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COMPARATIVE STUDY OF ANATOMY AND HISTOLOGY ON THE OVARY AND OVIDUCT IN CAMEL (*Camelus dromedarius*) AND COW

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ABSTRACT

Ovaries and oviducts of 12 non pregnant female camels and 5 non pregnant Holstein cows from the industrial slaughter house of Mashhad were examined. Sections (6 µm) were stained with Hematoxylin and Eosin (H & E), Periodic Acid Shif (PAS), Alcian blue (Ab), Van gisson (Vg), Verhof (V) and Masson's trichorome (Mt). The ovary of camel is flattened, lobulated measuring 3.54± 0.98 cm in length (mean ± SEM), 2.58± 0.57 cm in width and 7.66± 0.69 cm in thickness. Cortex of the she camel's ovary has many follicles in various stages of development, ranges between 40 ± 7.7 µm and 7.6 mm. Primordial follicle of camel was significantly ($p<0.001$) bigger (40.5± 7.33µm) than the primordial follicle of cow (34.7± 8.4 µm).

Histological structure of oviduct in camel was similar to cow. The secretion of epithelial cell of the oviduct in the camel was neutral mucopolysaccharides but in cow it was acidic mucopolysaccharides. Isthmus of camel was significantly thicker (850.2±252 µm) than the isthmus of cow (717.2±352 µm).

Key words: Camel, cow, histology, ovary, oviduct

Anatomy and histology of ovary and oviduct is well studied in human and animals (Dellmant, 2006; Bacha and Wood, 1990; Sobotta, 1980). The reproductive system of camel is frequently studied by some researchess (Skidmore *et al,* 1998; Adams *et al,* 1990). Genital organs of female dromedary have been studied previously (Tibary, 2001; Tibary and Anouassi, 1997; Tibary *et al,* 2001). In this research comparative anatomy and histology of ovary and oviduct in camel and cow was studied.

Materials and Methods

In the present study, ovaries and oviducts of 12 non-pregnant female camels (*C. dromedarius*) and 5 non-pregnant Holstein cows were obtained from the industrial slaughter house of Mashhad. The length, width and thickness of the ovary and oviduct (Ampulla, Isthmus) were measured in both camels and cows. All the samples were flushed with normal saline, fixed in 10% formaldehyde, dehydrated, cleared and embedded in paraffin. Thereafter, sections were cut at 6 µm with a Lecia Rotary Microtome, mounted on a glass slide and stained with Hematoxylin and Eosin (H & E), Masson's trichrome (Mt), and Van gisson (Vg) for collagen fibres, Verhof (V) for elastic fibres, Alcian blue (Ab) and Periodic Acid Schiff (PAS) for histochemistry of mucous-substances (Lee and Luna, 1988 and Romeis, 1989). For statistical analyses, student's t test and Mann Whitney test were used to compare the diameter of each follicle and the diameter of ampulla and isthmus in both camel and cow.

Results

The gross anatomy of the ovary and oviduct of the camel is shown in Fig 1. The camel ovary is flattened, lobulated measuring 3.54 ± 0.98 cm in length, 2.58 ± 0.57 cm in width and 1.66 ± 0.69 cm in thickness. The ovary of cow is oval and lobulated measuring 3.45 ± 0.64 cm in length, 2.39 ± 0.49 cm in width and 1.99 ± 0.51 cm in thickness. The ovary is attached to the broad ligament by a well-defined strong ligament which extends from the hillus of ovary to the tip of the corresponding uterine horn. Both ovaries of camel are enclosed within a fold of the mesosalpinx known as the ovarian bursa, the apex of this bursa forms a large circular orifice within which lies the fimbriae of the oviduct. The ovary in both camel and cow is covered by a surface epithelium (germinal epithelium) which consists of simple columnar to cuboidal and underling the

