DETERMINATION OF VITAMIN A STATUS BY USING VITAMIN A_2

BY

PUNNEE THAITAWEE (B.Sc. in Biology)

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
(BIOCHEMISTRY)

IN THE

FACULTY OF GRADUATE STUDIES

OF

MAHIDOL UNIVERSITY

1984

ABSTRACT

To detect vitamin A deficiency in early stage an isotopic dilution method would be required. In order to avoid using radioisotope vitamin A_2 was used as a tracer molecule since vitamin A_2 is a natural analogue of vitamin A_1 with an extra double bond at 3, 4 position in the cyclohexyl ring.

Various methods to estimate vitamin A_2 in the presence of vitamin A_1 were investigated. Among all the techniques investigated colorimetric method with trichloroacetic acid in chloroform was found to be most suitable since the coloured product of vitamin A_2 absorbed at 690 nm whereas that of vitamin A_1 absorbed at 620 nm.

In rats it was found that vitamin A_2 was present in the blood circulation at a higher concentration than vitamin A_1 when equal amount of vitamin A_2 and vitamin A_1 were given. The concentration of vitamin A_2 in serum increased with time and reached a steady state 5 days after the dose.

The relationship of serum vitamin A_1 : A_2 ratio and liver vitamin A content were studied by giving vitamin A_2 (10, 20, 100 µg) to rats that had different vitamin A content in the liver. At 7 days after the dose there was a linear relationship between serum vitamin A_1 : A_2 ratio and log of liver vitamin A concentration. All three different doses of vitamin A_2 gave the same equation :-

$$Y = 0.747 \log X - 0.256$$

(Y = serum vitamin A_1 : A_2 ratio and X is liver vitamin A concentration in µg/g of liver)

These results indicated that the relationship was independent of the dose. At shorter times (1, 3 days) after the dose of vitamin A_2 there was also a relationship between serum vitamin A_1 : A_2 ratio and liver vitamin A concentration, but this was dependent on dose size. The best condition to estimate vitamin A status was therefore as follows : a small dose of vitamin A_2 (10-100 µg) given to rat for 7 days and assay for serum vitamin A_1 : A_2 ratio. By using these conditions rats of unknown vitamin A status have been tested and found that there was about 15% standard error in calculated concentration from that of assayed values.