# A NOTE ON THE ADRENIN CONTENT OF THE ADRENALS OF SNAKES

BY

J. R. VALLE & A. PORTO

*(Department of Endocrinology of Instituto Butantan)*

Preliminary studies have been reported on the morphology of the adrenals of (1) as well as on the survival period after adrenalectomy in the reptilia (2).

This note deals with the approximate adrenin content of the same organs of the *Bothrops jararaca*, as determined biologically.

## METHODS

1) *Preparation of Extracts*: Immediately after decapitation of 10 to 12 healthy, adults, weighing from 160 to 340 g, the adrenals were removed, cleaned from connecting tissue and weighed on a torsion balance. Approximatelly 1 g of fresh glands are so secured. The, in a mortar ground glands, are then extracted with 0.1 N HC1 (1 ml/100 mg of glands) and filtered. The filtrate neutralized with 10% sodium acetate to congo red indicator. Heated for 5 minutes and filtered hot. The filtrate may be adjusted by dilution with distilled water to a 1% solution, i.e., the equivalent extract of 10 mg per ml. Control extracts of ovaries and liver of the same snakes were prepared essentially by the same known method of Folin et al. (3).

Concentrated and diluted extracts have been used for the assay.

2) *Biological assay*: The pressor activity of the extracts was assayed in dogs with complete abolition of all central nervous functions. This is obtained according to the method of GALVÃO and PEREIRA (4) by injecting in the "cisterna magna", under 50 cm Hg pressure, a 20% sodium chloride solution. Artificial respiration and heating are used. The carotid artery is connected by rubber tubing to a Hg manometer and the extracts injected into the femoral vein.

The action of the extracts upon the smooth musculature "in vitro" was studied with duodenal strips and uterine horns of adult rats. The smooth muscles were immersed in 50 ml of oxygenated Ringer-Locke solution, at 38°C, and their longitudinal contractions registered in the usual manner.

In both instances, for the pressor activity in dogs and the inhibitory effect in rats, we tested also a known solution of adrenaline (*) as a basis for the approximate quantitative bio-assay of the mentioned extracts.

## RESULTS

The diluted extracts of the ophidian adrenals, injected intravenously, rose the blood pressure of dogs in all the experiments performed. The intensity and the duration of the effect were proportional to the amount administered (Fig. 1, A and C). In one instance the increase of the carotidean pressure, following the injection of 1 ml = 2 mg of adrenals, was as high as that induced by a dosis of 5 *y* of adrenaline (Fig. 1, C and E). This means, therefore, a hormonal concentration of 2.5 mg of adrenaline per gram of fresh tissue. However, in another test, a low concentration of 0.5 mg/g was obtained. None reaction followed the administration of the control extracts (see Fig. 1, B).

An example of the inhibitory action of the extracts of adrenals of snakes upon the intestinal and uterine contractions is shown in fig. 2, A and B. A dosis of 0.5 ml = 10 mg of an adrenal extract causes a fall of the duodenal tonus as strong as that of 50 *y* of adrenaline (Fig. 2, A.). This is equivalent concentration of 5 mg of adrenaline per gram of adrenal gland. We prefer, however, as more reliable, the approximate content determined by the dog method.

Studies concerning the adrenin content of adrenals of mammals have been summarized by Bomskov (5). The average vallues reported are from 0.2 to 4.2 mg of adrenin per gram of adrenal tissue. As the values above mentioned for the ophidian adrenals varied from 0.5 to 2.5 mg/g, it seems that the approximate adrenin concentration in adrenals of snakes can be compared with those data for mammals.

## CONCLUSION

Extracts of adrenals of *Bothrops jararaca* increased the blood pressure of dogs with complete abolition of the central nervous activities and inhibited the spontaneous contractions "in vitro" of duodenal and uterine strips of rats. These peripheric actions, analogous to those observed after a known adrenaline solution, were not obtained with control extracts of ovaries and liver of the same donors.

The approximate adrenin content of the adrenals of those ophidia was found to be 0.5 to 2.5 mg/g. This adrenin concentration in snake's adrenals does not seem to be inferior to the known values for the same organs of mammals.

---

(*) Adrenaline hydrochloride, Parke Davis & Co.

