

**THE SIZE AND ASPECT OF CORPUS LUTEUM IN CORRELATION  
WITH PROGESTERONE LEVEL IN THE FIRST PART OF THE PREGNANCY IN DAIRY COW**  
DIMENSIUNEA ȘI ASPECTUL CORPULUI GALBEN CORELATE  
CU NIVELUL DE PROGESTERON ÎN PRIMA PARTE A GESTAȚIEI LA VACA DE LAPTE

C.M. BERCEA-STRUGARIU<sup>1)</sup>, N.T. CONSTANTIN<sup>1),2),\*</sup>,  
F.P. POSASTIUC<sup>1)</sup>, Crina Raluca ANDREI<sup>1)</sup>,  
Ioana Cristina SPRINȚU<sup>1)</sup>, C. MICȘA<sup>1)</sup>,  
C. VLĂGIOIU<sup>1)</sup>

**ABSTRACT | REZUMAT**

The present study aimed to determine whether the size and type of the corpus luteum can influence the plasma concentration of progesterone. It is known that there are two types of corpora lutea in cows: the homogeneous corpus luteum (hCL) and the cavitory corpus luteum (cvCL). Following the hormonal synchronization, 82 cows were artificially inseminated using semen from the same bull and after the subsequent transrectal ultrasound examination at 30 days, 40 of the pregnant females (30 multiparous and 10 nulliparous) were chosen for this study. They were classed in 2 batches: hCL and cvCL, each one containing 15 adult cows and 5 heifers. The circulating progesterone was assayed at 14 days of pregnancy. The results were surprising in terms of the average volume of the corpus luteum in the hCL group was lower than that in the cvCL group ( $5730.63 \pm 1402.57 \text{ mm}^3$  vs.  $6988.96 \pm 1218.47 \text{ mm}^3$ ,  $p < 0.005$ ). Regarding pregnancy conception rate recorded between the two groups, higher values have been obtained in females included in the cvCL group, both in adult cows (36.55 %) and heifers (43.15%), in comparison with females from the hCL group (33.35%, respectively 41.66%). The obtained results demonstrated that cavitory luteal tissue does not influence the potential to maintain pregnancy in cows.

**Keywords:** conception rate, corpus luteum types, progesterone level, dairy cow

Scopul prezentului studiu a fost acela de a determina dacă dimensiunea și tipul corpului luteal poate influența concentrația de progesteron circulant. Este cunoscută existența a două tipuri de corpi luteali la vacă: corpul luteal omogen (CLO) și corpul luteal cavitar (CLcv). În urma sincronizării hormonale, 82 de vaci au fost inseminate artificial cu material seminal de la același taur, iar după examinarea ecografică transrectală efectuată la 30 de zile, 40 dintre femelele gestante (30 multipare și 10 nulipare) au fost selecționate pentru acest studiu. Bovinele au fost grupate în două loturi: CLO și CLcv, fiecare lot conținând câte 15 vaci adulte și 5 juninci. Nivelul plasmatic de progesteron a fost evaluat la 14 zile de gestație. Rezultatele au fost surprinzătoare prin prisma faptului că media volumului de țesut luteal a grupului CLO a fost mai scăzută decât cea a grupului CLcv ( $5730,63 \pm 1402,57 \text{ mm}^3$  vs.  $6988,96 \pm 1218,47 \text{ mm}^3$ ,  $p < 0,005$ ). În ceea ce privește rata de gestație înregistrată în rândul celor două grupuri, s-au obținut valori crescute la femelele din grupul CLcv, atât la adulte (36,55 %), cât și la juninci (43,15 %), comparativ cu femelele din grupul CLO (33,35 %, respectiv 41,66 %). S-a demonstrat că țesutul luteal nu influențează capacitatea de menținere a gestației la vacă.

