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The distribution of noradrenaline in the undivided spleen of the cat

Dearnaley & Geffen (1966) showed that it was more satisfactory to express the noradrenaline content of the cat spleen in terms of the deoxyribonucleic acid-phosphorus (DNA-P) content of that organ rather than in terms of tissue wet weight. Furthermore, when the relation between the noradrenaline contents, expressed per μmol DNA-P, of the anterior and posterior portions of the cat spleen was calculated, the posterior portion was found to contain an amount of noradrenaline that was equivalent to 90% of that in the anterior portion.

The distribution of the noradrenaline content of the anterior portion of cat spleens was found to be approximately $\log_{10}$ normal (Brown, Dearnaley & Geffen, 1967).

Experiments with the effects of several drugs on the noradrenaline content of the undivided spleen *in situ* (Abbs & Robertson, 1969, 1970; Robertson & Abbs, 1971) have been made and it was therefore reasonable to determine the normality of the distribution of noradrenaline in the whole spleen; the rankit method (Ipsen & Jerne, 1944; Bliss, 1967) was applied.

The experimental procedures have been previously described (Abbs & Robertson, 1970). Cat spleens were homogenized in an ice-cold sucrose medium and the noradrenaline and DNA-P contents were measured. Figures from twenty-six experiments were available for analysis.

Using the rankit method and an Elliot 4130 computer linked to a graph plotter, graphs were prepared and points plotted for the observations of the noradrenaline content of the spleen, expressed as ng per μmol DNA-P, without transformation and also with the following five transformations: x^2, $x^{\frac{1}{2}}$, x^0, $x^{-\frac{1}{2}}$, x^{-1}.

A straight line for each set of points was fitted by applying the method of least squares. The square root and logarithmic transformations gave reasonably linear trends but the best linear fit was found for those observations plotted without transformation (Fig. 1a). The mean and standard deviation for each form of the observations were interpolated from the six graphs using a procedure described by Ipsen & Jerne (1944) and were compared with calculated values (Table 1). Agreement between the interpolated and calculated means and standard deviations was closest with the untransformed figures but there was also good agreement for the square root and logarithmic functions.

As an attempt to differentiate between these possibilities, a second degree polynomial curve was fitted to each set of plotted points (Fig. 1b). In this series, the observations without transformation gave a graph which was almost rectilinear. The other graphs, however, were distinctly curvilinear indicating that the data in the transformations were not distributed normally.

Our results with the modified rankit method show that the criteria for normality

Table 1. *The effect of transformation of the data.*

Form of observation	Calculated Mean	Calculated s.d.	Interpolated Mean	Interpolated s.d.
x	88·6	25·8	88·6	26·7
x^2	8494	4742	8450	5130
$x^{\frac{1}{2}}$	9·31	1·39	9·31	1·45
x^0	1·929	0·135	1·928	0·141
$x^{-\frac{1}{2}}$	0·1099	0·0177	0·1098	0·0190
x^{-1}	0·01237	0·00413	0·01233	0·00459

Figures shown above are means and standard deviations (s.d.) relating to various forms of the observations of the noradrenaline content of the undivided spleen of the cat. The untransformed observations (x) are expressed in ng noradrenaline per μmol DNA-P. Interpolated values were derived from the graphs illustrated in Fig. 1a.

