

SIALIC ACID IN HUMAN SEMEN

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Summary: Sialic acid of seminal fluid of eighty two human subjects has been studied in relation to infertility. Normozoospermic group had highest sialic acid content (94 *mgm/100 ml* of the fluid) and was significantly different from other groups. The lowest sialic acid level was observed in necrozoospermic group (54 *mgm/100 ml* of the fluid). Azoospermic (62 *mgm/100 ml*) and vasectomised group (73 *mgm/100 ml*) had 33 and 22 percent less sialic acid level respectively than normozoospermic group. For the pooled observation sialic acid was found to be correlated ($r=0.282$, significant at 5 percent level) with the total sperm count.

Key words: sialic acid sperm concentration sperm motility vasectomy

INTRODUCTION

Sialic acid is the group of a family of compounds, containing acetyl and glycolyl derivatives of neuraminic acid. Sialic acid is an important moiety of follicle stimulating and leutinizing hormone. Leutinizing hormone is a glycoprotein and consists of about 3.5% sialic acid, whereas about 5.1% sialic acid is present in human follicle stimulating hormone (3). Sialic acids are found in seminal plasma, saliva, cervical mucous and in most glycoproteins. In recent years, the occurrence and possible functions of sialic acid in mammalian tissues and fluids have received much interest.

Warren (7) found that the seminal vesicular and prostatic fluid contain 231.9 and 60.6 *mgm* of sialic acid per 100 *ml* of fluid and thus calculated the approximate contribution of prostate to be about two third to attain a concentration of 124 *mgm* of sialic acid per 100 *ml* of semen. Contribution of sialic acid from testes, epididymis and vas deferens are probably negligible. Elliason (1) found the sialic acid content of seminal vesicular secretion to be 133 *mgm/100 ml* of fluid and 62 to 108 *mgm/100 ml* of the ejaculate.

The physiological significance of sialic acid in human seminal fluid at different states of fertility is yet to be ascertained. The present study has been designed to determine the sialic acid content of human seminal fluid at different states of fertility, having wide

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variation in total sperm count and sperm motility. The interrelationship among sialic acid concentration and different physical parameters in semen have also been observed.

MATERIALS AND METHODS

After seven days of coital abstinence, masturbated specimen of seminal fluids were collected from eighty two male partners of the couples attending the infertility clinic and vasectomy camp of the S.S.K.M. Hospital, Calcutta. The sample was allowed to liquify for 20 min. and divided into two parts. One part was used to measure the physical parameters. The motility of sperm cells were determined by the method of Tjioe and Oentoeng (6) and the total sperm count was estimated by the method of Weisman (See in Frankel *et al.* -2). The other portion of the fluid was centrifuged at 3000 xg in a refrigerated centrifuge to settle spermatozoa down. Sialic acid of the seminal plasma was determined by the thiobarbituric acid method of Warren (8).

Based on the Physical parameters, the seminal fluid was grouped (4) as follows:

1.	Normozoospermic	No. of spermatozoa	>40 million/ml
		Motility	>60%
		Morphology	>80% normal
2.	Asthenozoospermic	No. of spermatozoa	>40 million/ml
		Motility	<60%
3.	Oligozoospermic	No. of spermatozoa	≤40 million/ml
		Motility	>60%
4.	Oligoasthenozoospermic	No. of spermatozoa	<40 million/ml
		Motility	<60%
5.	Necrozoospermic	Seminal fluid having sperm in any number but all of them dead.	
6.	Azoospermic	Semen devoid of spermatozoa.	
7.	Vasectomized	Seminal fluid after the vas deferens had been bilaterally ligated.	

RESULTS AND DISCUSSION

The physical parameters and sialic acid content of human seminal fluid of different groups are given in Table I. Sialic acid content of normozoospermic group was highest, i.e., 94 mgm/100 ml of the fluid, and the lowest conc., i.e., 54 mgm/100 ml has been observed

TABLE I: Physical parameters and sialic acid concentration of semen in fertile, sub-fertile and infertile groups.

