

Ultrasonic Characteristics of Morphological Structure on Bovine Ovaries

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소의 난소에 대한 형태학적 구조의 초음파학적 특성

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요 약

본 실험은 촉진 및 호르몬 측정으로는 알기 힘든 난소의 정상 혹은 병리학적 형태 및 변화를 알아보기 위하여 실시하였다.

실험실에서 도살장으로부터 채취된 난소 100개를 수침법으로 초음파 사진을 찍고 그 실제 단면과 비교하였다. 그리고, 홀스타인 50두에서 직장 벽을 통해 난소를 초음파로 관찰하여 난소의 정상 상태 및 병적 상태를 조사하였다. 이 기초 실험을 바탕으로 하여 홀스타인 소 1두를 과배란 처리하여 42일간 난소의 형태 및 변화를 직장 벽을 통해 초음파로 관찰하고 난포의 크기를 측정하였다.

수침법을 통한 난소의 관찰로 난포와 황체의 정상적·비정상적인 구조를 관찰할 수 있었고, 과배란처리한 소 난소의 관찰로 난포와 황체의 능동적 상호작용을 관찰할 수 있었다.

(key word : ultrasonography, ovary, superovulation, follicle, corpus luteum)

INTRODUCTION

The use of diagnostic ultrasonography in veterinary medicine in general, and especially for the assessment of the bovine genital tract and ovarian structure is not wide spread in Korea, but is increasing rapidly. The ovaries and the tips of the bovine uterine horns are not always easy to reach with the ultrasound transducer (probe) via the rectum, vagina or via the abdominal wall.

Ultrasonography is very useful when rectal palpation of the genital tract as well as hormone

analysis do not give the desired information about normal or pathological ovarian activity. Visualization of the ovaries via rectum or vagina can give us extra information about the follicle population, the presence of functional corpus luteum, follicular and luteinized cyst, haematomas in ovaries and abnormalities in the ovarian region. And the illustration of the ovaries allow greater understanding of the anatomical structures. Other application of ultrasonography in cow besides the study of ovarian structure include early pregnancy diagnosis etc.

This paper describes the characteristics of the common ovarian structures and ovary induced

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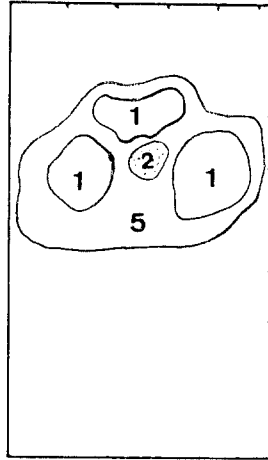
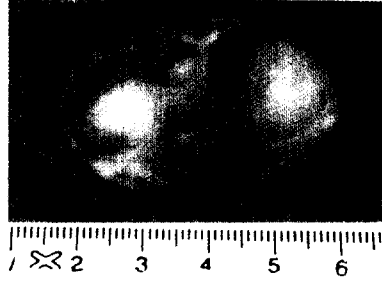
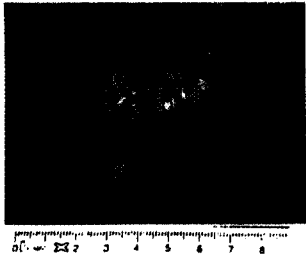


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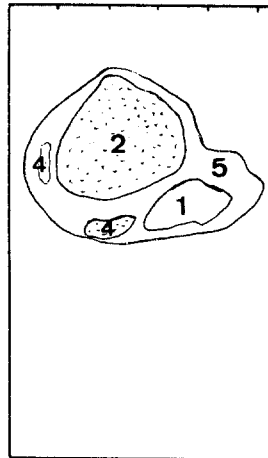
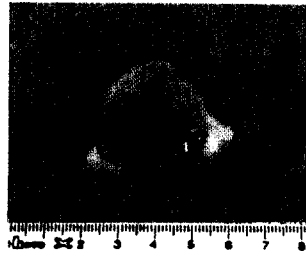
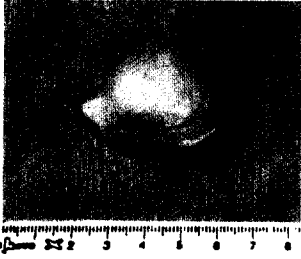


