THE EFFECT OF DIETHYLSILBESTROL ON BEEF QUALITY

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At the Seventh Annual Reciprocal Meat Conference Joseph Kastelic (1954) presented a paper dealing with the influence of hormone administration and the production of beef. He stated at that time there was a dearth of data about the effects of diethylstilbestrol on carcass quality. Since that time many of the experiment stations have conducted projects related to the subject of implanting or feeding diethylstilbestrol to almost all classes and weights of cattle.

The next year at the Eighth Annual Reciprocal Meat Conference, Robert L. Reddish (1955) presented a paper on new developments of the effects of hormones on fattening cattle. In his paper he discussed the following topics: dosage, gains, increased efficiency, length of feeding periods, effects on the live animals and the effects on the beef carcasses.

The purpose of this paper is to bring us somewhat up to date on the subject of the effect of diethylstilbestrol on beef quality. Even though a list of literature cited is presented it does not cover completely all experiments dealing with this subject. Many other experiments have been conducted using diethylstilbestrol but in many cases no reference is made to the end product, the beef carcass. It may be stated that the literature cited covers material from forty-five tests at sixteen stations where over 900 cattle were fed diethylstilbestrol and twenty-seven tests at seven stations where over 850 cattle were implanted with diethylstilbestrol.

Klosterman (1955) at the Cornell Nutrition Conference for Feed Manufacturers stated that diethylstilbestrol made no significant difference in yields, tended to lower steer carcass grades and increase bull carcass grades, with considerable variation in grade among carcasses within treatments, tended to increase rib-eye area in steers and reduce it in bulls, tended to increase edible portion of steers and reduce it in bulls and from the limited data available diethylstilbestrol implanting made a slight reduction in tenderness. He also stated that effects of diethylstilbestrol on beef carcass quality are relatively small as compared to age of animal when slaughtered, ration fed, length of feeding period and carcass ageing.

A significant increase in lean and area of the rib-eye from implanted steers was reported by Clegg et al. (1954), (1956), and Simon et al. (1955). They also reported a significant decrease in fat content of the carcass. A significant increase in per cent moisture of implanted spayed heifers and intact heifers as well as a significant decrease in ether extract and a significant increase in the area of the rib-eye was also reported. They found no difference of organoleptic quality between treated and untreated cattle carcasses.
Slight increases in rib-eye area (but the same size when placed on a carcass weight basis), less fat over the rib-eye while the percentage of liver, viscera and hide were reported by Parsons (1956) as being the same when cattle were fed diethylstilbestrol. No significant carcass differences were reported by Deans et. al. (1955)(1956), from studies made of separable fat, lean and bone, ether extract from the rib-eye, cooking shrinkage or shear test. An increase in per cent moisture in the fat and increased ether extract of the rib-eye approached significance for the treated animals.

Aunan et. al. (1956) reported that diethylstilbestrol treated steers had larger rib-eyes but had the same percentage of moisture in the rib-eye. They also reported that steers fed diethylstilbestrol 112 days graded higher than the controls but when the controls were fed to the same weight they graded higher than the carcasses from the treated steers.

At the North Platte Nebraska Experiment Station, Baker et. al. (1956) reported an increased area of the rib-eye for treated steers but when the area was based on square inches per one-hundred pounds of carcass there was no difference. They also reported no differences in grades for treated and untreated cattle.

Carcass studies made by Cahill et. al. (1956) revealed diethylstilbestrol implanting gave a significant increase in weights of steer chucks, significant decrease in steer flanks and kidney knobs yet gave a significant increase in weights of bull chucks and area of the rib-eye and a significant increase in the weight of bull flanks. They also reported heavier pituitary and adrenal glands for the treated animals and lighter thyroid glands from bulls but no change in the thyroid glands between treated and untreated steers. Implanting diethylstilbestrol reduced the carcass grades for steers and increased the bull grades. At the same time treated bull carcasses were fatter while treated steer carcasses were leaner which in turn increased the edible portion of steers and decreased the edible portion of bulls.

Beeson et. al. (1956) reported a significant increase in percentage of moisture and a highly significant increase in percentage of protein in the lean meat of yearling steers fed diethylstilbestrol while Andrews et. al. (1956) found no difference for these carcass characteristics in steer calves fed diethylstilbestrol.

According to Good et. al. (1957) steers fed or implanted with diethylstilbestrol had no significant effect on yield, shrink to market, carcass grade, cooler shrink, moisture content of fat or lean, cooking quality or measurements of the right metacarpus. Feeding diethylstilbestrol significantly increased the per cent of lean and decreased the per cent of fat in the carcass. Implanting increased the per cent nitrogen content of the rib-eye muscle. Diethylstilbestrol also significantly increased the width of the round.