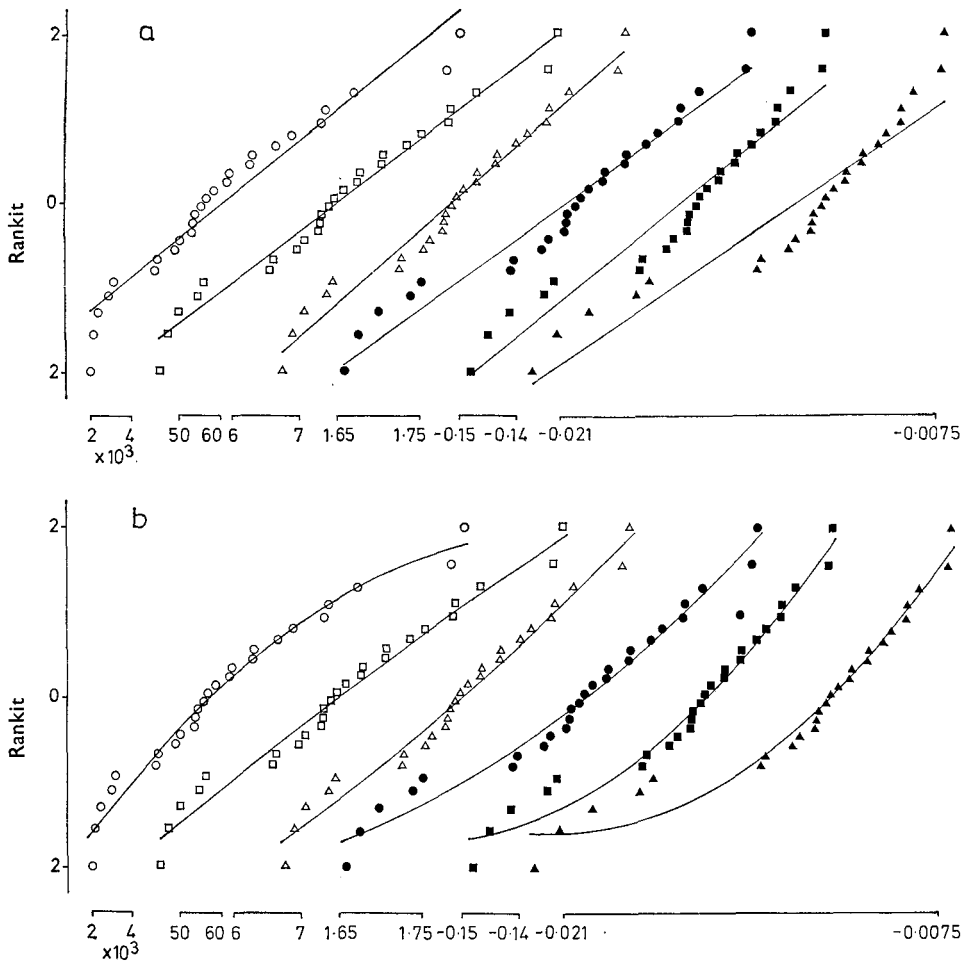

FIG. 1. Composite rankit diagrams to determine the normality of the distribution of noradrenaline in the undivided spleen of the cat. Untransformed observations, x (□), expressed in ng noradrenaline per μmol DNA-P, and the following transformations thereof—x^2 (○), $x^{\frac{1}{2}}$ (△), x^0 (●), $x^{-\frac{1}{2}}$ (■), and x^{-1} (▲)—were plotted against the appropriate rankits. Only parts of each scale are shown on the abscissa. a. A straight line was fitted to each set of points using the method of least squares. b. A second degree polynomial curve was fitted to each set of points.

of a distribution are met most satisfactorily when the observations of the noradrenaline content of the spleen are considered without transformation.

It is possible that differences in the regional distribution of noradrenaline in the cat spleen underlie the difference between our results with undivided spleens and those of Brown & others (1967) relating to divided spleens. Certainly, differences in the densities of the adrenergic innervation of the lateral (thin or anterior) and medial (wide or posterior) ends of the cat spleen have been suggested (Green & Fleming, 1968).

This work forms part of a thesis presented by one of us (M.I.R.) in fulfilment of the requirements for the Degree of Doctor of Philosophy in the University of London.

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Effect of calcium on reserpine-induced catalepsy

High calcium pretreatment reverses the gross behavioral effects of reserpine in the guinea-pig as well as the reserpine-induced inhibition of pethidine analgesia (Radouco-Thomas, 1971). Furthermore, calcium pretreatment attenuates reserpine rigidity (Radouco-Thomas, 1970) and partially antagonizes the reserpine-induced depression of the conditioned avoidance response in the rat (Boyaner & Radouco-Thomas, 1971). These results prompted an investigation of the effect of high calcium pretreatment on reserpine-induced catalepsy in the rat.

Sprague-Dawley, male rats (260-300 g) were used to assess the intensity of catalepsy by carefully raising each leg of the animals in turn to a height of either 2 or 5 cm by placing it on a suitable block. If the rat did not remove its leg within 15 s, the catalepsy test was taken to be positive. The degree of catalepsy was expressed as the percentage of positive responses obtained in each group.

The rats were randomly divided into four treatment groups. Each group consisted of a minimum of 9 animals: group 1—placebo (0·9% NaCl); group 2—calcium chloride (3 × 100 mg/kg calcium); group 3—reserpine (1 mg/kg); group 4—calcium plus reserpine (3 × 100 mg/kg calcium +1 mg/kg reserpine).

All drugs were administered subcutaneously. The three injections of calcium were given at 15 min intervals. In calcium-reserpine treated rats, reserpine was injected 15 min after the last calcium injection.