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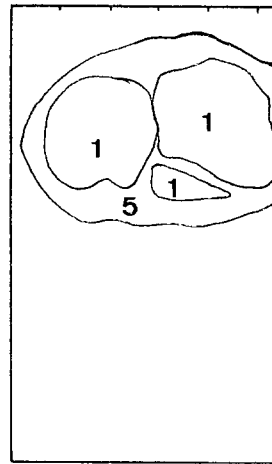
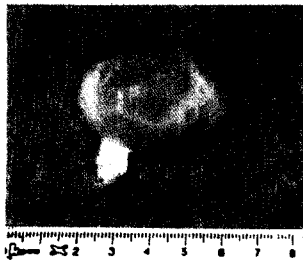


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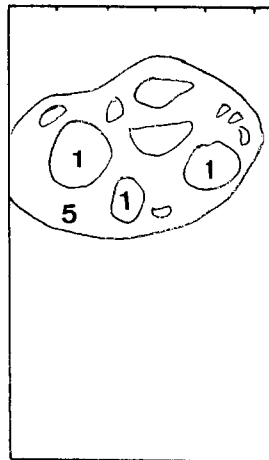
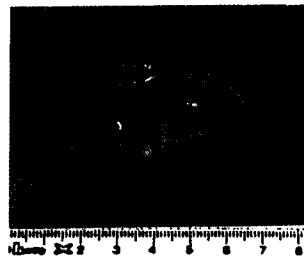
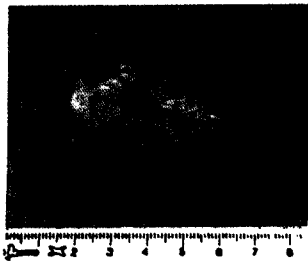


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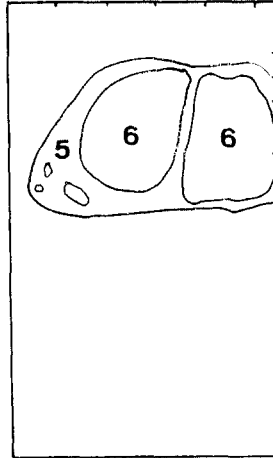
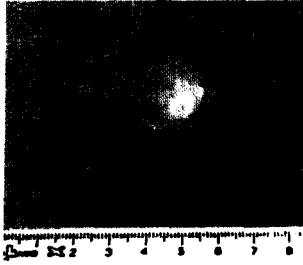


Fig. 7

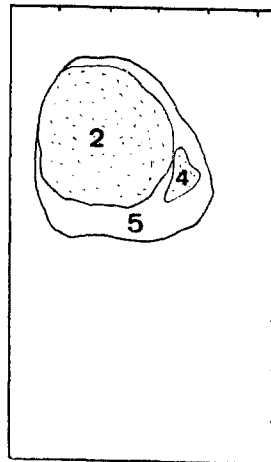
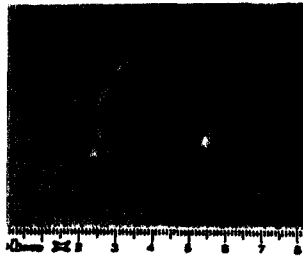
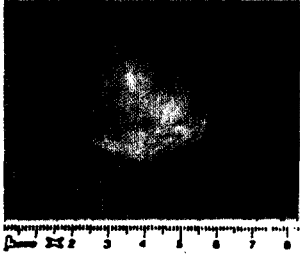