A report on four investigations using ninety-two cattle by Kastelic et. al. (1956) revealed that diethylstilbestrol has no consistent influence on carcass characteristics as measured by carcass weight; grade; per cent fat, bone and lean of the 9-10-11th rib; area of the rib-eye and thickness of fat. They state that differences in carcasses are probably not due to nutritional treatment but are due to inherent biological differences among the animals on test.
It may be noted at this point that daily gains for cattle fed diethylstilbestrol were greater in all tests reported than the controls. Implanting with diethylstilbestrol also increased the daily gains in all tests reported except for Smith et. al. (1957) who reported that heifers implanted with 36 mg. gained at a lower rate than the controls. They also reported no significant carcass differences between spayed or non-spayed heifers.

Carcass data on grades and yields were reported by Andrews et. al. (1954) (1956), Aunan et. al. (1956), Bird et. al. (1957), Baker, F. S. et. al. (1955), (1956), Baker, G. N., et. al. (1956), Beeson et. al. (1956), Bell et. al. (1956), Burroughs et. al. (1954) (1955), Cahill et. al. (1956), Clegg et. al. (1954) (1956), Connell et. al. (1955), Deans et. al. (1955) (1956), Dowe et. al. (1957), Duitsman (1957), Good et. al. (1957), Hentges et. al. (1955), Kastelic et. al. (1955) (1956), Klosterman et. al. (1955), Koch et. al. (1957), Luther et. al. (1955), Marion et. al. (1955), Matsushima et. al. (1956) (1957), Mitchell et. al. (1955), Murphy et. al. (1955), O'Mary et. al. (1956), Parsons (1956), Perry et. al. (1955), Pope (1956), Richard et. al. (1956), Richardson et. al. (1957), Simone et. al. (1955), Smith et. al (1957) and Story (1956) (1957). In 27% of these tests where cattle were fed diethylstilbestrol the yields were greater, 47% of the tests lower and 24% of the tests about the same. For grades the diethylstilbestrol fed cattle produced higher grading carcasses in 31% of the tests, lower grades in 33% of the tests and about the same grade in 56% of the tests. Cattle implanted with diethylstilbestrol gave higher yields in 26% of the tests, lower yields in 61% of the tests and about the same yields in 13% of the tests. For grades the carcasses from diethylstilbestrol implanted cattle graded higher 33% of the time and lower 67% of the time. The amount of diethylstilbestrol fed or implanted seemed to make but very little difference.

As a summary for this review of carcass data I would like to quote from Kastelic et. al. (1955). "The current studies revealed that there exists among cattle larger variations in degree of muscling and amount of fat regardless of ration treatments and that it was not possible to relate these differences to levels of stilbestrol fed".

Stob et. al. (1956) reported that tissues from the liver, kidney, kidney fat and muscle at the 11th and 12th rib of cattle fed diethylstilbestrol when fed to mice gave a statistically significant increase in uterine weights of the mice. In contrast Preston et. al. (1956) examined tissue (lean, fat, liver, kidney, heart and offal) removed from cattle fed diethylstilbestrol in four experiments which revealed no detectable estrogenic residues. Either of the two methods of assay would have shown the presence of as little as 2 micrograms of diethylstilbestrol per kilogram of tissue. Turner (1956) also reported that tissue from steers fed diethylstilbestrol was free of residual estrogen. The tissue tested was edible red meat, rib-eye, neck trimmings, tongue, heart, spleen and brain. The kidneys contained 4 parts per million and the lungs 10-12 parts per million of residual estrogen.

The data available at the present time presents considerable conflicting effects on carcasses from feeding or implanting diethylstilbestrol. Diethylstilbestrol gives consistent daily gain increases but probably has little effect on carcass quality provided the treated and controls receive the same total amount of concentrates. There may also be a question in the
minds of some people regarding the residual estrogens which may be present in meat from cattle treated with diethylstilbestrol.

Literature Cited


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DR. BUTLER: This committee is attempting to adhere to the original concept of the reciprocal meat conference, which is to allow some discussion following the papers. For me that is one of the reasons for us to get together here. So I should like for Harold Hedrick to come up now and conduct the discussion.

DR. R. B. HEDRICK: I wish to thank you, Charley, for your excellent review. I am sure that everyone appreciates the time and effort that you have put into this.

