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Cull cow management and its effect on carcass characteristics.

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Introduction:
As cow meat comprises about 40% of the beef consumed in Brasil, an improvement in its quality by different management practices would be of great importance.
A common practice in Brasil is to breed cull cows 4 to 5 months before slaughter. The ranchers base this practice on the point that if a cow does not come in heat, she will remain more calm and, consequently, this behavior will increase live weight gain and carcass quality due to more deposition of muscle and fat. Kolb (1976) and Walker et al. (1985) found that pregnant cows had a slightly higher live weight gain, due mainly to the fetus and fetal membranes and lower dressing percent. In the last few years the practice of removing the ovaries in cows has steadily increased as the ranchers feel it improves the fattening process and facilitates management in places where cattle are raised extensively. Since the cow cannot come in oestrus, one can mix her with other categories without any disadvantage. Neumann and Snapp (1969) verified that spayed heifers were more calm, but their performance was similar to non-castrated. Some work has also been done with the use of IUD (intra-uterine device) to avoid pregnancy in cows (Hawk et al., 1968; Barcelos, 1979). Little is known, however, of the effect of these practices on carcass characteristics and meat quality. The purpose of this study was to verify if quality of beef from open, pregnant, ovariectomized and IUD treated cows was different.

Materials and Methods:
The work was conducted on a private ranch located in Santa Maria - RS - Brasil. Seventy-two cows were used: 44 Charolais (C) and 28 Aberdeen Angus (AA) 7 to 11 years old. The cows were randomly distributed within each breed in 4 treatments: T1 = 23 open cows, 14 C and 9 AA; T2 = 17 pregnant cows, 10 C and 7 AA; T3 = 20 ovariectomized cows, 12 C and 8 AA; T4 = 12 cows with IUD, 8 C and 4 AA. The experiment was planned with 20 cows/treatment, but 3 cows in T2 failed to get pregnant and were considered as open. On the other hand, 8 cows in T4, got pregnant and were discarded from the experiment. The experimental period was 185 days during the spring/summer, which includes the breeding season of 75 days, during which time the cows grazed only native pasture.
At slaughter time, cows were checked for pregnancy and, in the T4 cows, the IUD was searched to determine its localization. After 24 h chill, carcasses were subjectively and objectively evaluated following the procedure recommended by Müller (1980) and a portion of the Longissimus muscle was removed from each carcass, transported to the Meat Laboratory and frozen and stored for sensory studies. Losses during thawing and cooking procedures were also determined.

Results and Discussion:
The effect of treatments on warm and cold carcass weight, dressing percent and carcass shrinkage, is presented in table 1.

TABLE 1. EFFECT OF DIFFERENT TREATMENTS ON COW YIELD AND SHRINKAGE

	n	Carcass weight - kg		Dressing %		% Shrinkage
		Warm	Cold	Warm	Cold	
Open	23	184.93	183.63	49.86[a]	49.51[a]	.70
Pregnant	17	187.02	184.93	48.13[b]	47.59[b]	1.12
Castrated	20	182.49	181.07	49.92[a]	49.54[a]	.78
With IUD	12	188.68	186.92	50.10[a]	49.64[a]	.93

[a,b] Means in a column with different superscripts differ (P<.05).

There was no significant difference between treatments in warm or cold carcass weight. Pregnant cows, however, displayed a lower (P<.05) warm and cold dressing percent. Any advantage, therefore, that the 2 cows had presented in live weight gain was due to the weight of the pregnant uterus (fetus, membranes and fetal liquids) that in the present work presented an average weight of 13.26 kg, with a range of 7.6 to 27.2 kg. The present results agree with the findings of Hart et al. (1940), Kolb (1976) and Walker et al. (1985). In this last work the total uterus weight averaged 18.36 kg with an age of about 6.49 months. In the present work the average age of the fetuses was around 3 months. Pregnant cows also presented a nonsignificant higher cold shrinkage. Kolb (1976) reported that pregnant cows had a higher percentage of water in their muscles, which could explain the higher losses in the chill room. The different treatments did not affect carcass characteristics (table 2). None of the characteristics measured were significantly affected by the 4 treatments. Cows with IUD displayed a nonsignificant larger ribeye area and lower deposition of subcutaneous fat. In this treatment, however, the proportion of Charolais in relation to Angus was a little higher, (66%), whereas in the other 3 treatments it was around 60%. Müller and Borges (1977) and Walker et al. (1985) also failed to detect any difference in carcasses from pregnant and open beef females. Fat thickness, as measured between the 12th and 13th rib, was higher for pregnant cows, but the difference was nonsignificant. The organoleptic characteristics of the meat can be visualized in table 3.

