

# ANDROGENICITY IN VITAMINS

A. SHARAF & N. GOMAA

*Pharmacology Research Unit, National Research Center (U.A.R.)*

## ABSTRACT

On studying androgenicity of vitamins the following results were obtained:

Vitamins E and A possess androgenic property and act synergistically with testosterone on increasing the seminal vesicle weight of castrated male rats. Vitamin B<sub>12</sub> also exhibit androgenic activity but has no effect on the action of testosterone. On the other hand vitamin C though possesses no androgenic properties yet it acts synergistically with testosterone. As regards vitamin B<sub>6</sub>, it has neither androgenic property nor synergistic action with testosterone.

The greatly increased employment of hormones in therapy attracted the investigators to search for more available sources other than the previously used hormones which are obtained from animal sources.

A surprising discovery was that vitamins possess some hormone-like properties. This finding raised the possibility of using such vitamins which are important for maintaining normal life, instead of the more expensive animal or synthetic hormones, as they can be obtained from food plants and with much less price. Since that time, many vitamins had been shown to exhibit some hormone-like effects in various degrees of potency. Also the possibility that vitamins may influence the action of hormones, which are the main internal secretions controlling body function e.g. metabolism, growth, reproduction and other vital processes which are all under the influence of endocrine secretions; suggested a study of the relationship between vitamins and hormones.

It is, therefore, proposed to undertake an investigation in order to examine various vitamins from a hormonal point of view and their possible inter-relationship to gonadal hormones.

In this present study, the androgenic effect of some vitamins and their relation to testosterone has been studied on the seminal vesicles of castrated rats.

Vitamins investigated in this present study are: B<sub>12</sub>, E, A, B<sub>6</sub>, and C.

## EXPERIMENTAL AND RESULTS

Androgenicity of vitamins was studied in this work, on the seminal vesicle of castrated rats. Injection was made daily for 10 days. In this respect, vitamins B<sub>12</sub>, E and A were proved to possess this property, while

vitamin C and B<sub>6</sub> does not exhibit any androgenic activities.

The relative androgenic activity as tested on the seminal vesicle is compared in Table I.

Table I

Vitamins used	Daily dose mg.	Seminal vesicle wt.		Ratio between cont. and treated
		Control g.	Treated g.	
B <sub>12</sub>	10	0.086	±0.0134 0.117	1 : 1.4
	20	0.086	±0.0073 0.112	1 : 1.42
	30	0.086 ±0.0046	±0.0083 0.124	1 : 1.44
E	30	0.088	±0.0074 0.113	1 : 1.28
	50	0.088	±0.0213 0.124	1 : 1.41
	100	0.088 ±0.0102	±0.0151 0.144	1 : 1.64
A	3000 I.U.	0.035	±0.023 0.164	1 : 4.69
	6000 I.U.	0.035 ±0.0057	±0.0062 0.186	1 : 5.31
C	40	0.144 ±0.0152	0.145 ±0.0139	1 : 1.01
	60	0.144	0.146 0.0072	1 : 1.013
B <sub>6</sub>	10	0.118	±0.0109 0.116	1 : 0.98
	20	0.118	±0.0130 0.117	1 : 0.99
	30	0.118 ±0.0424	0.119 0.00566	1 : 1.01

It is clear from the above Table that vitamin B<sub>12</sub>, E and A produced a significant increase in the seminal vesicle weight of castrated male rats while vitamin C and B<sub>6</sub> has no effect on that organ.

Moreover the relation between these vitamins and testosterone was also studied on the seminal vesicle weight of castrated male rats. Injection was daily for 10 days. The result is recorded in Table II.

Table II

Vitamin used	Daily dose of the vitamin	Seminal vesicle weight	
		lmg. testosterone alone	lmg. testost. + vitamin used
C	40 mg.	0.897	0.941±0.0074
	60 mg.	±0.0458	1.223±0.1658
	80 mg.		1.415±0.2328
B <sub>6</sub>	20 mg.	0.183	0.186±0.0136
	30 mg.	±0.025	0.186±0.0233
B <sub>12</sub>	10 mcg.	1.105	1.118±0.0185
	20 mcg.	±0.103	1.120±0.003
	30 mcg.		1.143±0.0519
E	30 mg.	1.055	1.460±0.1863
	50 mg.	±0.2269	1.486±0.0539
	100 mg.		1.615±0.159
A	3000 I.U.	1.251	1.721±0.0995
	6000 I.U.	±0.00831	1.745±0.0346

The above Table indicates that vitamin C, E and A produce significant increase in the action of testosterone when they were given together, while vitamin B<sub>6</sub> and B<sub>12</sub> has no effect on the action of testosterone.

