

A POLYUROCYSTOGRAPH

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An instrument is suggested for recording the frequency and volume of micturition in dogs, together with the volume of urine excreted in the 24 h. Work with the instrument requires no special preparation of the animal.

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After resection of the urinary bladder in man and animals a long time is required for recovery of the initial capacity or thereabouts of this organ. Radiological measurement of the capacity of the urinary bladder after operation is unphysiological and is not sufficiently accurate.

Using an idea of I. P. Pavlov, I. S. Tsitovich [3] for the first time in the Soviet Union exteriorized the ureters separately on to the skin of a dog, and by means of glass fistula tubes and rubber receivers studied the renal function for 24 h and discovered several phases in urine excretion. On the basis of these data, F. T. Agarkov [1] suggested an apparatus for recording the indices of function of the kidneys separately on a slowly rotating kymograph.

However, when exteriorizing the ureters, these workers disturbed their innervation, introduced infection into the upper urinary tract, and completely abolished the role of the urinary bladder as an active reservoir and evacuator of urine. To correct these defects, E. P. Tsvetov [2] used a special apparatus to study the function of the bladder after various types of ileocystoplasty for recording the principal physiological components of micturition (frequency, volume) during chronic experiments on dogs. This apparatus provides the best means of estimating the function of the urinary bladder, although it does possess a number of disadvantages.

For these reasons, in collaboration with the engineers O. Ya. Cherepkov, A. N. Stepanov, P. N. Tsukanov, and A. P. Smirnov, a polyurocystograph has been constructed (Fig. 1).

This apparatus records the frequency of micturition in dogs, the volume of urine at each micturition, the time between them, and the 24 h volume of urine. All these indices are recorded automatically on a slowly rotating kymograph for 24 h. The animal is kept in a metabolism cage. Urine from the cage passes

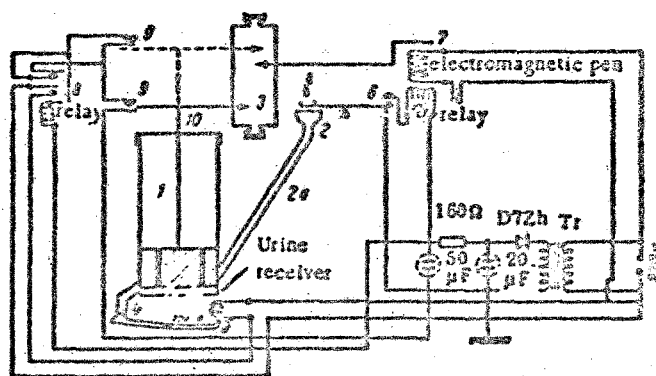


Fig. 1. Working diagram of apparatus. Explanation in text.

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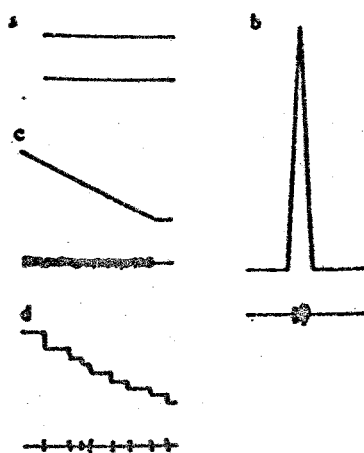


Fig. 2. Recording of micturition by the polyurocystograph. a) Initial horizontal lines before micturition; b) record of act of micturition in a healthy dog; c) record of urine flowing immediately after operation; d) record of urine flowing one month after operation. Above, urine arriving in recording cylinder; below, marker of drops of urine. Curves read from right to left.

through a filter into a receiving funnel (Fig. 1 and 2), connected by a polyvinyl chloride tube (Fig. 2a) to a measuring cylinder (1). The capacity of the cylinder is 135-140 ml. The outlet valve of the cylinder (4) is in the closed position at the beginning of the experiment. A foam rubber piston (10), with vertical holes for allowing air to pass through, rises upward as the urine enters along with contact pen (10). Any additional batch of urine, including individual drops, is recorded by the rocking contact scales (6) connected to an electromagnetic pen (7). Movements of this pen, and also of the contact pen (10), are made on the slowly rotating kymograph (3).

As the diagram (Fig. 1) shows, at the moment of the first rise of the piston (10) the contact (9) on relay (8), connected to the output electromagnetic valve (4, 5), is closed. When the contact pen (10) is in its highest position, the second contact (9) on relay (8) is closed and the electromagnetic valve (4, 5) is opened. Urine from the cylinder passes through the outlet valve (4) into the vessels where its daily volume is measured. When the contact pen (10) is in its lowest position contact (9) of relay (8) is opened, the electromagnetic valve (4, 5) is closed, and the apparatus returns to its initial position.

The apparatus has been tested on five dogs weighing from 10-14 kg. In three dogs, after determination of the background diuresis through the 24 h, subtotal resection of the bladder was performed (Fig. 2). Observations continued on the dogs for one month.

LITERATURE CITED

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3. I. S. Tsitovich, in: *Collection in Honor of I. P. Pavlov's 75th Birthday* [in Russian], Leningrad (1921), p. 115.