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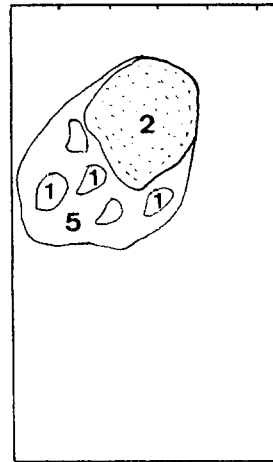
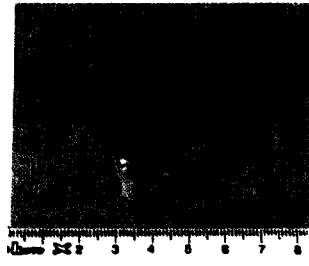
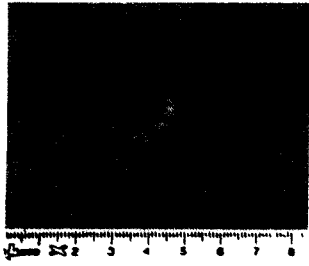


Fig. 9

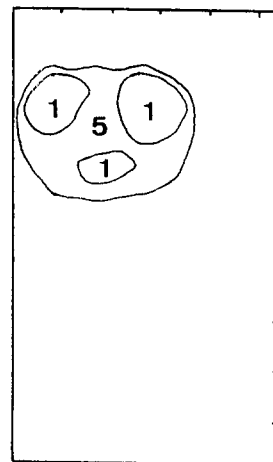
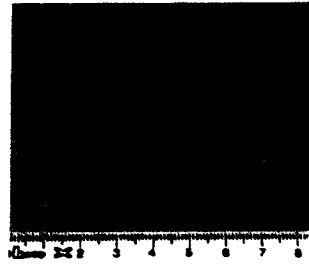
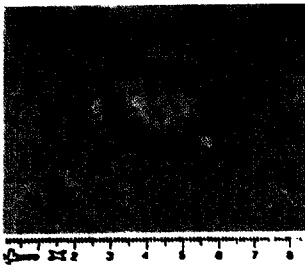


Fig. 10.

Fig. 10. The images on Fig. 3~10 are shown as

- top left : overall view of the structure in vivo
 - top right : transection of the structure
 - bottom left : ultrasound images of the ovary in water
 - bottom right : drawing of the ultrasound images
- The numbers refer to their structure mentioned like after

1. follicle
2. corpus luteum
3. corpus luteum with cavity
4. corpus luteum atreticum
5. ovarian stroma
6. follicular cyst

RESULTS

1. Experiment 1

Section of 8 representative ovaries containing

a corpus luteum or follicles among the 100 ovaries and corresponding images are shown(Fig. 3~10). Images made *in vivo* show the rectum wall at the top of the image(Fig. 11~14).

The follicular fluid was nonechogenic, so fol-

Fig. 11.

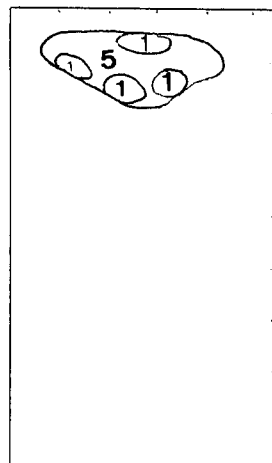
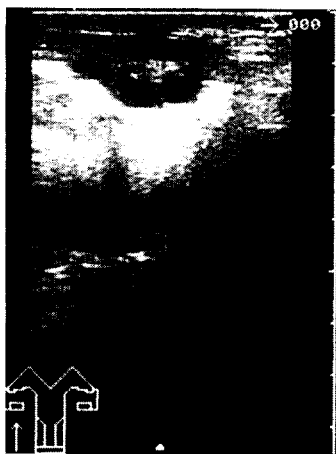


Fig. 12.

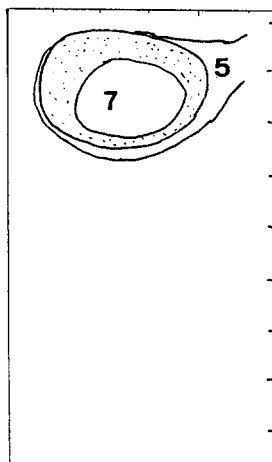
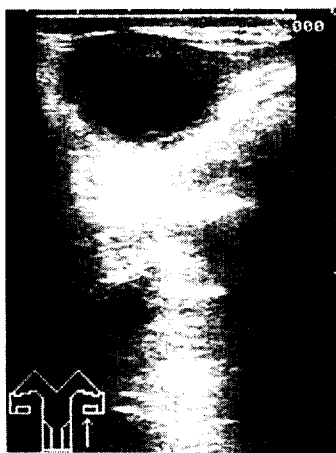


Fig. 13.