Parameters groups (N)	Volume/ ejaculate (ml)	Count (million/ml)	Motility (%)	Active motility (%)	No or motile sperm (million/ml)	Sialic acid (mgm/100 ml),
Normozoospermic (19)	2.8 ±0.4	149 ± 17.9	71 ± 2	58 ± 2	106 ± 12.7	94 ± 6.5
Asthenozoospermic (9)	3.2 ±0.4	98 ± 27.0	36 ± 4	22 ± 4	41 ±15.6	69 ± 7.9
Oligozoospermic (9)	1.6 ±0.2	26 ± 3.0	65 ± 3	52 ± 4	17 ± 2.6	73 ± 9.2
Oligoasthenozoospermic	2.3 ±0.5	19 ± 4.5	29 ± 5	19 ± 6	8 ± 2.3	64 ± 2.8
Necrozoospermic (9)	4.2 ±0.8	43 ± 11.3	—	—	—	54 ± 6.2
Azoospermic (11)	2.0 ±0.3	—	—	—	—	62 6.2
Vasectomised (15)	2.9 ±0.2	—	—	—	—	73 ± 7.4

Figures in parenthesis indicate the number of observation.
Values are Mean ± SE.

in case of necrozoospermic group. The asthenozoospermic and oligozoospermic groups had approximately 27 and 22% less sialic acid level respectively than that of normozoospermic group. Whereas the level in case of oligoasthenozoospermic and azoospermic, and necrozoospermic group had 33 and 44% less respectively than normozoospermic group. These differences were found statistically significant ($P < 0.01$) in case of oligoasthenozoospermic and azoospermic groups and ($P < 0.05$) in case of necrozoospermic group. These findings probably suggest that there is a likelihood of an association of viability of sperm to the optimum availability of sialic acid in the seminal fluid. However, the magnitude of variation of sialic acid content among subfertile and infertile groups were found insignificant. The present values of sialic acid in all fertile and subfertile groups are somewhat less than the values reported by Warren (7).

It has been mentioned that sialic acid is an important moiety of gonadotrophin (3). The gonadotrophin has been found to be responsible for the maintenance of spermatogenesis and to regulate the testicular function (5). As follicle stimulating and leutinizing hormones contain sialic acid, there may be a possible relationship between gonadotrophin

level and seminal sialic acid as reflected from the sialic acid level in seminal fluid in case of different fertile and infertile groups. — However, this needs to be further substantiated by simultaneous measurement of seminal gonadotrophin level and contribution of sialic acid from different glandular secretions in the ejaculate since it was noted by Eliasson (1) that there are large variation in sialic acid level in seminal vesicular and prostatic secretion in man.

In order to assess the possible relationship between sialic acid content and other physical parameters, the correlation coefficients were computed for the pooled data of the four groups (normo, astheno, oligo and oligoasthenozoospermic group) using linear least square method. The total sperm count and the sialic acid was found to be correlated ($r=0.282$) which is significant as 5 percent level.

The corresponding regression equation is given below:

$$\text{Sialic Acid} = 0.08 \times \text{Total count (million/ml)} + 64.0$$

(mgm/100 ml).

Motility, active motility, and number of motile cells failed to show any significant correlation with sialic acid in pooled data.

The sialic acid content of seminal fluid in vasectomized group (73 mgm per 100 ml) was 22% less than normozoospermic group. The difference was statistically significant ($P<0.05$). As the proven fertile persons were vasectomized, the relatively low value of sialic acid in the seminal fluid of vasectomized group may possibly be due to the alteration of testicular function or epididymal secretions. Since the secretions of testes, epididymis and vas deferens add little to the total volume of ejaculate (4), the relative contribution of sialic acid from those organs on the total sialic acid level of the seminal fluid of vasectomized individuals need to be carefully evaluated.

REFERENCES

1. Eliasson, R. Origin of neuraminic acid in human seminal fluid. *Nature* **203** : 980, 1964.
2. Frankel, S., S. Reitman and A.C. Sonnenwirth. *Gradwohl's Clinical Laboratory Methods and Diagnosis Vol. 2* : (The C.V. Mosby Company), 1970.
3. Moudgal, N.R. *Gonadotrophins and Gonadal Function* (New York: Academic Press), 1974.
4. Nag, A. and N. Chaudhuri. Electrolyte content of human seminal fluid at different states of fertility. *Ind. J. Exp. Biol.*, **16** : 754-756, 1978.
5. Steinberger, E., A. Steinberger and M. Ficher. In "Recent Progress in Hormone Research". Ed. E.B. Astwood Vol. **26** : New York: Academic Press, 1970.
6. Tjoe, D. Y. and S. Oentoeng. The viscosity of human semen and the percentage of motile spermatozoa. *Fertil. Steril.*, **19**: 562-565, 1968.
7. Warren, L. Sialic acid in human semen and in the male genital tract. *J. Clin. Invest.*, **38** : 755-761, 1959.
8. Warren, L. Thiobarbituric acid assay of sialic acid. *J. Biol. Chem.*, **234** : 1971-1975, 1959.