

# RESPONSES OF CORONARY VESSELS TO PITUITARY (POSTERIOR LOBE) EXTRACT AND TO ADRENALINE

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During exercises in practical pharmacology for students, it has often been observed that pituitary (posterior lobe) extract and adrenaline produce unexpected changes in coronary flow. The observations have been made when the heart of the rabbit or of the cat has been perfused by Langendorff's method with oxygenated Locke's solution at 35°–37° C. Posterior lobe extract and adrenaline were injected into a cannula tied in the aorta through a rubber tube attached to a side arm of the cannula. The amounts of posterior lobe extract which were injected varied from 0.01 to 0.04 unit for rabbit hearts and from 0.02 to 0.1 unit for cat hearts. The amounts of adrenaline varied from 0.1 to 5.0  $\mu$ g. for rabbit hearts and from 0.02 to 0.5  $\mu$ g. for cat hearts. The rate of flow of Locke's solution coming from the heart was recorded continuously by Stephenson's recorder (1948).

The student is taught that posterior lobe extract constricts the coronary vessels. In the rabbit heart this constriction is almost invariably observed, but in the cat

TABLE I  
EFFECT OF PITUITARY (POSTERIOR LOBE) EXTRACT ON CORONARY FLOW

Rabbit heart					Cat heart				
Exp.	No. of observations	Constriction	Constriction followed by dilatation	Dilatation	Exp.	No. of observations	Constriction	Constriction followed by dilatation	Dilatation
1	2	1	1	—	10	6	—	—	6
2	5	5	—	—	11	3	—	—	3
3	2	2	—	—	12	3	3	—	—
4	3	3	—	—	13	6	6	—	—
5	3	3	—	—	14	8	—	4	4
6	4	4	—	—	15	8	1	—	7
7	2	2	—	—	16	7	—	7	—
8	3	3	—	—	17	7	3	4	—
9	3	3	—	—	18	5	—	3	2
Total	27	26	1	0	Total	53	13	18	22

heart the constriction is often followed by dilatation, or dilatation may be the only response. In Table I the results of nine experiments on rabbit hearts and of nine experiments on cat hearts are recorded. It will be seen that the rabbit heart responded to posterior lobe extract according to expectation, but that the cat heart did not. In the cat heart dilatation was the only effect seen in Exps. 10 and 11, whereas constriction was the only effect in Exps. 12 and 13. In Exp. 14 the total number of injections was eight, of which four produced initial constriction followed by dilatation, while four produced dilatation alone. Similarly in Exp. 17 the total number of injections was seven, all of which produced constriction, but four of the injections produced dilatation after the constriction. The totals at the foot of Table I show that in the cat dilatation is more commonly produced by posterior lobe extract than is constriction (see Fig. 1).

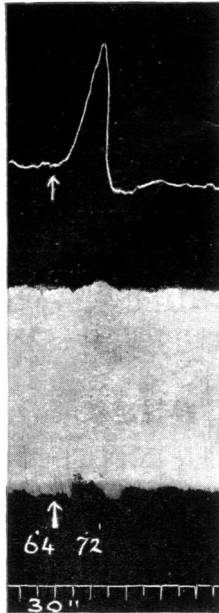


FIG. 1.—Isolated cat heart. Upper record is the coronary flow; dilatation was recorded upwards. Lower record is amplitude of beat. Figures below the record are heart rate per min. At the arrow 0.02 unit pituitary (posterior lobe) extract was injected into the aortic cannula. Note the coronary dilatation.

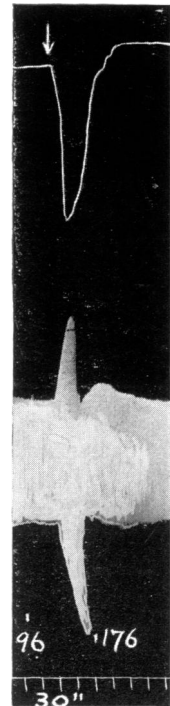


FIG. 2.—Isolated rabbit heart. Records as in Fig. 1. At the arrow 0.5  $\mu$ g. adrenaline was injected. Note the coronary constriction.

When adrenaline is injected there is a change in the force of the contraction which may modify the coronary flow by obstructing it; in consequence it is less easy to discover the direct effect of adrenaline on the coronary vessels. Table II shows the results in experiments on nine rabbit hearts and ten cat hearts. In the rabbit, adrenaline caused constriction in almost all of the fifty-seven trials, while a succeeding dilatation was observed in one-third of them (see Fig. 2). In the cat initial constriction was caused by adrenaline in less than one-fifth of the trials, while dilatation was observed sixty-two times out of sixty-three.

TABLE II  
EFFECT OF ADRENALINE ON CORONARY FLOW

Rabbit heart					Cat heart				
Exp.	No. of observations	Constriction only	Constriction followed by dilatation	Dilatation only	Exp.	No. of observations	Constriction only	Constriction followed by dilatation	Dilatation only
1	3	—	3	—	10	15	—	—	15
2	8	4	4	—	11	7	1	—	6
3	8	7	1	—	12	6	—	3	3
4	7	3	4	—	13	5	—	3	2
5	6	4	2	—	14	5	—	1	4
6	9	7	2	—	15	5	—	1	4
7	6	4	2	—	16	6	—	1	5
8	4	4	—	—	17	7	—	2	5
9	6	5	1	—	18	5	—	—	5
					19	2	—	—	2
Total	57	38	19	0	Total	63	1	11	51

*The action of ephedrine.*—The opportunity was also taken in these experiments to examine the effect of ephedrine in cat and rabbit hearts. Ephedrine increases the rate and amplitude of beat of the cat heart when injected in amounts from 5 to 20  $\mu$ g., but it has little or no effect on the rate and amplitude of the rabbit heart even when injected in amounts ten times greater; thus in six of ten experiments ephedrine had no effect on the rate and amplitude of the rabbit heart, and in three of ten experiments it had little effect; only in one heart was the effect of ephedrine definite. On the coronary flow the effect of ephedrine was qualitatively similar to that of adrenaline in both cat and rabbit hearts, though its effect was more prolonged.

#### DISCUSSION

When the coronary flow in the dog is investigated by means of a Morawitz cannula in the heart-lung preparation, adrenaline always increases the flow and posterior lobe pituitary extract always diminishes it. This contrast is much less sharp in the isolated heart of the rabbit and of the cat perfused with Locke's solution. Adrenaline causes constriction in the rabbit heart whereas posterior lobe extract causes dilatation in the cat heart. Evidently the contrast is at least as great between the coronary vessels of the rabbit and those of the cat as it is between the two agents. The coronary vessels of the rabbit respond much more by constriction to both agents, while those of the cat respond much more by dilatation. The same difference was shown by Gunn (1926) to hold good for histamine.

#### SUMMARY

1. Pituitary (posterior lobe) extract very often causes dilatation of the coronary vessels of the isolated cat heart perfused by Langendorff's method. This dilatation may occur without antecedent constriction.

2. Adrenaline causes constriction of the coronary vessels of the perfused rabbit heart, dilatation following the constriction in only one-third of the trials.
3. Ephedrine stimulates the rate and amplitude of the cat heart, but is almost always without effect, in ten times the amount, on the rabbit heart.

## REFERENCES

- Gunn, J. A. (1926). *J. Pharmacol.*, **29**, 325.  
Stephenson, R. P. (1948). *J. Physiol.*, **107**, 162.