Those of you who are doing carcass work on cattle, either implanted or diethylstilbestrol, should have no trouble finding literature to support almost any results you might find.

At this time are there questions that you would like to direct to Charley or comments that you would like to make?

MR. VARNEY: I should like to call attention to the reference at the top of page 4. I think that we should give credit to conference members when it is due. The name of Jim Kemp has been inadvertently omitted from this report.

MR. HEDRICK: Are there other comments or questions?

MR. KEAN: I wonder if anybody else is getting the response that we seem to be getting from some of the companies in the East about fat setting up on diethylstilbestrol-fed cattle. Has anybody else experienced this? Some of our packers are starting to complain, not vigorously but quite often about it, that they cannot get the fat to set up with the lean nearly as firm as they would like to have it. I just wonder if this complaint has been made to others.

MR. HEDRICK: Is that due to the lower grade?

MR. KEAN: I don't know. They complain about all of them.

MR. HEDRICK: I should like to raise a question. You made reference here to Klosterman's work in which the feeding of diethylstilbestrol reduced the tenderness. Since we have an expert group on tenderness maybe we can have some comments on that.
DR. DEATHERAGE: I suppose you are asking me because that was done in our laboratory. (Laughter) I don't have the record. However, it was significant. From the standpoint of investigations whether it would be of practical significance is another matter. Certainly from all the work that we did, with all of the steers lumped together we would have to say they were less tender, and in the case of the bulls I would say probably just about as much.

I think Vern or Larry will have some comments on that.

MR. SOULE: I have one statement that I should like to make. You get the reports from the experiment stations on feeder days, etc., and they say that the feeding or the implanting of stilbestrol (and other things come up, too) lowers the carcass up to a third of a grade. They will put numbers on there, some going from 1 to 12 and some going from 12 down to 1. The first thing you have to do is to convert all of them. You have to write the guy and find out what he means. Is he going up the scale or down the scale when he gives the grade? That is something that should be standardized.

Anyhow they come in and they say there is a lowering of the grade, you see. Davie knows and he does it when he follows the carcasses in Kansas City or St. Joseph. You have those little cards on there that give you the marbling. You can have the grader give you the marbling scores just like he gives the texture scores. For just a simple little thing like that why don't you get after your nutritionists? I know it isn't your fault but get after your nutritionist so you can have more information.

That is what I am fighting for with some of the fellows in our company when they fail to get all that information. I have it all written up so that they can go to the grader and get the scores on marbling and texture, and if they want to they can even go through and score the eye and the loin. I realize that it is only eyeball grading, but in many cases the carcasses are not even broken down. It seems to me that you should have more information than just saying there is a lowering of the carcass grade. It does not help us scientifically unless we know why. Of course, those records do not mean anything to the farmers, but if you could give marbling scores, firmness scores and texture scores it certainly would help a lot and then a person with a little deductive reasoning could figure out why there is a lowering of carcass grade.

That is not a question that I am bringing up. It is just a statement of fact that I am making.

MR. FRED CARROLL (University of California): Maybe I am going over something that has already been gone over because I missed part of this, but we have been running carcass compositions along with our testing of stilbestrol treated meat, trying to find out why the carcass graded lower. We finish these cattle out. Of course, they will not finish at the same time that non-treated cattle will, but if you finish them out then the difference becomes much less, and in three years of work the panels could detect the hormone-treated cattle, but it was not significant.
I mean, it would take a lot more numbers than we have done to show that there is a significant difference in eating quality between the hormone-fed and those not hormone-fed. But generally speaking, I think all the hormone does is your animals, if they are fed equally, are not quite as fat.

MR. HEDRICK: The Chair says that we have used up our ten minutes. So we will wait until the recess and then direct our questions to Charley.

Thank you.

DR. BUTLER: Thank you, Harold.

You will notice that we started with the second paper this morning. The reason was that some of the red hot data that Ohio put into the projector yesterday burned up the motor. But we have had it repaired and I believe we are ready to go now. So we will ask Johnny Pierce to give his report on some beef grading considerations. (Applause)

MR. J. C. PIERCE: This is a re-run of a paper that we gave at Chicago last December with a few minor revisions, and O. D. asked me to take a little more time and to get into it here today so that you people can tear into me. There was not too much time in December.

First of all, I should like to say that we have three people here from our staff, Charley Murphey, Lowell Strong, and I think Mr. Van Zant who has joined the Quartermaster Food and Container Institute, but I hope he is here, who has done more with certain phases of this work than I have. So if there are any perplexing questions we will just give them to them.