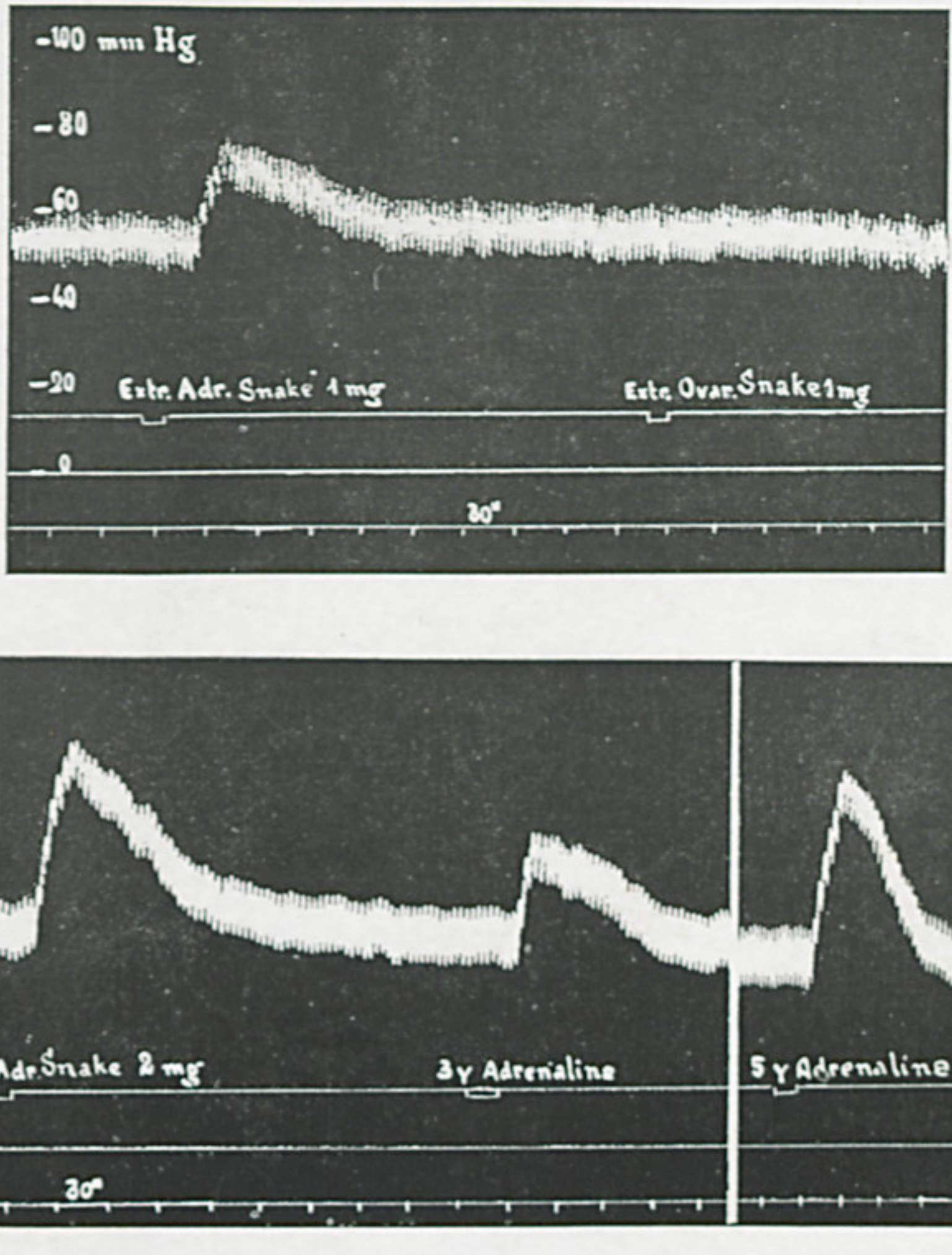


Fig. 1

Dog, 18 kg. Complete abolition of the central nervous activities following the cisternal injection of 20% sodium chloride under 50 cm Hg (Time intervals 30").

A. 1 ml = 1 mg of an adrenal extract of *B. jararaca*, effective.
B. 1 ml = 1 mg of an ovarian extract of *B. jararaca*, ineffective.
C. 2 ml = 2 mg of the same adrenal extracts as in A.
D. and E. 3 γ and 5 γ of adrenaline hydrochloride.

Note the comparable responses in A and D, C and E.

## RESUMO

Extratos de adrenais de jararacas adultas, de ambos os sexos e sacrificadas por decapitação, elevam a pressão arterial do cão, com o sistema nervoso central destruido conforme a técnica de Galvão e Pereira, e inibem as contrações espon-

