OVARIAN CYSTS IN DOMESTIC ANIMALS: A REVIEW

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ABSTRACT
A comprehensive review of more than 25 eminent scientists in the field of Animal Reproduction has been enlightened in relation to the normal cyclical activity of the ovary, nature and types of ovarian cysts and endocrine balance of reproductive functions in various domestic animals. Diagnosis and treatment protocol of ovarian cysts and its prevalence in various animal species with particular reference to bovine has been reviewed and discussed.

KEYWORDS: Ovarian cyst, veterinary, domestic animals, Peshawar

INTRODUCTION
On the global basis, 20 highest ranked animal diseases with impact on the poor comprise 3 syndromes, neonatal mortality, reproductive disorders and nutritional/micronutrient deficiencies. While the research opportunities identified fall into 3 major categories, epidemiology, economics and impact assessment (Perry et al., 2002).

The female reproductive tract consists of the ovaries, uterine tubes (oviducts), uterus, vagina and vulva. The ovaries are unique organs amongst the glands of internal secretion in that their primary function is to produce gametes and secretion of hormones, which are intimately related and directed towards successful reproduction (Jainudeen & Hafeez, 1987 and Hiller, 1990). The ovary is composed of medulla and cortex, surrounded by germinal epithelium. Medulla consists of irregularly arranged fibro-elastic connective tissue and extensive nervous and vascular systems while cortex contains ovarian follicles and or corpora lutea at various stages of development or regression. The connective tissue of the cortex contains fibroblasts, collagen and reticular fibres, blood vessels, lymphatic vessels, nerves and smooth muscle fibres (Hafeez, 1987).

At birth, a layer of follicular cells surrounds the primary oocytes in the ovary to form primordial follicles. At first these are scattered throughout the ovary, but during early neonatal life they become localized in the peripheral cortical zone, beneath the tunica albuginea and surrounding the vascular medulla (Hafeez, 1987). The shape and size of the ovary vary both with the species and the stage of the estrus cycle. In cattle and sheep the ovary is almond shaped, whereas in the horse it is bean shaped owing to the presence of a definite ovulation fossa (Hafeez, 1987). Several thousands of follicles are present in each ovary of the cow, but only one follicle ovulates per estrus cycle. The follicle collapses following ovulation, leaving a depressed area on the surface of the ovary, no hemorrhage occurs at this site, instead the cavity gradually fills with luteal cells (corpus luteum). The corpus luteum (CL) reaches maturity about 7 days after ovulation and functions for a further 8 or 9 days before it finally regresses. The CL changes color during the cycle, brick-red early in the cycle, golden yellow at mid cycle and yellowish-white at the end of cycle. Old CL appears on the surface of the ovaries as white scars, corpus albican.
Remnants of bovine corpus albicans persist during several successive cycles and bovine corpus luteum of estrus cycle begins to regress 14 to 15 days after estrus and its size may decrease by half within 36 hrs (Jainudeen and Hafeez, 1987). A delicate qualitative and quantitative interplay exists between the hypothalamus, pituitary, ovary and luteinizing hormone (LH), follicle stimulating hormone (FSH) and ovarian steroids essential for follicle maturation, ovulation, implantation and maintenance of gestation (Hafeez, 1987). Follicular growth, ovulation and luteal functions are regulated by the hypothalamic-pituitary ovarian axis. The graafian follicle secretes estrogens, particularly estradiol-17β. The rising levels of estradiol induce behavioral estrus and combined with declining levels of progesterone trigger the LH surge. If a mature follicle is present, this LH surge will cause ovulation about 24 hrs later. Luteal regression at the end of estrus cycle is caused by prostaglandin F2α (PGF2α) of uterine origin. The ability of exogenous PGF2α to induce luteolysis between the 5th and 15th days of the estrus cycle is used in estrus synchronization in the cow (Jainudeen and Hafeez, 1987).

The correct functioning of ovaries depends on a complex feedback mechanism involving the hypothalamic and anterior pituitary which ensures that development of egg bearing follicles proceed in an orderly manner. While the basic neuroendocrine mechanisms are similar in all mammals, each species has adapted the way in which the system is used to meet its specific requirements. For example, many species which inhabit areas of the Earth far from the Equator and hence are exposed to the stresses of cold and shortage of food during the winter have evolved a system where the pattern of reproductive activity is influenced considerably by day length (Lincoln and Short, 1980). This seasonal change in reproductive activity is mediated by recognition of the change in day length via the retina and pineal gland. A similar photoperiod mechanism also exists in those animals which, like human beings, show little seasonal change in reproductive activity but it does not totally dominate the intrinsic rhythm (Hiller, 1990).