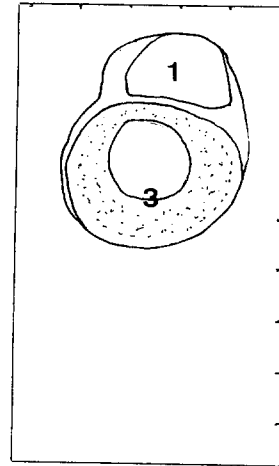


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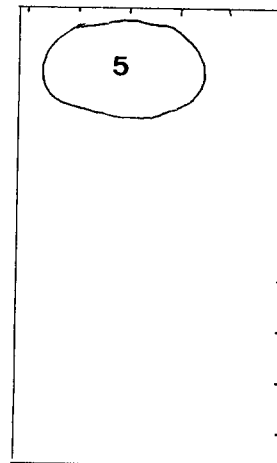
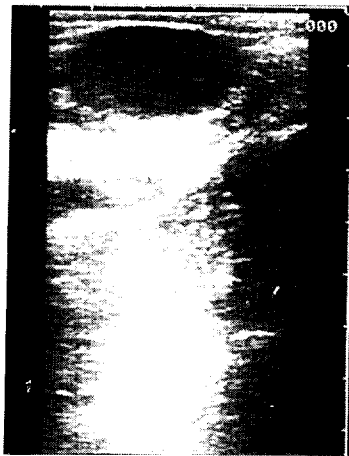


Fig. 14. The images on Fig. 11~14 are shown as
left : ultrasound images of the ovary *in vivo*

right : drawing of the ultrasound image

The number refers

1. follicle 2. corpus luteum 3. corpus luteum with cavity 4. corpus luteum atreticum
5. ovarian stroma 6. follicular cyst 7. luteal cyst

licles appeared as black. The cavity in corpus luteum was nonechogenic, too. But corpus luteum was echogenic.

2. Experiment 2

The follicular population in the heifer that were superovulated is shown in Table 1.

Examples and description of ultrasound images of follicles and luteal structures are given in Fig. 15. After successful superovulation a large

amount of follicles are recorded which lie close to another and show irregular forms because of various pressure. Seven days after initiation of treatment 7~8 follicles ovulated(number of ovulation estimated from number of corpus luteum). In this experiment, the reaction by hormone was not good, but we can monitored interaction of follicles and corpus luteum.

DISCUSSION

Table 1. Number of follicles in various diameter categories for cattle which was induced to superovulate

follicle category (mm)	days from beginning of treatment									
	1		2		3		4		6	
	L	R	L	R	L	R	L	R	L	R
2~5	7	4	5	3	7	3	1	1	0	0
1~10	1	0	2	0	4	3	5	2	2	1
11~15	0	0	0	0	0	0	2	1	6	1
>15	0	1	0	1	0	1	0	1	0	3
Total	8	5	7	4	11	7	8	5	8	5

L : left R : right

Locating an ovary with the ultrasound probe (transducer) was not difficult after a few practice sessions. Difficulty experienced in finding an ovary was corrected by digitally locating and repositioning the ovary. Complete evacuation of the rectum in the examining area and complete contact between probe(transducer) and the rectal wall were found to be very important. Fecal material between probe(transducer) and the rectal wall resulted in a black band on the viewing screen. Occasionally, a clear image was not obtained. This problem seemed to be caused by intervening tissue between the rectal wall and ovary and was corrected by manually repositioning the ovary. Sometimes the ovary rotated or changed its orientation during the course of an examination.

The ultrasonic anatomy of the bovine ovary was dominated by the two types of prominent glandular structures, follicles and corpus luteum. The follicular fluid was nonechogenic. Therefore, the follicles appeared on the ultrasound images as black, roughly circumscribed areas.