**Cuvinte cheie:** rata de gestație, tipuri de corpi luteali, nivel de progesteron, vaca de lapte

Luteal body evaluation along with embryo identification is a compulsory stage, with aspects such as the plain presence, structural variability, and dimensions being permanently assessed throughout a veritable clinical and paraclinical reckoning during early gestation, in cows. The corpus luteum (CL) is a transient endocrine gland on the surface of the mammalian ovaries that, depending on the species, can produce pro-

gesterone (P4), oxytocin, norepinephrine, and growth factors that can stimulate the synthesis of P4 (5). It is known that the conception rate in both cows and heifers is low due to the reduced circulating level of P4 (16). As a result, the endometrium will secrete a poor-quality embryotroph, which is directly involved in the development and survival of embryos.

Frequently, it is admitted that a harmoniously developed corpus luteum is associated with an increased plasma level of P4. However, even if there are many studies that have examined the relationship between corpus luteum size and plasma P4 concentration, not all of them certify the previous statement (1, 13).

1) University of Agronomic Sciences and Veterinary Medicine, Faculty of Veterinary Medicine, Bucharest, Romania

2) Research and Development Institute for Bovine, Balotești, Ilfov, Romania

\*) Corresponding author: [tiberiu.constantin@fmvb.usamv.ro](mailto:tiberiu.constantin@fmvb.usamv.ro)

It is known that the cow can develop homogeneous corpora lutea (hCL) or cavitory corpora lutea (cvCL), the latter being not considered pathological. The presence of the cavity has been shown that do not affect plasma or milk P4 levels (2, 12).

The present work wants to emphasize that the aspect and the size of corpora lutea have no negative impact on the conception rate.

## MATERIALS AND METHODS

The study was carried out over 7 months (from August 2022 to February 2023) on dairy cows belonging to a commercial farm in Prahova County. The total number of animals at the farm was about 900 animals, including the youth, from the Holstein Friesian breed. The maintenance of the animals is done in a free housing system, the animals being grouped into batches of productive performance. The average milk production of the entire group of lactating females was around 31.2 kg/animal.

Feeding is accomplished 2 times a day, at intervals of approximately 12 hours, and the diet is combined (TMR – total mixed ration). Water is ad libitum and available through drinkers with an anti-freeze system. At the level of the stable, the resting area is provided by individual cubicle mats and mattresses that are designed to offer excellent sleeping comfort and good hygiene. At the same time, the shelter has natural, but also artificial ventilation through horizontal fans, located centrally and through vertical fans, located at the level of the access area to the feeding front.

Milking takes place 3 times a day and it is facilitated by the use of a 24-back-to-back milking parlour. The average time required to milk a cow is 5.32 minutes; these and other data are automatically reported by reading pedometers attached to the collarbone.

Pregnant females in the weaning period are housed separately and are fed according to the far-off and close-up intervals. Immediately after calving, the female is housed in the maternity, and the calf is isolated from the mother after the first intake of colostrum. After exceeding about 3 days of transition between colostrum and lactate secretion, the female enters the dairy cow group, depending on milk production.

After 60 days of lactation, females are introduced into the breeding program by hormonal synchronization, according to an ultrasound examination of the ovaries and uterus. Eighty-two females were hormonally synchronized using the OvSynch protocol, and insemination was performed by the same operator using frozen conventional semen.

This protocol involves the injection of GnRH at a certain point in the oestrous cycle, followed by the injection of PgF<sub>20</sub> at 7 days. A second injection of GnRH is given 2 days after PgF<sub>20</sub>. Artificial insemination is per-

formed 16 hours (8-24 hours) after the last GnRH injection, not requiring oestrus detection. The first GnRH injection induces either ovulation or luteinization of all dominant or large follicles, and a new follicular wave will appear after about 3 days. At the same time, GnRH stimulates the development of luteal tissue from cells that were previously in the dominant follicle.

After the transrectal ultrasound examination (KWD, Value Store US, China and with a 3.5 MHz transrectal probe) performed at 30 days post insemination, from a total of 82 synchronized and inseminated females, 40 pregnant cows were chosen for this study.

Based on the aspect and the size of corpora lutea, that were evaluated by ultrasound examination on day 14 after the artificial insemination, they were classed in 2 batches: hCL and cvCL, each one containing 15 adult cows and 5 heifers.

