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Significance of Seminal Fructose Level in Spermatogenic Activity After Progesterone Treatment

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Abstract: ***Fructose is the main source of energy for the sperm motility. The degree of fructose utilization is directly proportional to the sperm motility. It could be the cause of negative correlation between sperm motility and semen fructose level. Fructose is a source of energy for the sperm motility. A parallel set of squirrels (Funambulus pennanti) treated with high and low doses of depot medroxy progesterone acetate (Depo provera), a synthetic progesterone for short and long term duration indicated that the spermatogenic activity in the seminiferous tubules was inversely related with the concentrations of seminal fructose. Thus the seminiferous tubules showing total arrest of spermatogenesis and atrophy of Leydig cells- anazoospermic condition, a significant increase in fructose values were observed, slight increase in the fructose values were registered in the oligozoospermic condition whereas a significant decrease in the fructose values were recorded in the partial arrest of spermatogenic activity. The results were supported by the cauda epididymal sperm count, histological changes in the Leydig cells histopathological changes in seminiferous tubules.***

Keywords: Depo Provera, Fructose, Spermatogenesis, Seminal Plasma

I. INTRODUCTION

In the routine of semen analysis, determination of fructose concentration in the seminal plasma has been recommended as a marker of the secretory activity of the seminal vesicles. Fructose is synthesized by these accessory sex organ under the influence of testosterone and supply as a source of energy the sperm metabolism and motility. Many earlier studies have shown that androgenic deficiency causes abnormal sperm formation and irregular motility development. It is also pointed out that low levels of testosterone may alter the secretory activity of the seminal vesicles affecting the synthesis of fructose.

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These correlations supported the hypothesis that determination of fructose concentration in the seminal plasma can provide information concerning androgen function. The present study of seeks to analyse precisely the relationship between seminal fructose levels and the spermatogenic activity after progesterone treatment. It is an attempt in course of a series of experiments on progesterone (Depo Provera).

II. MATERIALS AND METHODS

A. Animals:

Adult male squirrels weighting between 100 to 150 grams were collected during the breeding period from January to July 2010. After a week of acclimatization to laboratory conditions DMPA (Upjohn, USA) dissolved in olive oil was administered intramuscularly. The other control animals received same amount of olive oil.

B. Fructose estimation:

Animals were sacrificed using chloroform 24 hours after the last day of each experiment. Immediately, the seminal vesicles were exercised.

Dry weight of seminal vesicles were taken before proceeding for the bio-chemical analysis so that estimated value for fructose can be calculated/ gram dry weight of the reproductive tissue.

The homogenate was prepared in 2ml of saline. The tissue was ground with mortar and pestle. Clear supernant obtained after centrifugation at 3000 r.p.m. was used for the estimation. Quantitative estimations of fructose by resorcinol (Sheth and Rao, 1973) were carried out.

C. Histological studies:

For histology, the testis were fixed in Bouin's solution, dehydrated in ethanol and embedded in paraffin wax. The sections cut at 5u were stained with haematoxylin and eosin.

D. Statistical analysis:

Data were expressed is mean SEM. Students **'t'** test were employed for statistical comparison. $P<0.05$ and $P<0.01$ were considered significant

Table 1: Spermatogenic activity against Treatment.

Sr No	Group	Spermatogenic activity	Treatments	Mean seminal fructose
1	Azoospermic	Arrest in all tubules due to necrosis, disintegration and depopulation of germinal epithelium or arrest at pachytene stage of primary spermatocyte. Aplasia, fibrosis, sloughing off of gonial elements into lumen	1mg DMPA daily 30 days 1mg DMPA daily 60 days 5mg DMPA daily 15 days 5mg DMPA weekly 60 days	(6.4+0.06)** (6.15+0.18)* (6.134+0.41)* (5.72+0.15)**
2	Oligozoospermic	Some tubules showed spermatogenesis while others showed arrest at pachytene stage of primary spermatocyte, or at spermatogial stage, sometimes formation and then disintegration of large hypertrophied swollen gonial cells into multinucleate symplasmic masses.	5mg DMPA once 15 days 5mg DMPA once 30 days	(3.98+0.06) ** (3.35+0.05) *
3	Oligozoospermic	Partial depletion of germinal epithelium, arrest at round and long spermatid stage.	1mg DMPA daily 15 days 1mg DMPA once 15 days	(2.08+0.53) (3.01+0.03) **
4	Normospermic	Partial arrest of spermatogenesis in few tubules.	1mg DMPA once 30 days	(4.5+0.06)
5	Control	Complete process of spermatogenesis. The germinal epithelium 6-8 layers showing all stages of spermatogenesis.	Equal volume of olive oil	(5.13+0.08)

III. DISCUSSION

There are many possibilities and different views for the increase or decrease of fructose level in the seminal plasma. Thus according to Davies and Mccune, (1950) and phadke, et.al (1973), the fructose content is found to vary inversely with the spermatogenic activity and hence the sperm count. For example low values for fructose in oligospermic condition (seminiferous tubules sshowing partial arrest of spermatogenesis), whereas, slight increase in sever oligospermic condition and significant increase in azoospermic condition due to total arrest of spermatogenesis resulted by aplasia of germinal epithelium, formation of large vacuoles, severe reduction in the size and contour of tubules, high regression of Leydig and Sertoli cells, obliteration of lumen and apoptosis of germinal epithelium.

