92. The Relation between the Increase in Weight of Rats during the Dosing Period of Vitamin A and B₁ Determinations and the Standard Deviation of that Increase

By Katharine Hope Coward, *From the College of the Pharmaceutical Society, London*

(Received 27 July 1942)

Some years ago, in the early application of statistical methods to the analysis of results of vitamin determinations, Coward [1932] showed, by arranging 108 groups of rats used in vitamin A tests according to the average increase in weight of the groups, that the standard deviation of the increase in weight was independent of the size of the increase. The curve of response relating increase in weight to dose of vitamin A given was logarithmic in shape, and therefore the same degree of accuracy was obtainable whether the increase in weight was high or low. It has, however, lately seemed desirable to re-examine this point in view of possible improvements in the technique of carrying out the tests, and also to examine the results of vitamin B₁ determinations in the same way, for this has not been done before. The early result was fully confirmed and a similar result was obtained for the vitamin B₁ determinations.

Fig. 1. Relation between the average increase in weight of rats during the dosing period of vitamin A determinations and the standard deviation of the increase, (a) male rats, (b) female rats.

Material for the calculations

Many hundreds of groups of rats used in vitamin A determinations in this laboratory have been available for assessing the standard deviation of the increase in weight during the dosing period. The last hundred or so of these groups, in fact all the groups used since the laboratory's evacuation from London, form the material from which conclusions are

drawn in this paper. Scatter diagrams relating increase in weight and standard deviation of the increase were made of the results from male and female rats respectively (Fig. 1 *a, b*) and it was so obvious that there was no correlation between these figures that no calculation of the correlation coefficient was made.

For the vitamin B₁ examination, the last 100 groups of rats used for vitamin B₁ determinations in this laboratory were chosen. The result may be seen in Fig. 2 *a, b*. It is obvious here also that there is no correlation between increase in weight during the dosing period and the standard deviation of the increase.

Fig. 2. Relation between the average increase in weight of rats during the dosing period of vitamin B₁ determinations and the standard deviation of the increase, (*a*) male rats, (*b*) female rats.

There appears to be some decrease in the average standard deviation of the increase in weight of rats used in vitamin A tests as compared with that previously reported by the writer [Coward, 1933]. In the last 100 or so groups the average standard deviation,

$$\sigma = \sqrt{\frac{\sum d^2}{N-M}}$$
 (in which d = the deviation from the mean of any group, N = the total number of rats and M = the number of groups), was found to be 9.58 for the male rats and 8.22 for the female rats, whereas the values found in the earlier work were 11.86 and 9.74 respectively.

There has been some decrease also in the standard deviation of the increase in weight of rats during a 3 weeks' test for vitamin B₁. In the results quoted in this paper the mean value of σ is 6.54 for male rats and 5.08 for female rats, whereas the values found in the earlier work [Coward, Burn, Ling & Morgan, 1933] were 8.16 and 7.42 respectively.

SUMMARY

1. No correlation was found between the increase in weight of rats during the dosing period and the standard deviation of the increase, in either vitamin A or vitamin B₁ determinations.
2. Therefore as the curves of response relating increase in weight to dose of vitamin given are logarithmic, the same degree of accuracy is obtainable whether the increases in weight obtained in the determinations are high or low.
3. The standard deviation of the increases in weight of male and female rats in both vitamin A and vitamin B₁ determinations has decreased in the course of some years in this laboratory.

REFERENCES

- Coward, K. H. [1932]. *Biochem. J.* **26**, 691.
 — [1933]. *Biochem. J.* **27**, 445.
 Coward, K. H., Burn, J. H., Ling, H. W. & Morgan, B. G. E. [1933]. *Biochem. J.* **27**, 1719.