During the initial ultrasound examination, blood samples were taken from the subjects included in the study, by puncturing the vessels on the tail's ventral side. After collecting the samples, they were transported in optimal temperature conditions (4-8°C) within a maximum of 4 hours from the collection, to be stored until the time of processing. To separate the serum, the samples were centrifuged at  $g = 600$ , for about 15 minutes, according to the formula:  $g = \text{RPM}^2 \times R \times 1,118 \times 10^{-5}$ , where RPM (rotations per minute) = 2500 and R (rotor radius) = 8.6 cm, for the volume of the test tubes used in the study, using the EBA 20 (Hettich Zentrifugen®, Germany) centrifuge. The obtained serum was kept in Eppendorf tubes in a freezer at -20°C, until the time of processing.

After the collection of the blood samples and obtaining the blood serum, the serum progesterone level was determined by the ELISA method, using the Bovine progesterone kit (Cusabio®, USA).

The principle of the method consisted in the competitive immunoenzymatically technique. The work plate was precoated with goat anti-rabbit antibodies. Standards or samples were added to the wells of the plate containing an antibody specific for progesterone and horseradish peroxidase (HRP) conjugated solution. The competitive inhibition reaction was performed between HRP and antibodies. The substrate solution was added to the wells and the colour reaction that occurs was inversely proportional to the amount of progesterone in the sample.

The colour reaction was stopped by adding a Stop solution and the colour intensity was measured.

The detection range of the kit is between 0.5 ng/ml and 30 ng/ml, the sensitivity of the kit is less than 0.2 ng/ml, and the lower limit of detection is defined as the minimum concentration of progesterone which can be differentiated from 0. The specificity is excellent for the detection of bovine progesterone and no cross-reactions between progesterone and its analogues have

been recorded. All the steps were followed according to the ELISA kit instructions.:

In the present study, the conception rate at 30 days after insemination was calculated for the two groups.

## RESULTS AND DISCUSSION

Following the introduction of transrectal ultrasound examination in farm animals, the information provided was able to set up the basis of new hypotheses about the physiology of various organs and systems. The same happened in the case of bovine ovaries where the luteal gland can present a transient central cavity. The presence of this structure has generated interest in the level of progesterone that females could have and whether there is any negative impact on breeding activity in cattle.

The results of the ovarian ultrasounds performed on the females and the progesterone level measured 14 days after artificial insemination are shown in Table 1. In order to find out the volume of the homogeneous corpus luteum, the cavitory corpus luteum, and the cavity of the cavitory corpus luteum, it started from the mathematical formula:  $V = 4/3 \times \pi \times R^3$ , and R (radius) was calculated based on the formula:  $R = (\text{Transv. axis}/2 + \text{Long. axis}/2)/2$ .

The work of Howell et al. (1994) already underlined the fact that progesterone levels are lower during heat stress, even if the current study did not emphasize these differences (7).

Fields and Fields have obtained through their research conducted in 1996, a mean serum progesterone level of  $6.84 \pm 0.61$  ng/ml at 14 days of gestation, correlated with an average weight of the corpus luteum of 4.70 grams, in a group of multiparous cows. Even though in our study, we did not refer to the luteal tissue weight, the level of progesterone obtained in the two groups of animals was similar for females in the hCL group ( $6.71 \pm 0.21$  ng/ml) and higher for those in the cvCL group ( $8.78 \pm 0.75$  ng/ml) (4). In 1998, Tom et al. revealed that on day 14 of the oestrous cycle, Holstein cows develop a cross-sectional diameter of the homogeneous corpus luteum of approximately 25 mm and a serum progesterone level of 5.5 ng/ml. The same category of subjects, multiparous females respectively, according to our results, showed a mean transverse diameter of the luteal body of  $21.87 \pm 2.15$  mm and a progesterone level of  $7.21 \pm 0.57$  ng/ml. For the heifers, the mean transverse diameter was  $23.17 \pm 1.39$  mm and the progesterone production settled at  $6.71 \pm 0.27$  ng/ml (19). Compared to the results of the above-mentioned authors, we can hypothesize that today's cattle, probably due to genetic advances, tend to produce higher levels of progesterone with lower-diameter luteal bodies. However, the cited study does not provide the volume of