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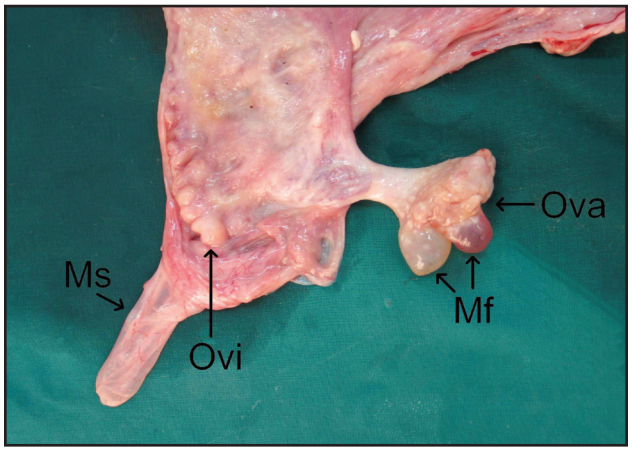

Fig 1. The gross anatomy of the ovary and oviduct of she camel. Ovary (Ova), Mature follicle (Mf), Oviduct (Ovi), Mesosalpinx (Ms).

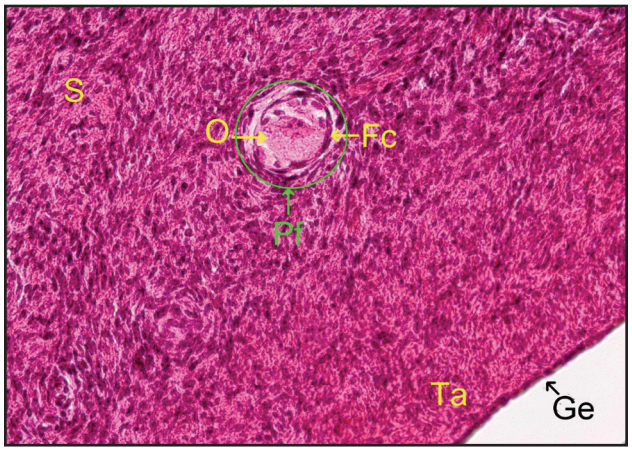

Fig 2. Histological structure of cross section in primordial follicle (Pf) of she camel, Stroma (S), Oocyte (O), Follicular cell (Fc), Tunica albuginea (Ta), Germinal epithelium (Ge), (H&E X 640).

surface epithelium is a capsule of dense collagenous fibres, (tunica albuginea).

The ovary in both species consisted of two distinct zones: cortex (outer layer) and medulla (inner layer), the cortex of ovary of she camel has many follicles in various stages of development (Primordial follicles, Primary f., Secondary f., Vesicular f. and mature f.) between 40 µm and 7.6 mm (Fig 2, 3, 4). Many veins and venules were observed around the corpus luteum in camel (Fig 5).

Histological structure of the follicles in various stages in camel was similar to that in cow but only the primordial follicle of camels was significantly ($p<0.001$) bigger (40.5 ± 7.33 µm) than the primordial follicle of cows (34.7 ± 8.4 µm) (Fig 4).

Interstitional endocrine cells were not observed in the ovary of camel and cow.

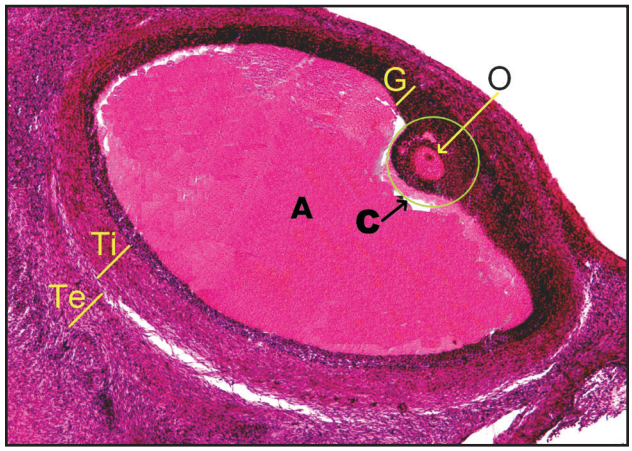

Fig 3. Histological structure of cross section of mature follicle of she camel, Oocyte (O), Granulose cell (G), Corona radiate (C), Antrum (A), Theca interna (Ti), Theca externa (Te), (H&E X 160).