0 day

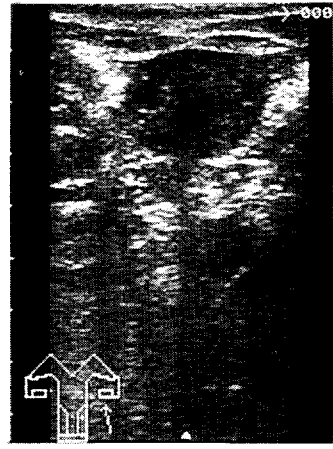
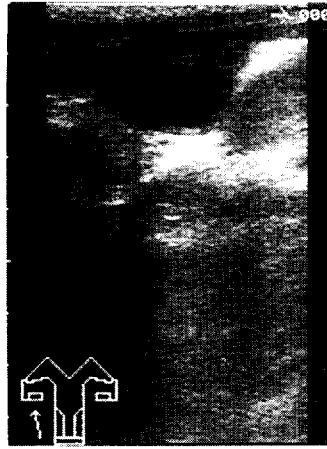


L

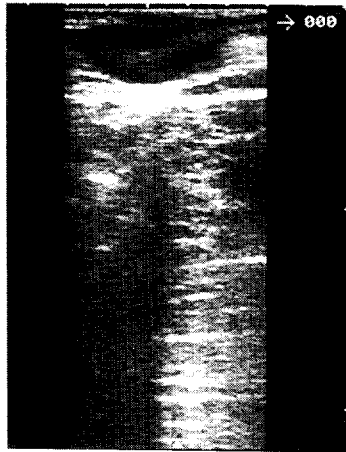


R

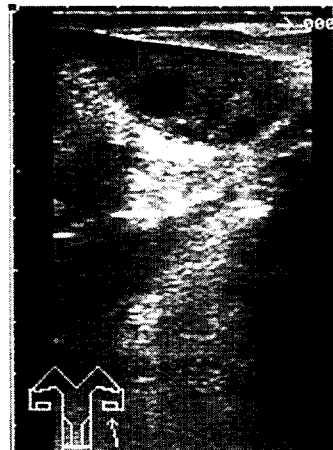
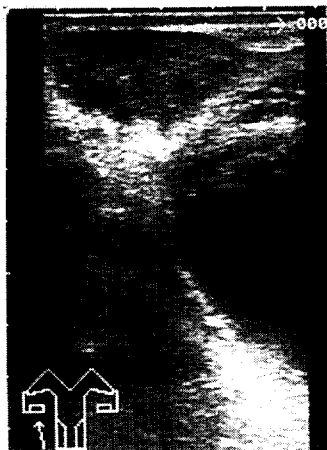
2 day



3 day



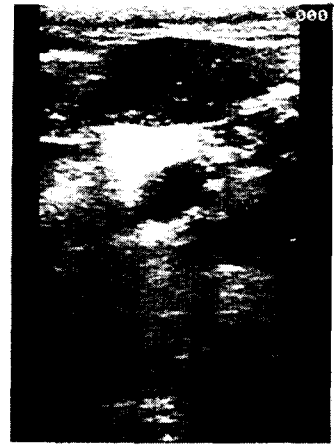
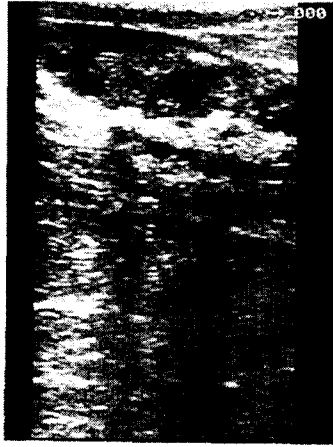
4 day