the corpus luteum in relation to the progesterone level

In 2005, Kayacik et al. divided 10 multiparous Holstein cows into three groups based on the length of the oestrous cycle. Thus, the females who showed an oestrous cycle of 21 days, registered a luteal body diameter of 22.4 mm and a progesterone level of 7.52 ng/ml, during the 14th day of the cycle. Within the group with an oestrous cycle longer than 21 days (approximately 31 days), the progesterone level, considering the same timing, was below 4 ng/ml, with a corpus luteum diameter similar to the one noted in cows with a normal sexual cycle (12).

Another study conducted on a group formed of 27 cows aimed to oversee the luteal activity and evaluate the morphology at 4, 9, 20, 25, 30, and 40 days after ovulation (6). The authors obtained at 9 days after ovulation, a mean volume of  $7520 \pm 3140$  mm<sup>3</sup> for the homogeneous cyclic luteal bodies, while for the cyclic cavitory luteal bodies, the average volume was 4330 mm<sup>3</sup>. In pregnant females, the volume of the homogeneous luteal bodies was  $6050 \pm 1710$  mm<sup>3</sup>, whereas pregnant females with cavitory luteal bodies reached  $8620 \pm 3460$  mm<sup>3</sup>. In addition, the progesterone level in all four categories ranged between 3 and 4.2 ng/ml. Due to the lack of data at 14 days after ovulation, the previously registered results could not be compared to the data obtained in our research.

Perez-Marin (2009), during their research conducted on 28 Holstein cattle, aged between 3 and 7 years, concluded that both the progesterone level and the transverse diameter of the luteal body may reveal similar values at 14 days after insemination, in both females with homogeneous corpus luteum and those with cavitory corpus luteum. The luteal body cavity was identified in 42.9% of the included subjects, the mean diameter ranging between 3 and 16 mm at 14 days after insemination (15).

Nogueira et al. (2012), evaluated previously synchronized embryo donor heifers from five different breeds, through ultrasonography and serology at 17 days of gestation. Thus, they have reported that when dealing with a transverse diameter of the luteal body close to  $2100 \pm 290$  mm in the Marchigiana heifers, the serum progesterone reached  $1.58 \pm 1.30$  ng/ml, whereas within the Caracu heifers a diameter of  $1880 \pm 390$  mm was linked to a progesterone concentration close to  $1.50 \pm 1.11$  ng/ml. Nellore heifers registered a diameter of  $1920 \pm 440$  mm and a mean progesterone concentration bordering  $1.48 \pm 1.05$  ng/ml. A luteal body diameter of  $2100 \pm 420$  mm in the Mestizo breed, prompted serum progesterone levels nearby  $1.41 \pm 0.89$  ng/ml. In the Angus heifers, the serum progesterone at 17 days of gestation was  $1.07 \pm 0.40$  ng/ml while dealing with a corpus luteum diameter of  $1960 \pm 330$  mm. Regarding the gestation rate, the highest levels were obtained by the Marchigiana breed (59.2%),