In most species sexual behavior is regulated by the cyclical secretion of ovarian hormones, which ensure that mating occurs at the appropriate time when eggs are ovulated. Human beings are an exception to this rule, which is one of the reasons for their relatively low fecundability. While the development of internal fertilization and viviparity in mammals in much less wasteful than external reproduction as in birds and fish. In every species the number of oocytes present in the ovaries greatly exceeds the number ovulated and hence a rigorous system of selection operates throughout the ovarian cycle (Hiller, 1990). Since fertility is one of the key determinants in the life time performance of any animal because of the production target of a calf per cow each year, therefore postpartum ovarian function has received considerable attention in cattle (Agarwal et al., 2005). Several reviews are available on the postpartum endocrinology of cattle (Lamming, 1982, Malven, 1984), sheep (Novea, 1984) and buffalo (Jainudeen, 1984). The most endocrine event preceding the first postpartum ovulation is the appearance of a pulsatile pattern of luteinizing hormone (LH) in sheep and cattle. Also a small increase in progesterone secretion precedes the first postpartum estrus in cattle and sheep. Suckling or the act of milking apparently inhibits the release of LH-RH necessary for the restoration of the pulsatile pattern of LH release (Jainudeen and Hafeez, 1987). Cystic ovarian disease or “cystic ovaries” is common in dairy cattle and is rarely encountered in beef cattle or other species. The disease is a common endocrine abnormality in dairy cattle, particularly among high producing dairy cows. Most ovarian cysts probably develop prior to the first ovulation postpartum, since more ovarian cysts were detected in cows examined at 30 days postpartum than after breeding or after abnormal estrus behavior (Erb and White, 1981). Although some cows may exhibit intense mounting behavior (nymphomania), the majority fail to exhibit estrus (anestrus). One or both ovaries contain multiple cysts or one or more large cysts. These are either follicular or luteal cysts. Follicular cysts undergo cyclical changes, i.e. they alternately grow and regress but fail to ovulate. Luteal cysts contain a thin rim of luteal tissue, also fail to ovulate, but persist for a prolonged period (Jainudeen and Hafeez, 1987). Concentrations of plasma progesterone are lower with follicular cysts than luteal cysts, but concentrations of estradiol show no relationship to the type of cyst.
The levels of testosterone in affected cows are similar to those found during estrus cycle (Kesler and Garverick, 1982). Some cows with cystic ovaries may show masculine characteristics. The cystic fluid is high in progesterone and low in estrogen, but these hormonal characteristics bear no relationship to the behavioral patterns (nymphomania or anestrus) (Jainudeen and Hafeez, 1987).

It is not certain whether cystic ovaries in cattle result from a failure of the ovulatory mechanism, from adrenal cortex hyperfunction or from a disturbance in the hypothalamo-pituitary axis. In cattle, available evidence (Kesler and Garverick, 1982) indicates that it may be caused by a failure in the LH-release mechanism. This failure is not due to a deficiency or release of GnRH but more to an insensitivity of the hypothalamic-pituitary axis to elevated levels of estradiol. Since the incidence of cystic ovaries is higher in early postpartum cows, it is likely that in cystic ovarian disease, follicular development and subsequent estradiol synthesis occur at a time when the hypothalamic pituitary axis would not release an ovulatory surge of LH in response to estradiol. The development of cystic ovaries in cattle has been related to high milk production, seasonal changes, hereditary predisposition and pituitary dysfunction. The cause and effect relationship between milk production and cystic ovarian disease is not clear, but the high milk yield may be a response to hormonal changes in cows with ovarian cysts rather than the cause of the disease (Kesler and Garverick, 1982). A relationship exists between cystic ovarian disease and heredity as the incidence has steadily declined in several herds after culling bulls whose daughters had cystic ovarian disease (Kirk et al., 1982). Cystic ovaries are also frequently encountered in dairy cows fed higher levels of nutrients and during the winter.

