestrol acetate, and clenbuterol), heavy metals (lead and cadmium), stress reducers (carazolol, azaperone, and propiopromazine), thyrostats or sulfa-drugs (sulfamethazine, sulfadimethoxine, sulfabromomethazine, sulfaethoxypyridazine, sulfachloropyridazine, and sulfamethoxypyridazine) or chlorinated hydrocarbon andorganophosphate pesticides (hexachlorobenzene, lindane, heptachlor, aldrin, 4, 4'-DDT, 4,4'-DDD, 4,4'-DDE, endrin, mirex, ethyl parathion, methyl parathion, pirimiphos-methyl, alpha-BHC, beta-BHC, delta-BHC, heptachlor epoxide, methoxychlor, ethion, chlorpyrifos, malathion, ronnel, trithion, dieldrin, diazinon, and disyston).

Study II Results

The second study conducted by the Center for Red Meat Safety involved muscle, fat, kidney and liver. The tissues were collected from steers and heifers at eight packing plants, four retail markets and one mail-order meat business in the U.S. and included "organic," "natural" and "conventional" beef. Study results (Smith et al., 1995) are presented in Table 2. There were 24 muscle, 20 fat, 13 liver and 6 kidney samples of "organic" beef; 20 muscle, 20 fat, 10 liver and 10 kidney samples of "conventional" beef. Analyses revealed no violative residues of anabolic steroids (estradiol, testosterone, progesterone) xenobiotics (zeranol, melengestrol acetate, trenbolone acetate), beta-lactam antibiotics (penicillin, tylosin, erythromycin), sulfa-drugs (sulfathiazole, sulfamethazine, sulfadimethoxine, sulfaquinoxaline), tetracycline antibiotics (tetracycline, oxytetracycline, chlortetracycline) or of 21 of the 25 chlorinated hydrocarbon and organophosphate pesticides (lindane, heptachlor, aldrin, 4,4'-DDT, 4,4'-DDD, 4,4'-DDE, ethyl parathion, methyl parathion, pirimiphos-methyl, alpha-BHC, beta-BHC, delta-BHC, heptachlor epoxide, methoxychlor, ethion, chlorpyrifos, malathion, ronnel, trithion, dieldrin, disyston). There were six violative residues of pesticides in livers from "organic" beef (three of hexachlorobenzene, three of diazinon), six violative residues of pesticides in livers from "natural" beef (two of hexachlorobenzene, one of endrin, three of diazinon) and three violative residues of pesticides in livers from "conventional" beef (two of hexachlorobenzene, one of mirex).

Additional Study Results

Usborne (1994) compared "natural" and "conventional" beef, purchased as such in retail supermarkets in Canada and reported no violative residues of sulfa-drugs, antibiotics, heavy metals, polychlorinated biphenyls, growth promotants, parasiticides, pentachlorophenol (a wood fungicide) or pesticides in either kind of beef. Potthast (1993) concluded, based upon studies of beef and pork from the European Union, that: (a) environmental residue contaminants (i.e., lead, mercury, cadmium) were hardly ever found, (b) pesticides had concentrations considerably below established limits such that complaints about pesticide contamination are becoming more and more rare, (c) toxic dioxines, which arise mostly from combustion processes, have, so far, not been detected in meat, and (d) random sampling and residue testing for antibiotics, drugs, anabolics and thyrostats effectively protect the consumer, and assure that chemical residues in meat will not be harmful to the public health.

Table 2. Aggregated Results of Testing Samples of Muscle, Fat, Liver and Kidney From Cattle of Three Kinds for Residues of Five Classes of Chemicals.

	Samples with Violative Residues of Total Tests Performed					
Kinds of Beef (Cattle Sources)	AnabolicSteroids (N=3)	Xenobiotics (N=3)	Beta-lactams (N=3)	Sulfa-Drugs (N=4)	Tetracyclines (N=3)	C.H.C. & O.P.[d] Pesticides (N=25)
Organic[a]	0 of 189	0 of 189	0 of 189	0 of 252	0 of 189	6 of 1575
Natural[b]	0 of 189	0 of 189	0 of 189	0 of 252	0 of 189	6 of 1575
Conventional[c]	0 of 180	0 of 180	0 of 180	0 of 240	0 of 180	3 of 1500
TOTAL	0 of 558	0 of 558	0 of 558	0 of 744	0 of 558	15 of 4650

[a] *Steers and heifers raised with no health or performance aids; no pesticides used on land or livestock.*

[b] *Steers and heifers raised with no health or performance aids; pesticides can be used on land and livestock.*

[c] *Steers and heifers raised with health or performance aids; pesticides can be used on land and livestock.*

[d] *Chlorinated hydrocarbon and organophosphate.*

Source: Smith et al. (1995). Submitted for publication.

Conclusion

The Center for Red Meat Safety at Colorado State University has conducted two studies that confirm beef is safe relative to the exceptionally low incidence of violative chemical residues. One study, involving 80 samples of muscle, fat, liver and kidney from "conventional," "natural," "organic" and "realizer" (chronically ill) steers and heifers as well as "cull (beef or dairy) cows," detected no violative residues of five anabolic steroids, two heavy metals, three stress reducers, six thyrostats/sulfa-drugs and 25 chlorinated hydrocarbon and organophosphate pesticides. A second study of muscle, fat, liver and kidney samples from "conventional," "natural" and "organic" steers and heifers detected zero violative residues in 558 tests for three xenobiotics, zero violative residues in 1,860 tests of ten sulfa-drugs or antibiotics and 15 violative residues (three in "conventional" beef; six in "natural" beef; six in "organic" beef; all in liver samples and none in muscle, fat or kidney samples) in 4,650 tests for 25 chlorinated hydrocarbon and organophosphate pesticides.

Data from these two studies reveal exceptionally low incidence of violative chemical residues in U.S. Beef produced under "conventional" production or management conditions. There were no violative residues of anabolic steroids (estrus suppressants, growth promotants), xenobiotics (growth promotants), heavy metals (environmental contaminants), stress reducers (tranquilizers), thyrostats or sulfa-drugs (growth promotants, health aids), beta-lactams (health aids) and tetracyclines (health aids). In one of our studies in which violative residues occurred, the residues were of pesticides, and the highest incidence was in livers from beef cattle produced under "natural" (six of 1575 tests; 0.38 percent) and "organic" (six of 1,575 tests; 0.38 percent) management conditions. The only violative residues of any chemical found in these two studies were in livers and not in meat, per se.

Results of these two studies reveal that it is highly unlikely that there is any difference in presence of harmful chemical residues of vaccines, pesticides, drugs, antibiotics or growth promotants in "conventional," "natural" and "organic" beef. Beef companies that attempt to position a "natural" or "organic" product is safer or less dangerous to personal or public health, by claiming that "conventional" beef contains violative chemical residues must be held accountable for conducting research studies of the type described here, to document their claims. To the best of our knowledge they have never done so.

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