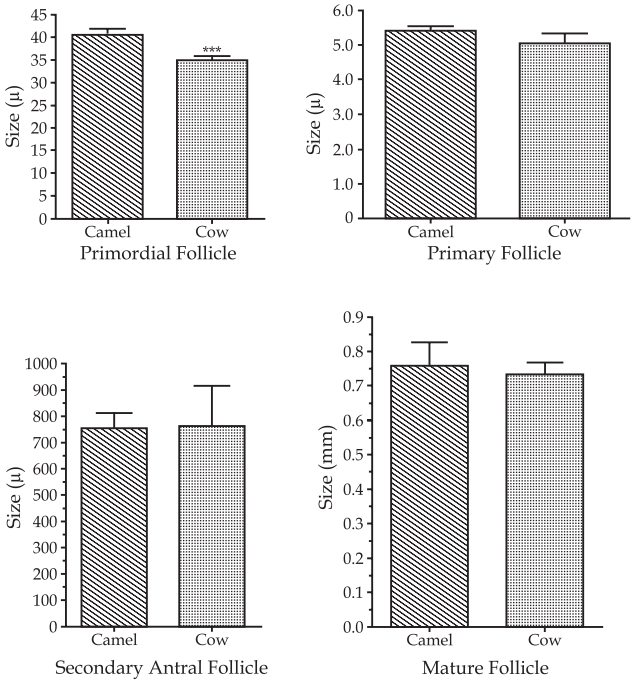

Fig 4. Average and mean diameter of follicular in camel and cow (*** significant; P<0.005)

The epithelial layer of the oviduct in camel and cow consisted of a single layer of ciliated and non-ciliated (peg cell) columnar cells. In histochemistry staining, the secretion of the oviduct in camel was neutral mucopolysaccharids but in cow it was acidic mucopolysaccharids (Fig 7).

In both the species the muscular layer in the isthmus was thicker than in the ampulla.

Discussion

The camel is a seasonally polyestrous induced ovulatory animal. Decreasing the length of daylight

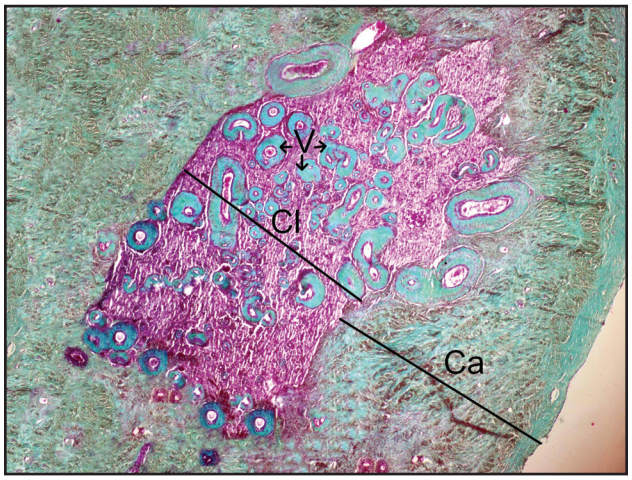

Fig 5. Histological structure of cross section in the corpus luteum in she camel, Vein (V), Corpus albicans (Ca), Corpus lutea (Cl), (Masson's trichrome (Mt) X 64).

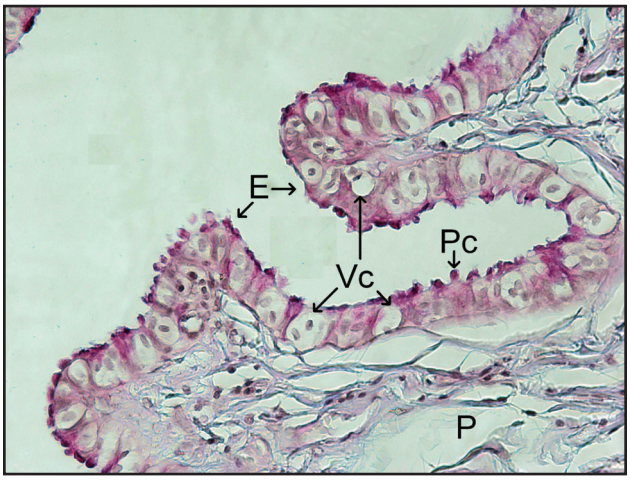

Fig 7. Histological structure of cross section in ampulla of she camel, Peg cell (Pc), Lamina propria (P), Vaculated cells (VC), Epithelium (E), (PAS and Ab, X 640).