Ovarian Cysts

Ovarian cysts are anovulatory fluid-filled structures >25mm in diameter that persist on ovaries for more than 10 days (Archibald and Thatcher, 1992). Ovarian cysts are classified as either follicular or luteal. Follicular cysts are thin-walled fluid-filled, ovarian structures >25mm in diameter. The follicular cysts typically do not have ovulation point and are lined by granulose cells (Alosta et al., 1998). Many cows exhibit more than one cystic structure on one or both ovaries. Early studies reported that cows with cysts exhibited intense and prolonged estrus behavior termed nymphomania (Kessler and Garverick, 1982) resulting from low progesterone due to the absence of functional corpus luteum and increased estradiol from the cystic follicle. Luteal cysts are thick-walled, fluid-filled structures >25mm in diameter that secrete normal to above normal amounts of progesterone. The luteal cysts also do not have an ovulation papilla and are lined with a connective tissue layer and the theca is luteinized (Alsta et al., 1998). Most luteal cysts probably form through luteinization of follicular cyst (Garverick, 1997) and can cause infertility if they persist and maintain systemic progesterone at concentrations that inhibit the LH surge and ovulation.

Diagnosis of Ovarian Cysts

Palpation per rectum of a large, fluid-filled structure is commonly used as a clinical indication of a follicular cyst. But unfortunately differentiation between follicular and luteal cysts via rectal palpation is difficult even for experienced practitioners (Farin et al., 1992). Accuracy of diagnosis increases when using transrectal ultrasonography, with correct identification of greater than 90% of luteal and nearly 75% of follicular cysts (Farin et al., 1990, 1992). Follicular and luteal cysts can also be classified on the basis of serum progesterone concentrations (Farin et al., 1990). Diagnosis of a cyst in conjunction with low serum progesterone is indicative of a follicular cyst, whereas a cyst in conjunction with high serum progesterone is indicative of a luteal cyst.

Treatment of Ovarian Cysts

Treatment for ovarian cysts depends on the nature of the cyst. Follicular cysts are most commonly treated by administration of synthetic GnRH analogs (Ijaz et al., 1987). HCG and GnRH are equally effective for the treatment of follicular cysts but GnRH being of lower molecular weight is less likely to stimulate antibody formation (Jainudeen and Hafeez, 1987). Manual rupture of cysts through rectal palpation is not recommended because of reduced efficacy compared with GnRH (Ijaz et al., 1987) and adverse side effects including adhesions around the ovary and adrenal may impair fertility (Archibald and Thatcher, 1992).
While some scientists have different opinion regarding the use of GnRH like; Treatment with GnRH induces luteinization rather than ovulation of the follicular cyst and ultimately results in formation of a luteal cyst (Garverick, 1997). Approximately 20% of untreated cows with follicular cysts recover spontaneously (Bierschwal et al., 1975). While some scientists are of the opinion that Prostaglandin F2α or its analogs are effective for regression of luteal cysts (Jainudeen and Hafeez, 1987 and Nanda et al., 1988). Progesterone injections may also restore ovarian cycles in cows with ovarian cysts (Jainudeen and Hafeez, 1987). Ovsynch, a protocol for synchronizing ovulation in lactating dairy cows, uses injections of both GnRH and PGF2α (Pursley et al., 1995, 1997) may be an effective treatment for ovarian cysts. Proper and timely diagnosis and judicious use of hormones such as progesterone, gonadotropins GnRH, PGF2α and non-hormonal agents have been advocated for the management of various reproductive disorders in cattle and buffaloes. A comprehensive approach should be made by involving the modern reproductive technologies for the proper diagnosis and amelioration of various reproductive problems encountered in cattle and buffaloes (Agarwal et al., 2005).

DISCUSSION

In a clinical study of buffaloes with histories of reproductive failure an incidence of 2.8 and 3.4% luteal and follicular cysts (Yousef, et al., 1991) and 24 and 10% in cows (Jeong, et al., 1996) were reported respectively. While in another clinical study an incidence of cystic ovaries, 2.8% in buffaloes (Samad and Qureshi, 2001) and 1.3% in cows (Nematullah, 2001) was reported respectively.

In abattoir survey of buffaloes, 2.7% cystic ovaries have also been reported (Razzaque, et al., 2004). In the abattoir survey of ewes, 11.76% follicular cysts were observed on the right ovary and 11.76% luteal cysts were found equally on both ovaries (Saberivand, and Haghighi, 2006). As a result of clinical study/investigation, out of total reproductive disorders, 39.5% was related to ovaries in buffaloes (Samad and Qureshi, 2001) and 79% in cows respectively (Jeong, et al., 1996).

It is clear from the study of the different scientists that ovarian involvement in the reproductive disorders is quite remarkable that may be due to its role in the endocrine balance of the system and is primarily being the main key to control the cyclical activity of the reproductive system. Therefore the animals suffering from such type of reproductive disorders could be treated and make them productive by adapting appropriate therapeutic measures/hormonal therapy.
REFERENCES


