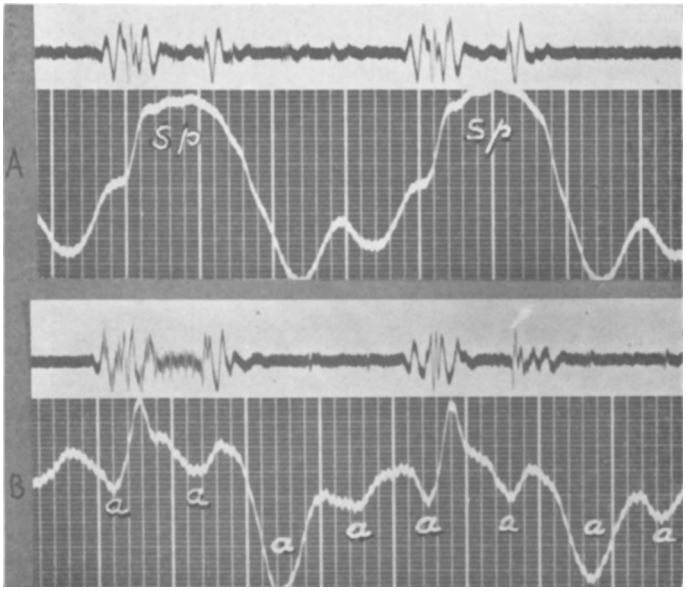

FIG. 4.
Tracings obtained during respiration in a patient with congestive failure, tricuspid insufficiency, and auricular flutter.
(A) Border tracing of right auricle (conventional tracing). A systolic plateau (SP) due to valvular insufficiency is apparent.
(B) Border tracing of right auricle (use of the filter). The rapid succession of auricular contractions (rate of 300) becomes apparent (a,a,a).

basis and principle of which are given.

(b) By using the filter, it is possible to record the fluorocardiogram of the child. This is of particular importance in congenital heart diseases.

(c) By using the filter, it is possible to study dyspneic cases of emphysema, pulmonary fibrosis, or congestive failure.

(d) The use of the filter eliminates those slow waves of cardiac origin which may interfere with other rapid cardiac waves whose study is more important in particular cases.

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Determination of Iodine-131 in Urine.* (17361)

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In conjunction with research on the diagnostic and therapeutic value of radioactive iodine (8.0 day I-131) in thyroid disorders, a simple and accurate procedure for determining the amount of radioiodine excreted is needed. Preparation of counting samples by evaporation of urine samples to dryness is a tedious and unpleasant procedure, and has also proved inaccurate, perhaps due partly to loss of some iodine by volatilization (possibly as volatile organic iodine compounds) and partly to variations in the geometrical character of the resulting solid samples.

* The iodine 131 used in this investigation was supplied and obtained on allocation from the Atomic Energy Commission.

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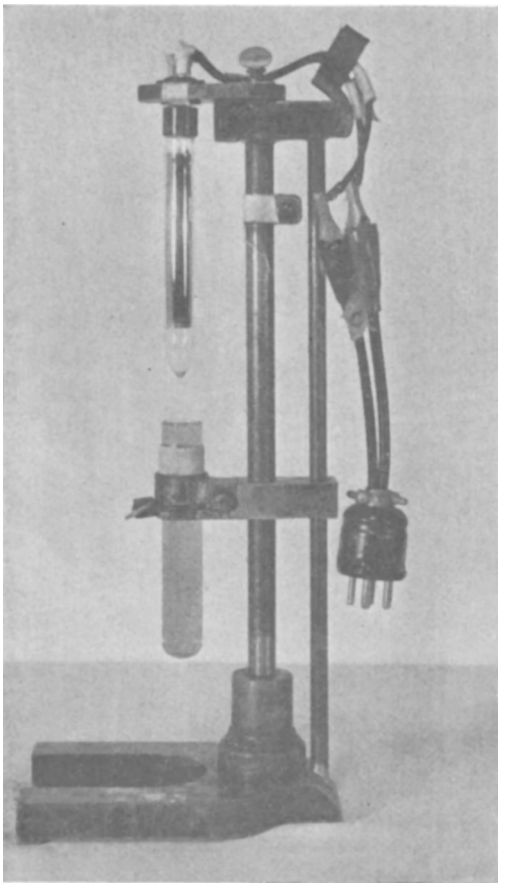


FIG. 1.
Shows the dipper counter (top) and sample tube (bottom) on microscope base.

