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RELATIONSHIP BETWEEN SERUM TOTAL CHOLESTEROL LEVELS ON THE DAY OF HORMONAL TREATMENT AND THE SUBSEQUENT OVARIAN RESPONSE IN OVARIAN CYSTIC COWS

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The relationship between serum total cholesterol level and the response of ovarian cyst 10 days after treatment was investigated. In experiment 1, 46 Holstein cows were used between July and August 1982, and in experiment 2, 21 Holstein cows were used between February and April 1983. HCG (10,000-20,000IU) was used for treatment in experiment 1, and hCG or LH-RH (100-200 μ g) was used in experiment 2. Ovarian changes were observed about 10 and 20 days after the treatment by rectal palpation. Ovarian response was divided into 2 groups: with ovarian response (disappearance or luteinization of cyst, occurrence of normal estrus), without ovarian response (no changes of cyst or appearance of new cyst). In experiment 1, 82.4% (14/17) of cows with total cholesterol levels between 160mg/dl and 210mg/dl showed ovarian response to hormonal treatment, which was significantly higher than those of cows with total cholesterol levels of less than 160mg/dl and over 210mg/dl ($P < 0.05$). Similar results were obtained in experiment 2.

Key words: cystic cows, total cholesterol, ovarian response

INTRODUCTION

It was previously reported in cattle that ovarian response to superovulation treatment was significantly related to serum total cholesterol level (T-CHO).^{3,8)} It was also reported that cows which had lowered T-CHO before calving were apt to

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suffer from diseases after calving as compared to the cows which had normal T-CHO.^{5,9,12)} Roos¹⁰⁾ and Kweon et al.⁷⁾ reported that T-CHO level after calving was negatively correlated with the number of services per conception. It was thought that the metabolic condition of cattle is closely correlated to reproductive efficiency including ovarian response to hormonal stimulation. To substantiate this hypothesis more concretely, the relationship between T-CHO levels on the day of hormonal treatment and the subsequent ovarian response was investigated.

MATERIALS AND METHODS

In experiment 1, 46 Holstein cows, which were diagnosed as having ovarian cyst by first rectal palpation, and in experiment 2, 21 Holstein cows, which had no changes of cystic follicle(s) even 7 days after first rectal palpation, were used. Experiment 1 was conducted between July and August 1982, while experiment 2 was conducted between February and April 1983. The calving number is between 1 and 6 and milk yield was 5 to 40kg per day. In both experiments, all cows were divided according to T-CHO level into 3 groups: a) below 160mg/dl, b) between 160 and 210mg/dl and c) over 210mg/dl. HCG hormone (Sankyo Phar. Ltd., Japan) at a dose of 10,000–20,000IU in experiment 1 and hCG or Gn-RH (Takeda Phar. Ltd., Japan) in experiment 2 were injected intramuscularly at a dose of 10,000–20,000IU and 100–200 μ g, respectively. Cystic follicle(s) of 20 cows in experiment 1 were ruptured manually through the recto-vaginal wall at the time of hormonal treatment. The subsequent ovarian changes after hormonal treatment were observed by rectal palpation about 10 and 20 days after treatment. The ovarian response was divided into 2 groups: with ovarian response (disappearance or luteinization of cyst, and occurrence of normal estrus), and without ovarian response (no changes of cyst or new appearance of cyst). Blood samples were collected from the coccygeal vein on the day of hormonal treatment. Serum was separated and stored at -20°C until analysis. T-CHO was analyzed spectrophotometrically by an enzyme method (International Reagents Co., Japan).¹⁾ Difference of the percentages was evaluated by the χ^2 -test.

RESULTS

The ovarian response of cystic cows to hCG hormone in experiment 1 is shown in Table 1. Twenty-five out of 46 cows (54.3%) showed ovarian response to hormonal treatment. The dosage of 20,000IU was found to be more effective than 10,000IU, and cows in which cystic follicle(s) were manually ruptured showed better ovarian response than those which were unruptured. But in both conditions, there was no significant difference between the response and the non-response groups. The relationship between T-CHO levels and ovarian response to hormonal treatment in experiment 1 is shown in Figure 1. Out of 17 cows with T-CHO levels between 160mg/dl and 210mg/dl, 14 cows (82.4%) showed ovarian response. Four out of 9 cows

TABLE 1 Ovarian response of cystic cows treated with different doses of hCG hormone and artificial rupture of follicles

10,000IU		20,000IU	
non-R	R ^a	non-R	R
2/8 ^b	8/12	9/18	6/8
(25.0%)	(66.7%)	(50.0%)	(75.0%)

a: Manual rupture of cystic follicles at the time of hormonal treatment.

b: No. of cows showing ovarian response / No. of cows examined.