#### DISCUSSION

In rats, treated with vitamin B<sub>12</sub>, the mean seminal vesicle weight was 0.124 g. in comparison with 0.086 g. for the control group. This finding in male rats confirms that of Gassner et al. (1950) on cockerels. Our results, moreover, showed that there is a slight but not significant synergism between vitamin B<sub>12</sub> and testosterone. However, it was proved by Sta-Mrad (1955) that injection of vitamin B<sub>12</sub> to impotent patients recovered sexual activity.

Also Krzanowska (1956) showed that the capability of spermatozoa to fertilization was improved in roosters injected weekly with vitamin B<sub>12</sub>.

On examining vitamin E, androgenic effects as manifested by a significant increase in development of seminal vesicle was noticed. When 30, 50 or 100 mg. of vitamin E were injected daily into castrated male rats for ten days a gradual increase in the seminal vesicle weight was produced; 0.114, 0.124 & 0.144g. respectively as compared with 0.086 g. for the control. The

ratio between the control and injected group was 1 : 1.33, 1 : 1.44 and 1 : 1.7, respectively.

Androgenic activity of vitamin E as demonstrated in this study confirms the findings of other various investigators e.g. Kudryaschov (1930), Mason (1933), Adamstone & Card (1934), Zagami (1933), Escudero et al. (1942) and Arata et al. (1962) as they proved that vitamin E deficiency produced testicular atrophy and changes in the seminal vesicles and prostate, in different animals, which are test objects for the male hormone testosterone.

In addition to the androgenic properties of vitamin E, it was also shown that this vitamin increases the action of testosterone when they were given together. The average seminal vesicle weights of groups treated with 1 mg. of testosterone and 30, 50 or 100 mg. of vitamin E are 1.460, 1.486 and  $\pm 0.159$  as compared with  $\pm \frac{0.2269}{1.055}$  of the control group receiving testosterone alone. The ratio between the control and the treated groups was 1 : 1.38, 1 : 1.47 and 1 : 1.53 respectively. This finding is in accordance with that of Adamstone (1941) who claimed that vitamin E reinforces the action of testosterone and also Caridroit (1942) who showed that vitamin E reduces the minimum effective dose of the male hormone.

In case of vitamin A, results obtained are also very interesting since they demonstrated that this vitamin is of a high significant androgenic effect. The average seminal vesicle weight of rats receiving 3000 or 6000 I.U. of vitamin A were 0.169 and 0.186 g. while that of the control was 0.035 g. The ratio between the control and treated group was 1 : 4.83 and 1 : 5.31. The deficiency symptoms demonstrated by various investigators, indicated that this vitamin affects the male sex organs. In this respect, Gross (1924), Wolbach & Howe (1925), Myra & Korenschevsky (1932), Heinrich & Zohler (1947), Maddoch, Cohen & Wolbach (1953) and Biswas & Deb (1965), studied the effect of vitamin A deficiency on the male genital system and those results agree to a great extent to those obtained in this work.

Vitamin A, not only possesses a significant androgenic activity, but also acts synergistically with testosterone in increasing the seminal vesicle of castrated rats. The average seminal vesicle weights of the group treated with 1 mg. testosterone together with 3000 I.U. or 6000 I.U. of vitamin A and the control group receiving testosterone alone was  $0.721 \pm 0.0995$ ,  $0.826 \pm 0.0346$  and  $0.251 \pm 0.0083$  respectively. The ratio between the control and treated group is 1 : 2.87, 1 : 3.29. This result is in accordance with that of Jean & Truat (1949) who proved that vitamin A deficiency interferes with synthesis and release of androgens. Moreover Boguth & Weiser (1961) proved that, in vitamin A deficient rats, testosterone propionate did not exert its normal action.

On the other hand, Vitamin C though possessing no androgenic effect, yet it acts synergistically with testosterone (intensifying its effect on the

seminal vesicles). Results showed that when 40, 60, or 80 mg. of vitamin C were given together with 1 mg. testosterone to castrated male rats, the average seminal vesicle weights were  $0.941 \pm 0.0074$ ,  $1.223 \pm 0.1658$  and  $1.415 \pm 0.2328$  respectively as compared with  $0.897 \pm 0.0458$  for the control group receiving testosterone alone i.e. the ratio between the control and treated groups is 1 : 1.1, 1 : 1.4 and 1 : 1.6 respectively.

