Nature, **149, 611- 611, (1942)**
Absorption of Minimal Doses of Beta-Carotene By Vitamin A-Deficient Rats
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WIDE differences between the theoretically expected and experimentally obtained potencies of pure vitamin A as compared with β-carotene have led to a considerable amount of speculation[1,2] on the possible manner of conversion of carotene into vitamin A *in vivo*. While there is no direct evidence in support of the postulated unsymmetrical fission of the provitamins, we felt that it might be of interest to study the extent of absorption of β-carotene by rats under the conditions of biological assay.

In the course of these experiments, it was observed that analysis of the fæces of rats maintained on a carotenoid-free diet gives an apparent carotene excretion value of 0·2–0·4 μgm. per rat per day. Examination in a visual spectrophotometer showed this to be due to a non-carotene pigment possessing only a general absorption. By chromatographic adsorption analysis on columns of Brockman's alumina it was possible to separate the carotene from the associated impurity and estimate it quantitatively. The identity of the excreted carotene and the non-carotene nature of the other pigment were confirmed by spectrophotometric data and growth experiments on rats.

Coconut oil content of diet (per cent)	Level of dosage μgm. β-carotene per rat per day	Amount of β-carotene ingested (μgm.)	Apparent carotene excretion (μgm.)	On separation			β-carotene excretion (per cent)
				Non-carotene (μgm. equiv.)	β-carotene found (μgm.)	β-carotene calculated (μgm.)*	
3	1	224·5	114·9	27·3	28·7	31·9	14·0
,,	2	448·9	159·0	40·4	49·8	55·3	12·3
10	1	204·0	117·0	36·0	22·8	25·3	12·6
,,	2	544·0	190·5	59·4	59·5	66·1	12·0

* Chromatographic analysis of known mixtures has shown the carotene recovery to be about 90 per cent, and these values are calculated on this basis.

Some experimental results are summarized in the accompanying table.

The figures presented in this table represent the total amounts for each group of 6–7 rats over an experimental period of 5–6 weeks.

It should be mentioned, however, that in order to get sufficient quantities of the pigments, it was necessary to collect the fæces of each group of rats for 10–14 days and preserve the same in the refrigerator before analysis could be performed. During this interval, a part of the carotene might have undergone destruction and therefore it is probable that the actual excretions were considerably higher than these figures would indicate.

In contrast to the behaviour of carotene, which may be due to its hydrocarbon nature, vitamin A is known to be quantitatively absorbed at far higher levels of intake; at any rate, no excretion could be detected[3,4]. It is therefore suggested that the incomplete absorption of β-carotene might be the major factor responsible for the observed discrepancies; after absorption, perhaps β-carotene is as efficient as vitamin A at the levels of the biological assay.

In a note[5] which reached us during the final stages of this investigation, Wald *et al.* arrive at a similar conclusion based on the results of absorption studies on human subjects at higher levels of intake.

Further work is in progress and full details will be published elsewhere.

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March 19.

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