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VITAMIN A SERUM LEVELS AFTER INGESTION OF DIFFERENT VITAMIN A PREPARATIONS*

FREDERICK KALZ, M.D. and
ANNA SCHAFER, M.Sc.,
Montreal

DETERMINATIONS of vitamin A blood levels, as reported by various authors, have not given uniform results; neither is there full agreement on the effect of vitamin A therapy in various skin diseases. These discrepancies have lately been critically reviewed and fully discussed by Jadassohn.[1]

Some of these contradictory findings were no doubt due to methodological errors, to lack of controls and to inadequate statistical evaluation; others may have been due to variations in potency of the vitamin A preparations used. Kimbel and Wigger[3] demonstrated a loss of potency of synthetic vitamin A acetate capsules after three years' storage; they also showed markedly higher blood levels after ingestion of a synthetic vitamin A preparation (Arovit drops) as compared with coated tablets (Arovit dragees) and to a synthetic vitamin A palmitate in oily suspension. Wulf and Nibbe[2] reported similar results demonstrating better absorption of vitamin A from a water-miscible emulsion.

We have lately examined the vitamin A serum values in a series of healthy persons and in patients suffering from a number of skin disorders involving abnormal keratinization. These results are published elsewhere.[4] During these investigations we also compared the blood levels after ingestion of several vitamin A preparations:

1. An aqueous emulsion of a synthetic vitamin A palmitate, containing 150,000 i.u. per c.c.
2. Sugar-coated tablets containing 50,000 i.u. of a synthetic vitamin A acetate.
3. Capsules containing 50,000 i.u. of a synthetic vitamin A palmitate.
4. The same preparation with the addition of 100 mg. of ascorbic acid per capsule.
5. Capsules of oleum percomorphi (25,000 i.u. per capsule).

TABLE I.—THE EFFECT OF INGESTION OF 200,000 I.U. OF VARIOUS VITAMIN A PREPARATIONS ON THE VITAMIN A SERUM LEVEL (I.U.)

	Preparation 1			*Preparation 2*			*Preparation 3*			*Preparation 4*			*Preparation 5*		
	A	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
Mean	74.7	510.1	426.6	79.1	304.7	178.0	70.2	146.5	103.9	90.6	326.9	459.0	58.0	209.3	202.9
Standard error	10.3	47.8	65.4	7.2	55.1	38.1	5.0	16.7	13.6	8.8	36.8	35.0	17.2	42.9	70.5

A: Fasting level.
B: 3 hours after ingestion of vitamin A.
C: 6 hours after ingestion of vitamin A.

TABLE II.—THE EFFECT OF INGESTION OF 200,000 I.U. OF VARIOUS VITAMIN A PREPARATIONS ON THE VITAMIN A SERUM LEVEL (I.U.)

	Preparation 1 *Vitamin A palmitate in water-miscible emulsion*			*Preparation 3* *Vitamin A palmitate in capsules*		
	A	*B*	*C*	*A*	*B*	*C*
	117.1	243.2	298.0	81.8	157.0	97.0
	119.4	530.4	324.0	63.0	128.0	73.0
	57.2	557.0	232.0	96.0	131.5	153.6
	94.0	580.0	650.0	87.0	213.0	73.0
	101.0	663.3	572.8	88.0	209.0	95.0
	32.3	606.0	187.8	65.0	231.0	195.0
	32.0	227.0	290.0	77.0	180.0	163.0
	53.0	576.0	303.0	61.0	111.0	*81.5*
	81.0	508.0	663.0	58.0	99.0	*74.0*
	60.0	610.0	746.0	46.3	72.3	79.3
				50.0	80.0	58.3
Mean	74.7	510.1	426.6	70.2	146.5	103.9
Standard error	10.3	47.8	65.4	5.0	16.7	13.6

A: Fasting level. B: Three hours after ingestion of vitamin A. C: Six hours after ingestion of vitamin A.
The *italic* data were missing and were obtained by using the formula proposed by Allan and Wishart[7], and modified by Yates[8].