TABLE 2. EFFECT OF DIFFERENT TREATMENTS ON SOME COW CARCASS CHARACTERISTICS

	Open	Pregnant	Castrated	With IUD
	n = 23	n = 17	n = 20	n = 12
Conformation[a]	9.00	8.88	8.30	8.25
Fat thickness, mm	1.85	2.52	1.72	1.62
Ribeye area, cm^2	60.11	59.58	58.78	62.70
Physiological maturity[b]	4.83	4.88	4.10	4.58
Marbling[c]	7.22	6.76	7.20	6.42
Texture of lean[d]	3.39	3.41	3.40	3.42
Color of lean[e]	3.30	3.53	3.70	3.42

[a] 7 = Regular minus, 8 = Regular, 9 = Regular plus, 10 = Good minus.
[b] 4 = D plus, 5 = D, 6 = D minus (USDA system).
[c] 8 = Small, 7 = Small minus, 6 = Slight plus.
[d] 5 = Very fine, 4 = Fine, 3 = Slightly coarse.
[e] 5 = Bright red, 4 = Red, 3 = Slightly dark red.

TABLE 3. EFFECT OF DIFFERENT TREATMENTS ON SOME COW MEAT QUALITY

		Shear value	Panel			% Losses	
	n	kg	Tenderness[a]	Juiciness[b]	Flavor[c]	Thawing	Cooking
Open	23	8.13	5.30	5.17	5.13	5.44	17.33
Pregnant	17	7.67	5.59	5.18	5.24	4.67	16.20
Castrated	20	7.52	5.55	5.20	5.05	5.84	18.15
With IUD	12	7.40	5.50	5.42	5.25	6.23	16.87

[a] 1 = Extremely tough, 5 = Average, 9 = Extremely tender.
[b] 1 = Extremely dry, 5 = Average, 9 = Extremely juicy.
[c] 1 = Undesirable flavor, 5 = Average, 9 = Flavorful.

The average values for the meat quality were not affected by the different treatments. It should be mentioned, however, that the tenderness evaluation presented a quite large variation. Panel tenderness varied from 3 to 7 and the shear force from 4 to 12, indicating that meat from some cows was quite tender whereas others were very tough. Müller (1974) found that pregnant cows had meat that was less tender, dryer and with lower flavor scores than open cows. Müller and Borges (1977) failed to detect any difference in the organoleptic characteristics of meat from pregnant and open cows. Age of the fetus may have something to do with it. In Müller's work (1974) it ranged from 3 to 8 months old, whereas in the present work and in the work done by Müller and Borges (1977) the average age was 3 months. Percentage losses of the steaks while thawing and cooking was similar to the findings of Müller (1977) and Müller and Borges (1977). Simple correlation coefficients were calculated and some of the results are presented in table 4.

TABLE 4. SIMPLE CORRELATION COEFFICIENTS BETWEEN TENDERNESS AND SOME PARAMETERS IN COW MEAT[a]

	Panel tenderness		Shear value	
	Charolais	Angus	Charolais	Angus
Average daily gain	.02	.11	.12	-.07
Marbling	.09	.31**	-.15	-.38**
Ribeye area	.01	.30**	-.09	-.43**

[a] Calculated using all cows independently of treatments.

The coefficients for ADG were low and nonsignificants. This result is in disagreement with the work conducted by Bowling et al. (1977) and Bowling and Butler (1978) where it was found that steers that gained faster due to better feeding regime, had more tender meat. Marbling and ribeye area were positively correlated with tenderness in Angus, but not with Charolais cows. The results of the present work indicate that there is no economical advantage to breeding, castrating, or avoiding pregnancy through the use of IUD, when fattening cull cows.

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