A procedure for direct counting of the I-131 radiations in the urine by means of a dipping counter has been devised along lines similar to those reported by Solomon and Estes[1] for aqueous solution measurements. A thin-walled glass dipping counter (Radiation Counter Laboratories, Mark 1, Model 80) was mounted on a modified microscope base, as shown in Fig. 1. Samples of urine (sometimes diluted with water) were placed in test tubes whose length was exactly that of the glass portion of the counter tube (about 11 cm), and whose inside diameter was about 2 cm, 5 or 6 mm greater than the outside diameter of the counter tube. In the experiments reported here, 8.5 ml of liquid proved optimum for covering the sensitive area of the counter when counter and sample tube were arranged concentrically.

Experimental. To reduce errors due to variations in geometry, all samples in a given series, including the standard urine, were counted in the same sample tube. Since the counter tubes showed some photosensitivity, the external surfaces of the sample tubes were blackened with India ink to exclude light.

The counter tube was used in conjunction with either a 64 scaler (Nuclear Instrument and Chemical Corp., Model 165) or a decimal scaler (Berkeley Scientific Company, Model 1000).

Background Count. Backgrounds were determined over a fifteen minute period with the sample tube containing 8.5 ml distilled water arranged in the experimental position.

Standard Urine Count. Standard urine samples were prepared by addition of a known volume of a previously standardized aqueous solution of I-131 to a known volume of normal urine. Samples of 8.5 ml of the resulting spiked urine were counted with the dipping counter, yielding values expressed as counts per minute per microcurie of I-131 per milliliter of urine. About ten microcuries per liter of urine makes a satisfactory standard (about 1000 counts per minute.)

Experimental Samples. Urine of the patients was collected in vessels containing 1 ml of KI solution (20 mg/ml), to decrease loss of iodine by volatilization. The specimens were then sampled (8.5 ml) for direct counting, or if too active (over 8000 counts per minute for 8.5 ml sample), were diluted with water to yield satisfactory counting samples. Counting periods were adjusted so as to yield a total of 5000 to 10,000 counts, so that standard errors were less than 2%. In addition, samples were counted in triplicate (3 separate 8.5 ml samples, placed successively in the same sample tube) to reduce errors due to variations in geometry and sampling. After each sample was counted, the sample tube and counter tube were washed twice with water, once with 6 N HNO_3, and rinsed 3 times with distilled water. It was found advisable to

[1] Solomon, A. K., and Estes, H. D., *Rev. Sci. Instru.*, 1948, **19**, 47.

check the background for a brief period after each count to determine whether decontamination was complete.

Effect of Dilution of Urine. Samples of a standard urine giving 195 counts per minute per 8.5 ml were diluted with varying amounts of water, and 8.5 ml samples of the dilutions were counted with the experimental apparatus to determine whether the diluted urine exhibited the same counting efficiency as the undiluted. Samples of total volume 8.5 ml were prepared, containing the following amounts of the standard urine: 1.5, 2.5, 3.5, 4.5, 5.5, 6.5, 7.5, and 8.5 ml.

Results and Discussion. Results of the experiment to determine effect of diluting the radioiodine-containing urine are shown in Fig. 2. It is apparent from the figure that addition of water to the urine does not affect the counting efficiency of the radiations, in spite of the variation in specific gravity. This is the anticipated result if the counts obtained are due largely to the gamma radiations from the I-131, as expected. The beta particles from this nuclide (0.60 Mev) should be essentially completely absorbed by a water layer of about 2 mm thickness.

Comparison of the experimental sample

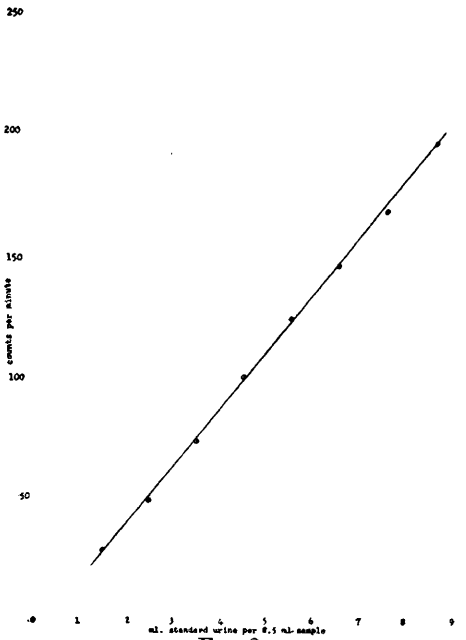
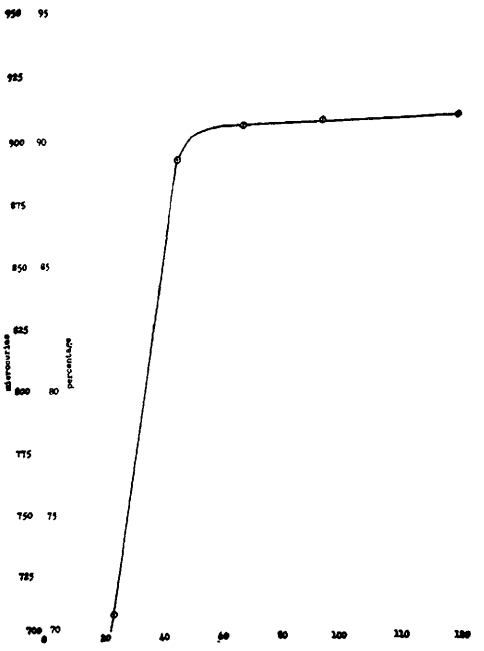


FIG. 2.
Effect of dilution of urine.