(44.4%) with T-CHO above 210mg/dl and 7 out of 20 cows (35.0%) with T-CHO below 160mg/dl showed ovarian response. Cows which had T-CHO levels between 160 and 210mg/dl showed significantly better ovarian response, as compared to other cows which had T-CHO levels above 210mg/dl ($P < 0.05$) or below 160mg/dl ($P < 0.01$). In experiment 2, out of 13 cows with T-CHO levels between 160 and 210mg/dl, 8 cows (61.5%) showed ovarian response (Table 2). One out of 3 cows (33.3%) with T-CHO over 210mg/dl and 1 out of 5 cows (20.0%) with T-CHO below 160mg/dl showed ovarian response. Although there was no significant difference between groups, cows with T-CHO levels between 160 and 210mg/dl showed better ovarian response.

DISCUSSION

Effect of hormonal treatment on ovarian cyst has been evaluated based on morphological changes of ovaries, days after hormonal treatment to the first estrus, days after treatment to conception and conception rate at the first estrus.¹¹⁾ We used the morphological changes of ovaries 10 days after the treatment as a parameter. In our previous report,⁸⁾ 13.0% (7/54) of the superovulated cows that had less than 130mg/dl of T-CHO, while 48.1% (25/52) of those that had 130 mg/dl and over produced more than 3 transferable embryos ($P < 0.01$). Normal range of the parameter was different between superovulation cows and cystic cows (130mg/dl \leq , 160mg/dl-210mg/dl). All cystic cows were those which had calved and were in lactation, while superovulation cows included heifers and non lactating cows. It was reported that the normal range of T-CHO level of lactating cows varied according to their daily milk yield.⁴⁾ This means that the cows with greater milk production had increased T-CHO level. Another report has shown that the cows which had suffered diseases within 1 week after calving and showed severe symptoms such as anorexia, fever and pains had lowered T-CHO until 10 weeks after calving.⁶⁾ Cows which showed clinical symptoms within 1 month before and after blood collection and had subclinical mastitis

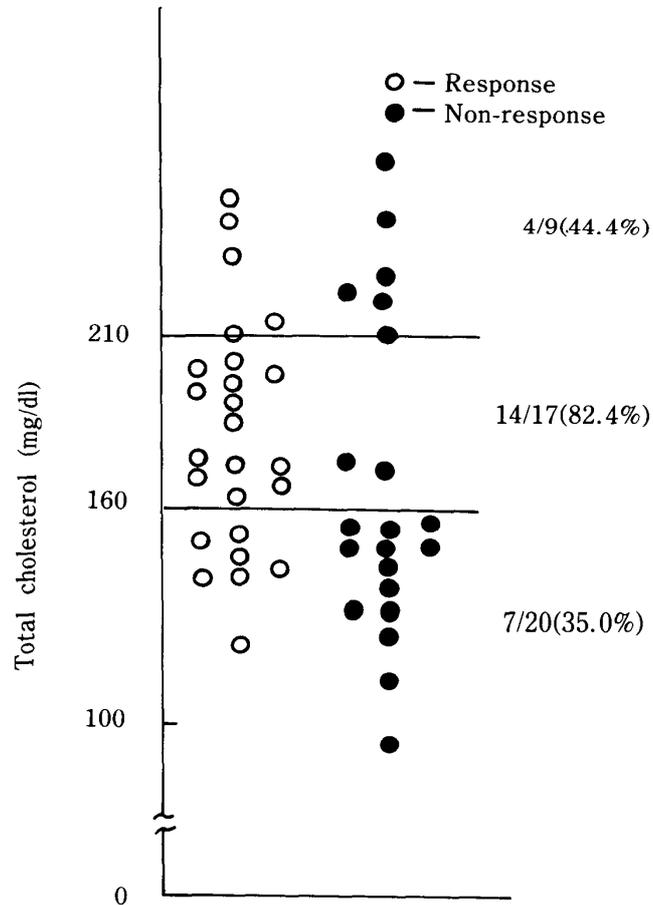


FIGURE 1 Relationship between T-CHO levels and the subsequent ovarian response

TABLE 2 Percentage of cows which showed ovarian response 10 days after treatment in relation to total cholesterol levels

T-CHO (mg/dl)	159 \geq	160-210	211 \leq
Experiment 1	7/20 ^a (35.0%)	14/17 ^b (82.4%)	4/9 ^c (44.4%)
Experiment 2	1/5 (20.0%)	8/13 (61.5%)	1/3 (33.3%)

a, b: $p < 0.01$

b, c: $p < 0.05$

on the day of blood collection had lowered T-CHO levels as compared to the normal cows.⁴⁾ Although in the present study, no relationship was found between milk yield and ovarian response, the higher T-CHO level of the cows which had greater milk production indicated a decreased effect on ovarian response to hormonal treatment in cystic cows. This was probably due to the accelerated metabolism of the cows and to their response to energy demands for increased milk production. Kweon et al.⁷⁾ and Haraszti et al.²⁾ indicated that there was a relationship between T-CHO level and fertility status post-calving. Reproductive efficiency, including ovarian response to hormonal treatment, was probably correlated to the metabolic condition, which was represented by the T-CHO level of cows. The mechanism by which the ovarian response to hormonal treatment was affected by the metabolic condition, which is represented by the T-CHO level of cows, is not known and further studies are needed.

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