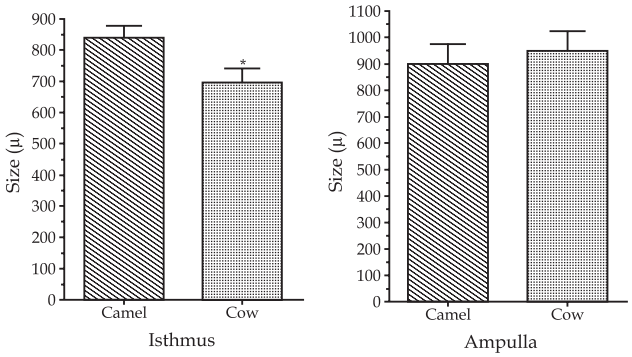

Fig 6. Average and mean diameter of ampulla and isthmus of both camel and cow (*Significant; p<0.001)

appears to be the stimulus for seasonality in camels (Sghiri and Driancourt, 1999; Skidmore *et al*, 1996). The oestrus cycle did not have a luteal phase. During a cycle of 28 days the ovarian activity was strictly follicular. Follicles maturated in 6 days, maintained their size for 13 days and regressed in 8 days. Ovulation was non-spontaneous and required the stimulus of coitus (Musa and Abusineina, 1978).

The camel is thus an induced ovulatory like the cat and the rabbit. Copulation apparently triggers the release of the gonadotrophins essential for ovulation to occur, approximately 36 hours later (Williamson and Payne, 1978)

The ovary in camel and cow consisted of two distinct zones: Cortex (outer layer) and medulla (inner layer), this structure is similar to that of dog and cat but in the mature mare, these areas become reversed (Dellman, 2006).

Shalash (1965) and Musa and Sineina (1976) who examined 787 and 416 reproductive tracts, respectively agree that there is more (12%) ovulation from the left than the right ovary (Shalash, 1965; Musa and Abusineine, 1976). The left ovary tend to be slightly larger than those of the right (1.24 as against 1.02 cm) (Shalash, 1965).

In the alpaca and llama ovaries are round to oval and globular in shape, with an irregular, firm texture on palpation (Sumar, 1983).

Ovarian size varies markedly depending on the structure present on the ovary but is approximately 1.5-2.5 cm × 1.2 cm × 1.0 cm in alpaca and llamas (Fowler and Bravo, 1998; Sumar and Adams, 1997).

Primordial follicles in the ovary of the camel were found to be distributed under the tunica albuginea and extend deeply for a short distance in the cortical tissue; this finding is similar to another research in alpaca and llama (Tibary, 2001; Tibary and Anouassi, 1997; Tibary *et al,* 2001). Multiocyte follicle was not observed in the ovary of camel and cow but this follicle was observed in the bitch and ewe (Bacha and Wood, 1990).

The corpora lutea of camel was 8.92 ± 0.54 mm in diameter (Srikandakumar *et al,* 2003). The central parts of corpus luteum in feline have several large veins and lipid droplets within the granulose lutein cells which appeared highly vacuolated (Sobotta, 1980).

Interstitial endocrine cells were not observed in the ovary of camel and cow but these cells were observed in rodent, bitch and queen (Dellman, 2006).

Micro and macroscopic study of the camel ovary showed that the shape, size and weight of ovary may differ from those of other species like the cow, ewe, sow and mare; the microscopic properties

of both then Graffian follicles and the corpora lutea show didnot clear differences (Abdo *et al,* 1968).

Histological observation of oviduct in camel and cow showed that the isthmus of camel was significantly ($p<0.05$) thicker (850 ± 252 µm) than the isthmus of cow (717.2 ± 352 µm) (Fig 6). The regional variation of epithelial cells of oviducts is associated with the cyclic changes in the epithelial cells in the cow and goat (Abe *et al,* 1993; Abe and Oikawa, 1993).

The topography of the oviduct provides a complex system of regulation which may influence not only the passage of gametes and embryos, but also the movement of fluid within the oviduct canal (Yaniz *et al,* 2006).

For the first time, uterine tube duplication, accessory uterine tubes and simultaneous occurrence of cystic changes in uterine tube, ovary and uterus were reported in dromedary camel (Nourani *et al,* 2005).

The present study has increased our understanding of the reproductive biology of the camel.

Acknowledgements

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