The serum levels of vitamin A were determined in 29 persons, fasting and three and six hours after ingestion of 200,000 i.u. of vitamin A. The colorimetric method of Carr and Price[5] was used. In Table I, the mean values of vitamin A after ingestion of 200,000 i.u. of this vitamin in five different preparations are listed.

*From the Department of Medicine, Subdepartment of Dermatology, McGill University, Montreal, Quebec.

TABLE III.

Source of variation	*Degrees of freedom*	*Sum of squares*	*Mean square*	*F*	*P*
Between groups	14	2287331.02	163380.79	15.90	P 0.001
Preparations (P)	4	905871.77	226467.94	22.04	P 0.001
Time interval (T)	2	884674.98	442337.49	43.06	P 0.001
Interaction (P×T)	8	496784.27	62098.03	6.04	P 0.001
Within groups (error)	69	708852.18	10273.22		
Total	83	2996183.20			

In Table II the serum values, fasting and after ingestion of 200,000 i.u. of vitamin A in a water-miscible emulsion (Preparation 1) and in capsule form (Prep. 3), are listed.

The results shown were subjected to an analysis of variance (Table III), using a method described by Snedecor.[6]

Inasmuch as all sources of variation tested were significant, "t" tests were conducted, using the error variance to calculate the standard errors. The results were as follows.

A. *Comparison of the Five Preparations*

1. The fasting values of the five groups showed no significant differences ($P > 0.70$).

2. At three hours after ingestion of the various vitamin A preparations there was a significantly higher serum level after use of Preparation 1 than after Prep. 2 ($P < 0.001$), after Prep. 3 ($P < 0.001$), and after Prep. 5 ($P < 0.001$), but not significantly higher than after use of Prep. 4 ($0.40 > P > 0.30$).

3. Preparation 2 caused a significantly greater rise after three hours than did Prep. 3 ($0.05 > P > 0.02$), but not significantly higher than 5 ($0.60 > P > 0.50$).

4. There was no significant difference at the three hour interval after Preparations 3 and 5 ($0.20 > P > 0.10$).

5. Preparation 4 produced a significantly greater effect than did Preparations 3 ($P < 0.001$) and 5 ($0.05 > P > 0.02$) and had the tendency to produce a greater effect than Prep. 2 ($0.10 > P > 0.05$).

B. *Time Intervals*

The three-hour and six-hour levels were significantly higher than the fasting values ($P < 0.001$).

The fact that the "preparation × time" interaction was significant ($P < 0.001$) indicates that the shape of the "time curve" produced by the various preparations was different. Preparations 1, 2 and 3 showed the tendency to produce slightly lower serum values after six hours as compared with the values after three hours p.c., while Prep. 4 showed a further increase after three hours. This suggests a possible effect of the ascorbic acid which was present in this preparation. Larger series will have to be examined to establish this point.

SUMMARY

The ingestion of 200,000 i.u. of vitamin A was followed by a marked increase in the serum levels after three and six hours. The increase was significantly higher with a water-miscible emulsion of a synthetic vitamin A preparation than with capsules containing synthetic and natural vitamin A. Serum values after five different preparations are listed and the differences evaluated statistically.

The statistical evaluation was done by Dr. B. Grad, Allan Memorial Institute, McGill University.

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PHYSIOLOGIC DEFECTS IN CHRONIC BRONCHITIS

After pulmonary function testing of 44 patients considered to have chronic bronchitis, eight were considered to have chronic pulmonary emphysema. The physiologic data on the remaining 36 patients indicated that persons with chronic bronchitis frequently have abnormal intrapulmonary distribution of inspired air, or a disproportion between alveolar ventilation and perfusion in some parts of their lungs, or both. These defects give rise to mild abnormalities in oxygen transfer. The findings are interpreted as evidence of bronchiolar obstruction in this group.

It seems likely, in view of the type of incidence of functional abnormalities, that some of these patients with chronic bronchitis are in an early phase of the natural history of chronic pulmonary emphysema.—A. D. Renzetti, Jr. *et al.*: *Am. Rev. Tuberc.*, 78: 191, 1958.