Hours after administration.

FIG. 3.
Urinary output of I^{131}. Tracer dose 100 microcuries.

counts (applying the dilution factor, if any) with the standard urine counts yields values in microcuries of I-131 per milliliter of experimental urine. Total output for the period over which the urine was collected is then obtained simply by multiplying this value by the total urine volume. Failure to collect the urine quantitatively is of course the greatest source of error in the measurements. Correction for radioactive decay since dosage may be applied either from the theoretical decay curve, or by counting the standard urine at the time of the experimental counts. Fig. 3 shows an actual series on a patient given 1000 microcuries of I-131. The curve indicates urinary output in microcuries and percentage, at daily intervals after administration.

Experiments now in progress are directed towards determination of the value of the urine measurements (*i.e.* rate of excretion of I-131) in diagnosis of thyroid disorders. It is believed that the determination of I-131 in urine is considerably more accurate than direct counting of the thyroid glands, which may vary considerably in size and shape, leading

to serious variations in geometry.

Summary. A method for the determination of Iodine-131 in urine is described. A dipping counter mounted on a modified microscope base using a blackened test tube with a sample large enough to cover the sensitive area of the tube was used. Counting of gamma radiations is quite reproducible by this procedure.

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Effect of Procaine Hydrochloride on Response of the Heart to Epinephrine During Cyclopropane Anaesthesia. (17362)

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While studying the production of ventricular fibrillation in dogs by the intravenous administration of epinephrine during cyclopropane anaesthesia, observations were made on the effect of procaine HCl on the cardiac irregularities. Its effect on the rate and rhythm of the heart during cyclopropane anaesthesia and its effect on the cardiac response to epinephrine were noted.

Method. A modification of Meek's technic was used.[1] Thirty minutes after premedication with 1.0 mg/kg morphine sulphate and 0.04 mg/kg atropine sulphate, 18 male and female dogs (4-10 kg in weight) were induced with a cyclopropane and oxygen mixture, intubated, and allowed a further 30 minutes to equilibrate with the cyclopropane-oxygen mixture administered by a to-and-fro carbon dioxide absorber. The mixture was adjusted to produce stage III, plane 3 anaesthesia. A total of 78 injections of epinephrine 0.01-0.03 mg/kg were made, taking 20 seconds for each injection, and with at least 20 minutes between injections. Procaine HCl 5-15 mg/kg in 5 cc saline was given in 50 seconds, 5 minutes before 32 of the epinephrine injections. On 7 occasions 50 mg/kg of procaine HCl were given and not followed by epinephrine. Electrocardiograms were recorded continuously during and following each injection. When ventricular fibrillation occurred, artificial respiration with 100% oxygen was instituted, thoracotomy performed, and cardiac resuscitation attempted using manual massage and intracordial injections of procaine HCl 5-15 mg/kg.

Effect on Cardiac Rate and Rhythm. The cardiac rate was increased in all but two experiments when procaine HCl was given. (Table I). The degree of acceleration present 5 minutes after the injection increased with the dose employed (Table II). On 24 occasions irregularities were present at the time procaine HCl was injected, and with the exception of one sinus arrhythmia these changed to a regular sinus rhythm. (Table I).

Modification of Cardiac Response to Epinephrine. The response of the heart to epinephrine was notably different after the administration of 5-15 mg/kg of procaine HCl. Epinephrine was given 46 times without previous procaine HCl and 32 times following this agent. The occurrence of various rhythms following the epinephrine is shown in Table III. Calculation of "p" value[2] reveals a significant increase in the number of normal rhythms, a significant decrease in the number of cases with a sinus arrhythmia component in the rhythm, and no significant change in the incidence of either extrasystoles or of ventricular tachycardia.

An attempt was made to determine whether increased vagal tone was contributing to the electrocardiographic picture obtained following epinephrine injections. Signs taken to mean increased vagal tone were initial slowing, A-V block, and suppression of the sinus

[1] Meek, W. J., Hathaway, H. R., Orth, O. S., *J. Pharm. Exp. Therapy*, 1937, **61**, 240.

[2] Mainland, D., *Can. J. Research*, 1948, E, **26**, 1.