

## Antioxidant Status and the Degree of Oxidative Stress in Dromedary (*Camelus dromedarius*) with or with Endometritis

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**Abstract:** Endometritis has been considered as an important factor in infertility. This study was conducted to assess antioxidant status, Reactive Oxygen Species (ROS) and reactive nitrogen species in healthy and camels with endometritis. The Total Antioxidant Status (TAS), lipid peroxidation in terms of Malondialdehyde (MDA) and antioxidant such as ascorbic acid, alpha tocoherol, in addition to copper and zinc compared between health and those with endometritis. A significant increase in MDA as well as a decrease TAS, AA, alpha tocopherol, Cu and Zn was observed in camels with endometritis compared to healthy. Free radical over production may be a contributing factor in reduction of antioxidant status and increase in the degree of lipid peroxidation. It could be suggested, that antioxidant may play a vita role in the management of infertility including endometritis.

**Key words:** Antioxidant, camel, oxidative stress, endometritis, MDA

### INTRODUCTION

The causes of infertility have been studied and being attributed to may factors such as managerial, bacterial (Al-Qarawi, 2005; Wernery, 1991; Shalash and Nawito, 1963). Endometritis is an important factor in infertility. Free radicals play an important role in endometritis and we have investigated their possible role and scavenging systems in endometritis in camels. The plasma concentration of Malondialdehyde (MDA) and erythrocyte Glutathione Peroxidase (GPx) activity was compared in healthy camels and in camels with endometritis.

During lipid peroxidation, MDA, a highly reactive dialdehyde, which is the end product of Poly Unstarurated Fatty Acid (PUFAs), can be generated. The level of MDA was significantly increased while GPx activity was decreased in the mares with endometritis. GPx is consumed by increased lipid peroxidation in purebred Arabian mares affected with endometritis (Yaralioglu-Guroze *et al.*, 2005). Parenteral administration of a single injection of vitamin E before parturition may decrease the incidence of metritis in dairy cows (Erskine *et al.*, 1997).

The cellular components of the human reproductive system are as vulnerable as other cells to the potential detrimental effects of Reactive Oxygen Species (ROS). Antioxidant protection is thus required (Taylor, 2001). Oxidative energy production is inevitably associated with the generation of Reactive Oxygen Species (ROS),

excessive concentrations of which can lead to cellular pathology. In recent study, has shown ROS to have signalling capabilities and there is emerging evidence that crucial reproductive processes may be influenced or mediated by ROS. There is thus considerable interest in the roles of antioxidants and ROS in infertility (Ford, 2001).

Therefore, it is crucial for the reproductive system to be well-guarded against oxidative injury, which may lead to infertility. Free radicals are highly reactive and oxidized lipids, amino acids and carbohydrates as well as causing DNA mutations. Reactive oxygen species therefore may have been implicated as an aetiological factor of a wide range of diseases. The objective of this investigation was to compare the antioxidant status and degree of oxidative stress in healthy and camels with endometritis.

### MATERIALS AND METHODS

In this investigation 35 female camels (*Camelus dromedarius*), of mean age (8-10) with endometritis and 25 health ones of age 7-11 were used. Endometritis was confirmed by using the diagnosis of ultrasonography and histopathology. Blood samples were collected form the jugular vein. Plasma TAS was measured using kit (Randox Laboratories Ltd, UK), by the incubation of 2,2'-azino-di-(3-ethyl-benzthiazoline sulphonate) with a peroxidase (metamyoglobin) and H<sub>2</sub>O<sub>2</sub> to produce the cation ABT<sup>+</sup>, which produces a relatively stable green colour, that can

be measured at wavelength of 600 nm. MDA plasma level was measured by using a colorimetric assay kits. A solution containing 2.55% (v v<sup>-1</sup>) (metaphosphoric acid; plasma: acid; 2:1) was added to the plasma and the mixture was frozen until thawed just prior the analysis. The storage period was less than 1 week. The plasma ascorbic acid was measured by HPLC using the method adopted by Lykkesfeldt *et al.* (2000). Plasma alpha tocopherol was measured using isocratic higher performance liquid chromatography with florescent detection (Miller *et al.*, 1984). The plasma copper and zinc were measured by the atomic absorption.

## RESULTS AND DISCUSSION

As shown in Table 1, the level of MDA increased in female camels subjected with endometritis ( $p < 0.05$ ) as compared with healthy ones. On the other hand, TAS showed a reduction in the levels, as well as in ascorbic acid and alpha tocopherol. Similarly, as shown in Table 2 a significant reduction ( $p < 0.05$ ) in both copper and zinc in camels infected with endometritis (Table 2).

Free radicals or reactive oxygen species have been reported as one of the major causes of many diseases, including infertility. Management as well as acquired infertility problems (heat factors, trauma, infection, neoplasia and hormonal imbalances) contributes to the bulk of infertility and *Trichomonas fetus* from the uterus of breeding camels (Tibary and Anouassi, 2001; Wernery, 1991).