**Table 1**  
**Data collected from the two groups of animals**

| Bovines         | hCL P4 (ng/ml) | h Long. axis (mm) | h Transv. axis (mm) | hR (mm) | hCLV (mm <sup>3</sup> ) | cvCL P4 (ng/ml) | cv Long. axis (mm) | cv Transv. axis (mm) | cvR (mm) | cvCLV (mm <sup>3</sup> ) | cav. Long. axis (mm) | cav. Transv. axis (mm) | cav. R (mm) | cav. V (mm <sup>3</sup> ) | cvCLV without cav. (mm <sup>3</sup> ) |
|-----------------|----------------|-------------------|---------------------|---------|-------------------------|-----------------|--------------------|----------------------|----------|--------------------------|----------------------|------------------------|-------------|---------------------------|---------------------------------------|
| 1               | 6.56           | 23.03             | 21.75               | 11.18   | 5874.09                 | 8.52            | 26.11              | 25.45                | 12.89    | 8966.58                  | 8.23                 | 8.00                   | 4.05        | 279.66                    | 8686.91                               |
| 2               | 7.34           | 21.13             | 23.65               | 11.19   | 5874.09                 | 7.69            | 24.01              | 24.56                | 12.14    | 7495.36                  | 7.02                 | 7.13                   | 3.53        | 185.33                    | 7310.02                               |
| 3               | 7.13           | 24.44             | 23.68               | 12.03   | 7288.95                 | 7.83            | 26.95              | 25.33                | 13.07    | 9347.49                  | 7.34                 | 6.93                   | 3.56        | 190.09                    | 9157.40                               |
| 4               | 7.98           | 24.88             | 23.96               | 12.21   | 7621.05                 | 8.89            | 23.67              | 24.06                | 11.93    | 7113.16                  | 7.89                 | 8.11                   | 4.00        | 267.94                    | 6845.21                               |
| 5               | 7.66           | 23.12             | 22.77               | 11.47   | 6321.82                 | 9.13            | 24.89              | 23.85                | 12.18    | 7574.34                  | 8.00                 | 7.33                   | 3.83        | 235.67                    | 7338.66                               |
| 6               | 7.95           | 23.49             | 21.86               | 11.33   | 6101.27                 | 8.22            | 26.82              | 24.67                | 12.87    | 8930.11                  | 8.55                 | 6.45                   | 3.75        | 220.78                    | 8709.33                               |
| 7               | 6.34           | 20.81             | 21.97               | 10.69   | 5121.66                 | 9.65            | 22.08              | 21.96                | 11.01    | 5587.66                  | 7.90                 | 6.43                   | 3.58        | 192.49                    | 5395.16                               |
| 8               | 6.5            | 22.57             | 20.78               | 10.83   | 5329.12                 | 9.11            | 24.11              | 23.63                | 11.93    | 7117.63                  | 8.13                 | 8.10                   | 4.05        | 279.66                    | 6837.96                               |
| 9               | 7.23           | 20.78             | 21.34               | 10.53   | 4888.25                 | 8.05            | 23.13              | 21.09                | 11.05    | 5656.45                  | 10.64                | 10.37                  | 5.25        | 606.68                    | 5049.76                               |
| 10              | 7.09           | 20.65             | 19.59               | 10.06   | 4262.47                 | 7.66            | 24.45              | 25.03                | 12.37    | 7924.60                  | 10.00                | 9.12                   | 4.78        | 457.24                    | 7467.35                               |
| 11              | 7.59           | 21.12             | 21.56               | 10.67   | 5085.82                 | 8.81            | 23.03              | 24.77                | 11.95    | 7144.50                  | 12.03                | 11.66                  | 5.92        | 869.72                    | 6274.77                               |
| 12              | 6.45           | 21.39             | 22.18               | 10.89   | 5410.67                 | 8.31            | 23.89              | 22.93                | 11.70    | 6714.02                  | 8.66                 | 8.00                   | 4.16        | 302.49                    | 6411.52                               |