L

R

6 day



8 day



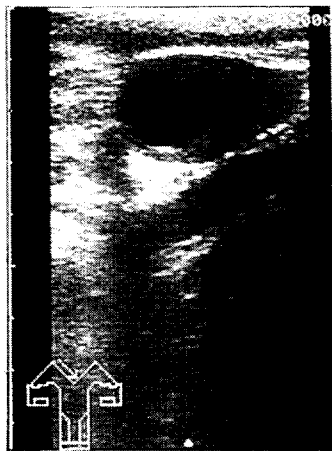
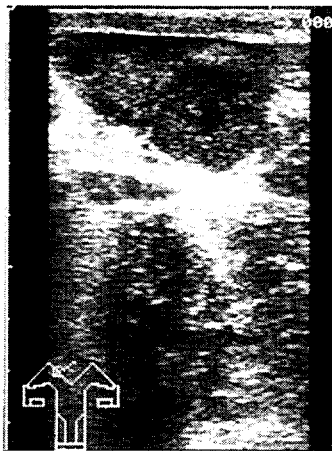
10 day



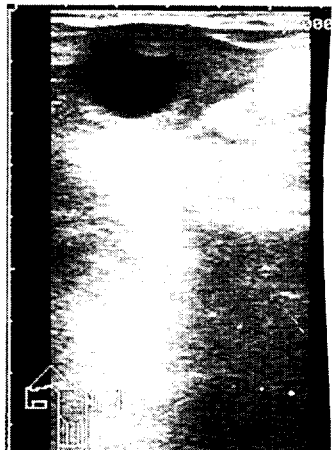
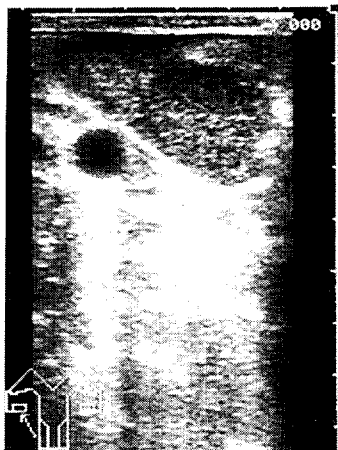
L

R

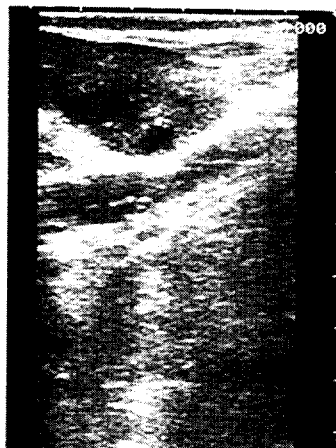
11 day



12 day



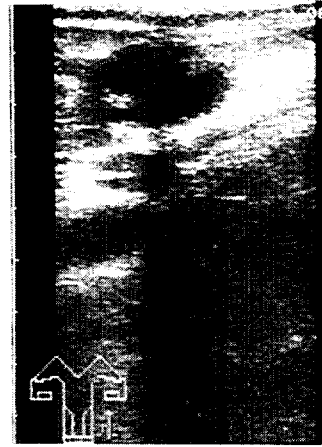
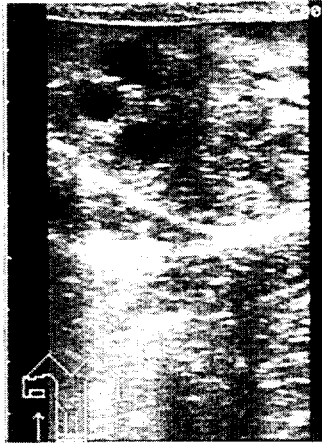
13 day