Reactive Oxygen Species (ROS), are deleterious for cells, which protects themselves by antioxidant system known as ROS scavenger and its activity can increase by up-regulation of ROS themselves or by down-regulation of ROS scavengers (Sanocka and Kurpisz, 2004). Better understanding of the mechanisms of reactive oxygen species production and detoxification and further investigation of their effect on the peritoneal environment are essential to obtain new insight into this disease and eventually develop new diagnostic and therapeutic strategies (Van Langendonck *et al.*, 2002). The measurements of ROS may have clinical relevance in the evaluation of infertility.

In line with the data reported for the dromedary, Yaralioglu-Guroze *et al.* (2005) indicated an increase in MDA in mares infected with endometritis. GPx is also reduced due to its consumption to counteract free radical produced during the pathogenesis of endometritis in mares. The peroxidation of polyunsaturated acids (PUFAs) due to over production of oxidant, can give rise

Table 1: The Antioxidant and oxidative stress biomarkers in healthy camels (*Camelus dromedarius*) and in camels with endometritis

Biomarkers	Healthy	Endometritis
Malondialdehyde (MDA) ( $\mu\text{M L}^{-1}$ )	30.44 $\pm$ 2.89 <sup>a</sup>	36.24 $\pm$ 2.44 <sup>b</sup>
Total Antioxidant Status (TAS) ( $\text{mmol L}^{-1}$ )	0.201 $\pm$ 0.006 <sup>a</sup>	0.156 $\pm$ 0.004 <sup>b</sup>
Ascorbic acid (AA) ( $\text{mg L}^{-1}$ )	3.48 $\pm$ 0.01 <sup>a</sup>	2.64 $\pm$ 0.03 <sup>b</sup>
Alpha tocopherol ( $\text{mg L}^{-1}$ )	2.06 $\pm$ 0.02 <sup>a</sup>	1.64 $\pm$ 0.04 <sup>b</sup>

Values are expressed as means $\pm$ Sd, <sup>a,b</sup>Means on the same raw having different superscripts are significantly different at  $p < 0.05$

Table 2: The plasma levels of copper and zinc in healthy camels (*Camelus dromedarius*) and in camels with endometritis

Biomarkers	Healthy	Endometritis
Cu ( $\mu\text{g 100 mL}^{-1}$ )	56.62 $\pm$ 2.8 <sup>a</sup>	51.67 $\pm$ 1.9 <sup>b</sup>
Zn ( $\mu\text{g 100 mL}^{-1}$ )	49.68 $\pm$ 1.8 <sup>a</sup>	43.06 $\pm$ 3.8 <sup>b</sup>

Values are expressed as means $\pm$ Sd, <sup>a,b</sup>Means on the same raw having different superscripts are significantly different at  $p < 0.05$

to cellular dysfunction associated with the loss of membrane function and integrity. It has been implicated in a wide variety of pathological conditions including infertility. The outcome of this investigation is that free radicals play a vital role in the pathogenesis of endometritis in the camels.

## CONCLUSION

The intriguing possibility that ROS may adopt several of these roles to modulate events in human reproduction warrants further investigation. Although the clinical use of exogenous antioxidants has yielded mixed results to date, increased knowledge of the mechanisms whereby both ROS and endogenous antioxidant systems influence reproductive processes will assist to unlock the undoubted potential of antioxidants in fertility treatment.

## REFERENCES

- AL-Qarawi, A.A., 2005. Infertility in the dromedary bull: a review of causes, relations and implications. *Anim. Reprod. Sci.*, 87: 73-92.
- Erskine, R.J., P.C. Bartlet, T. Herdt and P. Gaston, 1997. Effects of parenteral administration of vitamin E on health of periparturient dairy cows. *J. Am. Vet. Med. Assoc.*, 211: 466-9.
- Ford, W.C.L., 2001. Reactive oxygen species and sperm. *Hum. Fert.*, 4: 77.
- Sanocka, D. and M. Kurpisz, 2004. Reactive oxygen species and sperm cells. *Reprod. Biol. Endocrinol.*, 2: 12.
- Shalash, M.R. and M. Nawito, 1963. Some aspects of sterility in the female camel. *Deutsche Tierärztliche Wochenschrift*, [Article in German]. 70: 522-524.

- Taylor, C.T., 2001. Antioxidants and reactive oxygen species in human fertility. *Environ. Toxicol. Pharmacol.*, 10: 189-198.
- Tibary, A. and A. Anouassi, 2001. Retrospective study on an unusual form of ovario-bursal pathology in the camel (*Camelus dromedarius*). *Theriogenol.*, 56: 415-424.
- Van Langendonck, A., F. Casanas-Rouax and J. Donnez, 2002. Oxidative stress and peritoneal endometriosis. *Fertility Sterility*, 77: 861-870.
- Wernery, U., 1991. The bacterian camel with endometritis--isolation of *Trichomonas fetus* and different bacteria. *Zentralbl Veterinarmed. B*, 38: 523-528.
- Yaralioglu-Guroze, S., H. Cetin, O. Cen, S. Yilmaz and M.O. Atli, 2005. Changes in malondialdehyde concentrations and glutathione peroxidase activity in purebred Arabian mares with endometritis. *Vet. J.*, 170: 135-137.