| 13              | 8.03           | 22.16             | 19.55               | 10.42   | 4746.88                 | 8.45            | 21.66              | 24.55                | 11.55    | 6455.00                  | 9.63                 | 9.34                   | 4.74        | 446.57                    | 6008.43                               |
| 14              | 7.04           | 19.31             | 17.23               | 9.13    | 3191.49                 | 9.05            | 22.15              | 22.67                | 11.20    | 5889.84                  | 5.14                 | 4.89                   | 2.50        | 66.007                    | 5823.83                               |
| 15              | 7.27           | 25.09             | 26.23               | 12.83   | 8841.95                 | 9.41            | 25                 | 24.56                | 12.39    | 7963.10                  | 8.66                 | 10.29                  | 4.73        | 445.15                    | 7517.94                               |
| Cows average    | 7.21           | 22.26             | 21.87               | 11.03   | 5730.64                 | 8.59            | 24.13              | 23.94                | 12.02    | 7325.33                  | 8.52                 | 8.14                   | 4.17        | 336.37                    | 6988.96                               |
| Cows SD         | 0.57           | 1.72              | 2.15                | 0.90    | 1402.57                 | 0.63            | 1.63               | 1.27                 | 0.65     | 1175.11                  | 1.62                 | 1.77                   | 0.82        | 201.76                    | 1218.47                               |
| 16              | 6.56           | 24.31             | 23.96               | 12.06   | 7357.33                 | 9.51            | 21.9               | 24.56                | 11.61    | 6560.33                  | 10.01                | 9.45                   | 4.86        | 482.07                    | 6078.25                               |
| 17              | 6.81           | 23.03             | 21.05               | 11.02   | 5602.90                 | 8.99            | 25.03              | 25.43                | 12.61    | 8404.85                  | 9.03                 | 10.23                  | 4.81        | 467.36                    | 7937.48                               |
| 18              | 7.01           | 21.71             | 22.56               | 11.06   | 5675.66                 | 7.94            | 20.99              | 22.73                | 10.93    | 5466.74                  | 11.97                | 10.48                  | 5.61        | 740.18                    | 4726.56                               |
| 19              | 6.32           | 24.88             | 23.72               | 12.15   | 7509.26                 | 8.05            | 20.13              | 23.09                | 10.80    | 5281.32                  | 8.87                 | 6.89                   | 3.94        | 256.06                    | 5025.25                               |
| 20              | 6.83           | 23.17             | 24.56               | 11.93   | 7113.16                 | 9.42            | 22.18              | 23.00                | 11.29    | 6032.91                  | 6.83                 | 6.80                   | 3.40        | 165.64                    | 5867.26                               |
| Heifers average | 6.71           | 23.42             | 23.17               | 11.65   | 6651.67                 | 8.78            | 22.05              | 23.76                | 11.45    | 6349.23                  | 9.34                 | 8.77                   | 4.53        | 422.27                    | 5926.97                               |
| Heifers SD      | 0.27           | 1.23              | 1.39                | 0.56    | 935.27                  | 0.75            | 1.85               | 1.17                 | 0.72     | 1253.94                  | 1.87                 | 1.80                   | 0.86        | 223.69                    | 1257.25                               |
| Total average   | 7.08           | 22.55             | 22.19               | 11.18   | 5960.89                 | 8.63            | 23.60              | 23.89                | 11.87    | 7081.30                  | 8.72                 | 8.30                   | 4.25        | 357.84                    | 6723.45                               |
| Total SD        | 0.54           | 1.66              | 2.03                | 0.86    | 1342.04                 | 0.64            | 1.88               | 1.21                 | 0.69     | 1239.57                  | 1.67                 | 1.75                   | 0.82        | 204.90                    | 1284.26                               |