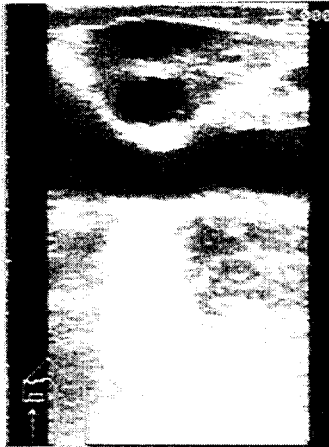
L

R

14 day



16 day



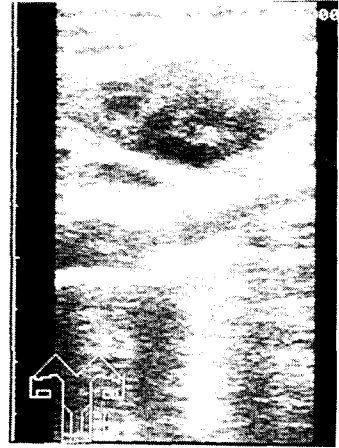
18 day



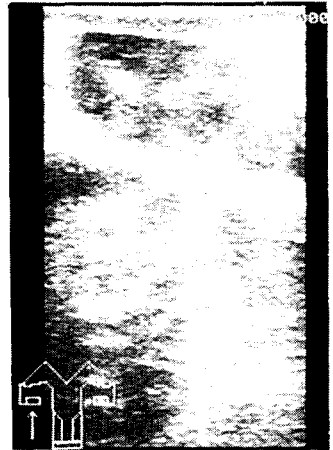
L

R

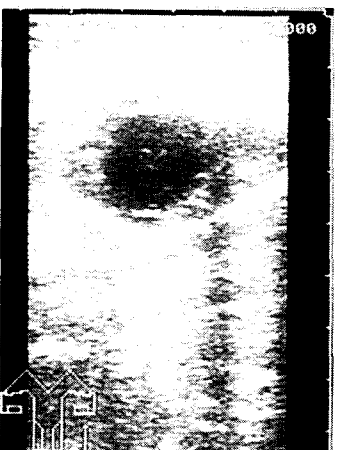
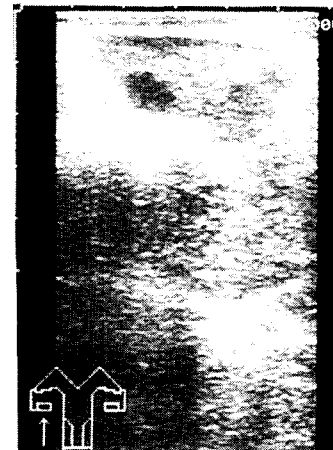
20 day



22 day



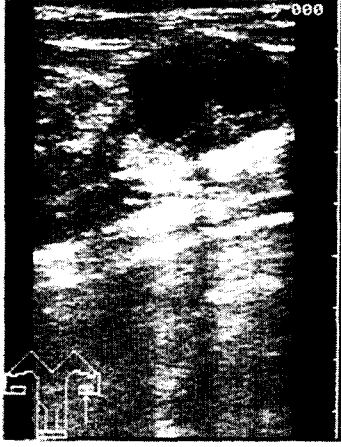
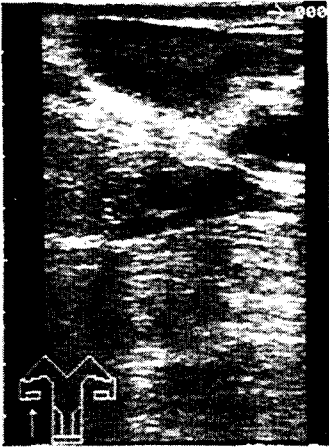
24 day



L

R

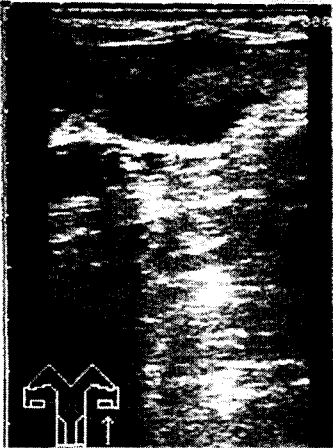
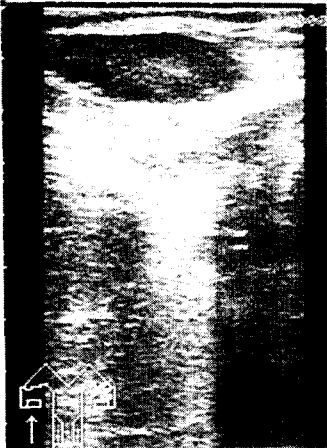
26 day