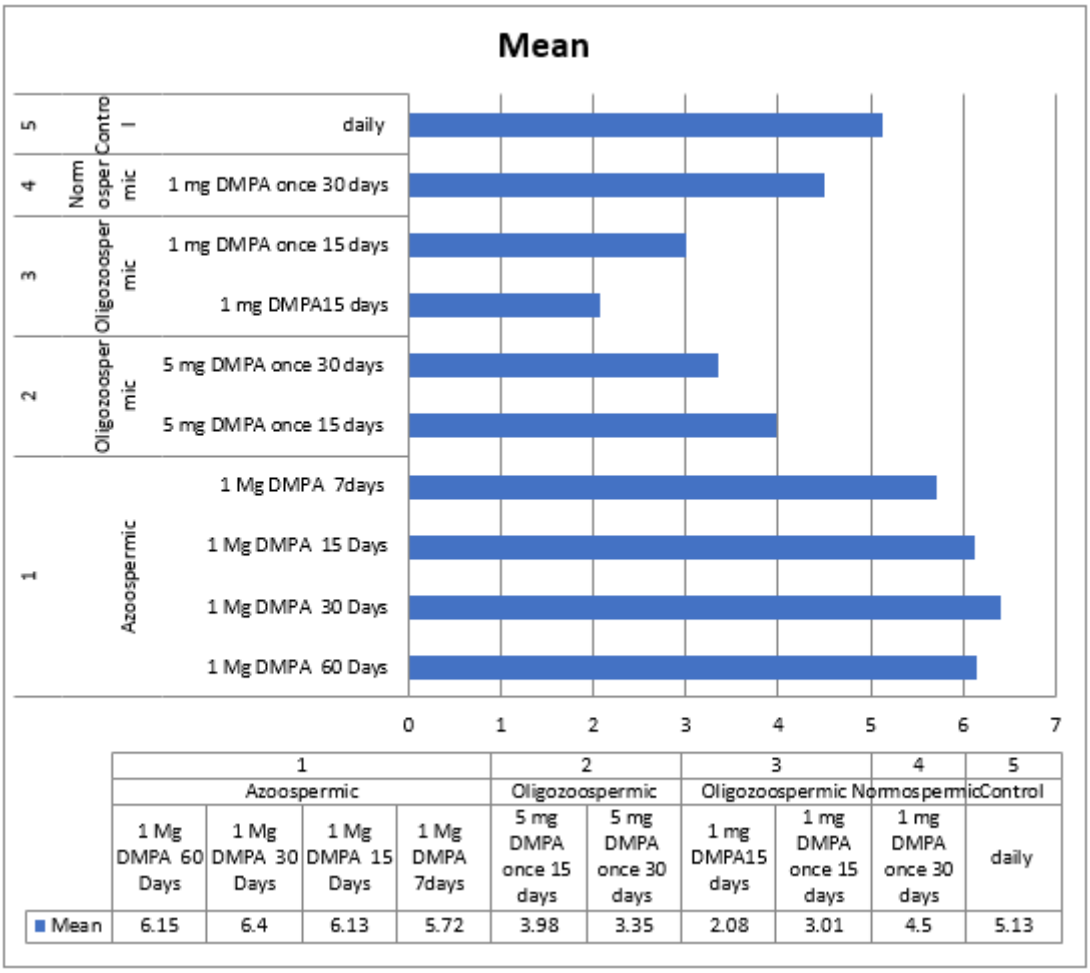
Thus the low value of fructose in oligospermic condition could result from the “utilization” of fructose by spermatozoa. The progressively higher values in case of severe oligospermia (oligozoospermia) and azoospermia may be due to “non-utilization” of fructose by the progressively declining number of spermatozoa.

The level of fructose depends upon endogeneous testosterone activity. And in the present work this is supported by the activity of Leydig cells and also by the measurement of testosterone by Elisa (Gupta, 2002). Thus indicating that the chief function of seminal fructose is not to provide the spermatozoa with a suitable substrate for their metabolic activity but fructose essentially be looked upon as an index of Leydig cell function. The effect of the progestogens on the testis induces structural disturbances and also on the accessory glands resulting into secretory capacities of the seminal vesicles (Ericsson and Dutt, 1965, Flickinger, 1977).

In our maintenance dose (Img DMPA once 30 days) fructose level were observed near to control values suggesting the control range of testosterone, normal appearance of spermatogenic activity, Leydig cells normospermic condition of sperms, their morphology, retention of normal size, histologic cytoarchitecture and to some extent secretory activity of the seminal vesicle (Gupta 2002) could maintain the spermatogenesis and control range of fructose needed for the metabolic activity of the sperms.

IV. CONCLUSIONS

In conclusions results derived from the study indicates that seminal fructose level has no role for formation of defective spermatozoa but plays a very important role in sperm motility, sperm chromatin stability and spermatogenesis. The decrease in seminal fructose level may produce infertility.



	1				2		3		4	5
	Azoospermic				Oligozoospermic		Oligozoospermic		Normospermic	Control
	1 Mg DMPA 60 Days	1 Mg DMPA 30 Days	1 Mg DMPA 15 Days	1 Mg DMPA 7days	5 mg DMPA once 15 days	5 mg DMPA once 30 days	1 mg DMPA15 days	1 mg DMPA once 15 days	1 mg DMPA once 30 days	daily
Mean	6.15	6.4	6.13	5.72	3.98	3.35	2.08	3.01	4.5	5.13

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