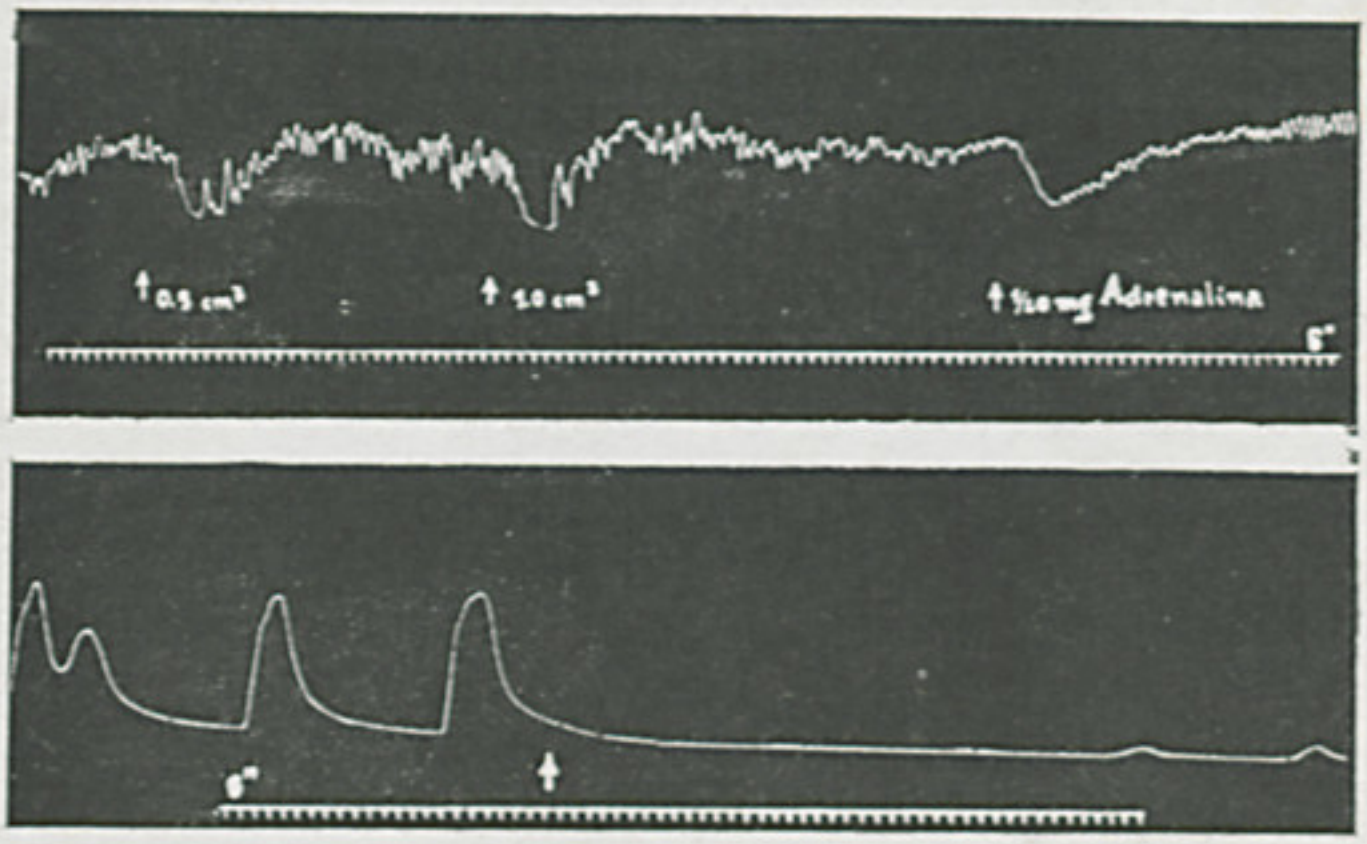


FIG. 2

Longitudinal spontaneous contractions "in vitro" of duodenum and uterus of an adult rat. (Time intervals 5").

A. Inhibition and fall of tonus of the duodenum following the addition to the nutritive bath of 0.5 ml = 10 mg, 1 ml = 20 mg of an adrenal extract of *B. jararaca* and of 50 $\gamma$ of adrenaline hydrochloride.

B. Inhibition of the uterine contractions with 0.5 ml = 10 mg of the same adrenal extract as in A.

tâneas, "in vitro", do duodeno e do útero do rato. Estes efeitos periféricos, não observados com extratos testemunhas de ovário ou de fígado dos mesmos doadores, foram comparáveis aos obtidos com uma solução de cloridrato de adrenalina.

O teor das adrenais dos ofídios em adrenalina seria de 0.5 a 2.5 mg por grama de glândula fresca. Esta concentração não parece, pois, inferior àquela referida por diferentes autores para os mesmos órgãos de mamíferos.

## REFERENCES

1. *Junqueira, L. C. U.* (1944). Nota sôbre a morfologia das adrenais dos ofídios. *Rev. Bras. Biologia*, **4**, 63-67.

2. *Valle, J. R.* (1945). Sobrevida da parelheira (*Philodryas* sp) depois da adrenalectomia. *Memórias do Instituto Butantan, in press.*

3. *Folin, O., Cannon, W. B. & Denis, W.* (1913). A new colorimetric method for the determination of epinephrine. *J. Biol. Chem.*, **13**, 477-483.

4. *Galvão, P. E. & Pereira, J.* (1942). Estudo das condições para a completa destruição de todo o sistema nervoso central nos mamíferos. *Arq. Inst. Biológico São Paulo*, **13**, 1-8.

5. *Bomskov, C.* (1939). Methodik der Hormonforschung. *Georg Thieme, Leipzig.*, Vol. 1, pp. 592-595.

(Received for publication in January, 1945).