28 day



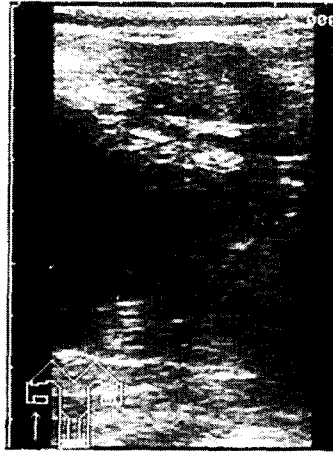
30 day



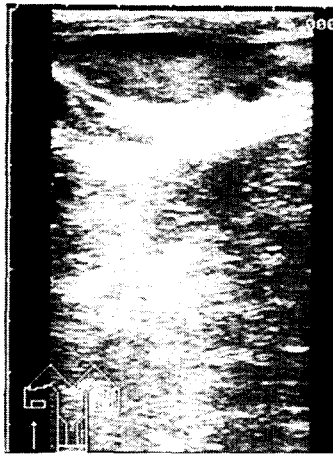
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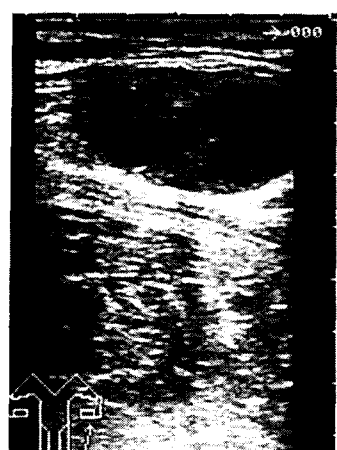
32 day



34 day



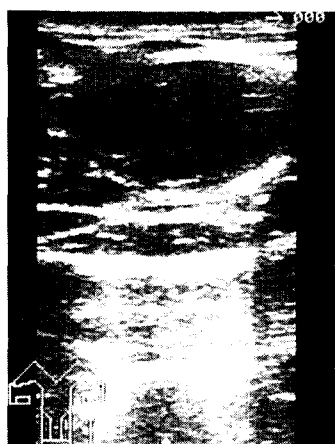
36 day



L

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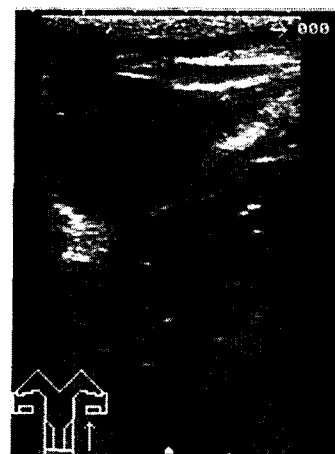
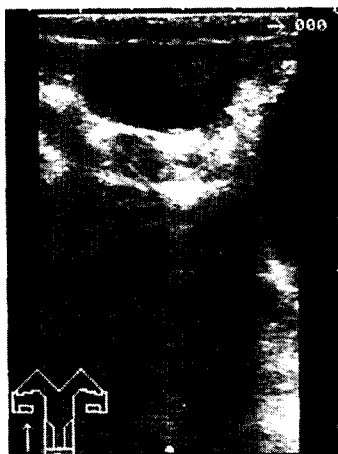
38 day



40 day



42 day



L

R

Fig. 15. Ultrasound images of the ovaries of a cattle induced to superovulate.

Care was required to avoid confusing follicles with other nonechogenic areas, such as a cavity in a corpus luteum. Only well-defined forms with a relatively smooth outline were considered follicles. The corpus luteum was echogenic.

In the superovulated cattle, the total number of follicles did not seem different among days of superovulation protocol. Perhaps the follicles which ovulated originated from the population of small follicles present when superovulation treatment was begun. Ovulation is proven as the disappearance of a large follicle with subsequent formation of a corpus luteum (Pierson and Ginther, 1988). Establishing the amount of corpora lutea after superovulation the same thoughts apply for documentation like in follicle evaluation, but after successful superovulation differentiation of several next to one another lying luteal gland is only possible (Leidl and Wolff, 1992).

Ultrasonography provides an accessible method of monitoring the structure of follicular and corpus luteum. Furthermore it is possible that ultrasonography monitors dynamic interaction of follicular and luteal structures. In addition, the technique will likely prove to be valuable in the clinical and diagnostic field.

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