The synergism between vitamin C and testosterone as proved in this present investigation is in accordance with that of Morgano & Sannazzari (1952) who observed that 1 mg. of testosterone propionate has a synergistic action with vitamin C. Also Grioud & Rastimanager (1942) showed that vitamin C is essential for the secretion of testosterone from the interstitial cells of the testicles.

As regards vitamin B<sub>6</sub> our results indicate that it has neither androgenic effect nor synergistic action with testosterone. This result, however, does not agree with that of Goldsmith (1952) who found that in castrated rats, supplemented with deoxypyridoxine, the seminal vesicle did not respond to injections of testosterone. Also Jeng & Kawin (1962) noticed an increase in weight of the testis in rats depleted of pyridoxine.

#### RESUME

Recherches sur l'activité de quelques vitamines ont délivrées les résultats suivants.

Les vitamines E et A possèdent une activité androgène et agissent synergétique avec le testostérone en faisant grandir le poids des vésicules séminales de rats masculins châtrés. La vitamine B<sub>12</sub> fait voir aussi une activité androgène, mais aucun effet sur l'action de testostérone. D'autre part la vitamine C possède aucune qualité androgène, mais un effet synergétique avec le testostérone. Quant à la vitamine B<sub>6</sub>, elle fait voir ni une qualité androgène, ni un effet synergétique avec le testostérone.

#### ZUSAMMENFASSUNG

Untersuchungen über androgene Wirkung von Vitaminen hatten folgende Ergebnisse.

Vitamin E und Vitamin A besitzen androgene Wirkung und zeigen sich synergistisch mit Testosteron bei der Vergrößerung des Gewichtes der Seminal-Vesikel kastrierter männlicher Ratten. Vitamin B<sub>12</sub> zeigt ebenso androgene Aktivität, besitzt aber keinen Einfluß auf die Wirkung des Testosterons. Vitamin C besitzt keine androgenen Eigenschaften, trotzdem wirkt es synergistisch mit Testosteron. Vitamin B<sub>6</sub> zeigt weder androgene Eigenschaften noch synergistische Wirkung mit Testosteron.

#### REFERENCES

- Adamstone, F. B. (1941). *Arch. Path.*, **31** (6): 70.  
Adamstone, F. B. & Card, L. F. (1934). *J. Morph.* **56** (2): 339.

- Arata, L., Santoro, R., Severi, M. A. & Pecora, P. (1962). *Boll. Soc. Ital. Biol. Sper.*, **38** (5): 212.
- Biswas, N. M. & Deb, C. C. (1965). *Endokrinologie*, **49**: 64.
- Caridroit, F. (1942). *Rev. Sci.* (Paris) **80**: 31.
- Escudero, A., Harraize, M. L. & Radice, J. C. (1942). *J. Path. Bact.*, **41**: 58.
- Gassner et al. (1950). Quoted from Merk. (1951). *Vitamins and Antibiotics in Animal Nutrition*.
- Goldsmith, E. D. (1952). Congr. intern. biochem. Résumé Commun, 2e Congr. Paris, 470.
- Grioud, A. & Rastimamanger, A. R. (1942). *Acide ascorbique* (Vitamin C, Herman et cie, Paris).
- Gross, L. (1924). *J. Pathol. Bact.* **27**: 27.
- Heinrich & Zohler (1947). *Arch. Pathol. Anat. Phys.* **314**: 45, Quoted from Casses Thesis.
- Jeng, H. M. & Kawin, B. (1962). *Proc. soc. Exp. Biol. Med.*, **109**: 222.
- Krzanowska, H. (1956). *Roczniki Nauk Rolniczych Ser B.* **70**: 317.
- Kudryaschov, B. A. (1930). *Endocrinologie*, **7** (2): 91.
- Maddoch, C. L., Cohen, J. & Wolbach, S. B. (1953), *Arch. Pathol.* **56**: 333.
- Mason, K. E. (1933). *Am. J. Anat.*, **52**: 153.
- Morgano, G. & Sannazzari, P. (1952). *Arch 'E Maragliano' Patol. clin.*, **5**: 701.
- Myra, S. M. & Korenchevsky, V. (1932). *J. Pathol. Bact.* **35** (6): 875.
- Sta-Mrad, A. (1955). *Tunesië med.* **43**: 147.
- Zagami, V. (1933). *Bull. Atti R. Acad. Med. Roma*, **59**: 59.