**Legend:** hCL P4 - level of progesterone obtained in the group of females with homogenous corpus luteum; h Long. axis - longitudinal axis of the homogenous corpus luteum; h Transv. axis - transverse axis of the homogenous corpus luteum; hR - radius of the transverse diameter of the homogenous corpus luteum; hCLV - volume of the homogenous corpus luteum; cvCL P4 - level of progesterone obtained in the group of females with cavitary corpus luteum; cv Long. axis - longitudinal axis of the cavitary corpus luteum; cv Transv. axis - transverse axis of the cavitary corpus luteum; cvR - radius of the transverse diameter of the cavitary corpus luteum; cvCLV - volume of the cavitary corpus luteum, including the cavity; cav. Long. axis - longitudinal axis of the cavity inside the corpus luteum; cav. Transv. axis - transverse axis of the cavity inside the corpus luteum; cav.R - radius of the corpus luteum cavity; cav.V - volume of the corpus luteum without the cavity; cvCLV without cav. - volume of the corpus luteum without the cavity; SD - standard deviation.

Mestizo breed (48.3%), followed by the Nellore heifers (41.1%), Caracu breed (40.6%), the lowest results being attained by the Angus breed (33.3 %). The cited study concluded that the corpus luteum type does not influence the pregnancy rate in bovine embryo recipients (14).

According to Ireland et al. (1980), the corpus luteum is classified into 4 stages within the oestrous cycle, based on the internal and external diameter, the vascularized surface and the presence of follicles with a diameter greater than 10 mm (8). Based on these data, Rizzo et al., (2016) obtained an average of progesterone of  $9.33 \pm 1.98$  ng/ml in cattle in the 3<sup>rd</sup> stage (11-17 days of the oestrous cycle, with a diameter of the luteal tissue of 1.6-2 cm) (17).

Although Rocha et al. (2019) conducted a study on 22 cows from the Nelore beef breed, they determined that both the transverse diameter of the corpus luteum and its volume do not correlate with the serum level of progesterone, so as happens in the case of the luteal tissue, between days 4 and 8 of the oestrous cycle (18).

Jaśkowski et al. (2021) obtained similar results to those achieved in this study, except that the working protocol consisted of monitoring gestation in recipient Holstein heifers that were inseminated on day 7 of the heat synchronization protocol with frozen embryos. At the same time, the volume of the luteal tissue of the heifers was greater than that of the homogeneous luteal bodies ( $7148.5 \pm 3457.1$  mm<sup>3</sup> vs.  $5873.7 \pm 2863.9$  mm<sup>3</sup>,  $P < 0.001$ ). However, after removing the volume of the luteal cavity, the two volumes were similar ( $5873.7 \pm 2863.9$  mm<sup>3</sup> vs.  $6219.4 \pm 3032.3$  mm<sup>3</sup>, for the group of heifers with homogeneous luteal tissue and those with cavity luteal tissue,  $P < 0.3$ ). In the case of the heifers from our groups, the situation was reversed ( $6651.67 \pm 935.27$  mm<sup>3</sup> vs.  $5926.97 \pm 1257.77$  mm<sup>3</sup>,  $p < 0.005$ ). The same authors reported a transverse diameter of the luteal cavity on the 14th day of pregnancy of  $10.2 \pm 4.36$  mm, significantly higher than that obtained in our group ( $8.77 \pm 1.80$  mm).

Jaśkowski et al. (2021) reported also a lower mean serum progesterone concentration in heifers with homogeneous luteal tissue ( $7.15 \pm 2.84$  ng/ml) compared to those with cavity luteal tissue ( $11.31 \pm 2.59$  ng/ml;  $P < 0.0001$ ). This ratio of values is also maintained in the present study, where the heifers from the cvCL group have a value of more than 2 ng/ml compared to those belonging to the hCL group ( $8.78 \pm 0.75$  ng/ml vs.  $6, 71 \pm 0.21$  ng/ml). Jaśkowski et al. (2021) concluded that the morphological evaluation by ultrasound examination of the luteal structures should be included in the assessment of the functional status of the luteal bodies in embryo-receiving heifers. The cited study clearly described the fact that the presence of luteal cavity structures does not disqualify a

heifer from being a recipient of embryos. Moreover, as a result of the higher concentration of progesterone in this case, it may indicate a greater probability of maintaining the pregnancy at the moment of maternal recognition of pregnancy (9).

In a recent study, Cunha et al. (2022) reported a mean progesterone level of  $3.6 \pm 0.3$  ng/ml, at a mean luteal volume of  $24.51 \pm 1.45$  mm, on the 13th day of the oestrous cycle, following the synchronization of cattle with hCG (3).

## CONCLUSIONS

Given the controversies surrounding the secretory potency of the corpus luteum, considering the type and structural variability of these specific ovarian structures, the present work advocates for the exegesis of the analysed implications. Therefore, this comparative study scrutinizes the humoral distinctions between the homogenous and cavity corpus luteum underlying assumptions of key claims of critical clinical significance. However, the obtained results are not plentiful in order to promote one of the previously formulated premises, but may constitute the starting point for other scientific work.

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