mortality at an average of 11 to 12 days after inoculation. Drug concentrations as low as 0.0375% in the diet for 14 days after inoculation prolonged survival time considerably. Enheptin-P was also highly active in enterohepatitis produced by the oral inoculation of *Heterakis gallinae* ova, which is the presumptive major mode of naturally occurring infections.

Accordingly, a large number of related heterocycles were prepared (J. H. Clark and H. W. Marson) of which the most promising, 2-amino-5-nitrothiazole (*1*, *2*) (Enheptin-T)[3] may be equally active and can be produced

TABLE 1

THE EFFECT OF ENHEPTIN-T* (2-AMINO-5-NITROTHIAZOLE) ON ENTEROHEPATITIS OF TURKEYS PRODUCED WITH *Heterakis gallinae* OVA

Days treated†	% Drug in diet	No. alive/total‡		Days survival§	
		Treated	Control	Treated	Control
1–15 B	0.10	7/7	3/10	..	18
1–15 B	0.05	9/9	3/10	..	18
3–17 A	0.15	8/8	1/8	..	17
4–18 B	0.10	7/10	3/10	31	18
4–18 B	0.05	4/10	3/10	28	18
5–19 A	0.15	5/8	1/8	32	17
7–21 B	0.10	4/9	3/10	34	18
7–21 B	0.05	2/10‖	3/10	30	18
13–21# C	0.10	1/5**	2/10	25	14
13–21# and 21–28 B	0.15 and 0.05	6/10	3/10	41	18

* Enheptin-T is a trademarked product.

† Single oral inoculation with about 300 *Heterakis* ova at 0 days in tests A, B, and C.

‡ Seven weeks after inoculation in A, 8 weeks in B and C.

§ Average of dead birds only.

‖ Two deaths during treatment. All other deaths except ** after treatment stopped.

Treatment begun when clinical symptoms appeared in group.

** One death during treatment.

much more economically than Enheptin-P. In eight experiments with 96 rectally inoculated poults treated with 0.035% or 0.05% of Enheptin-T for 14 days, the average prolongation of survival time by 10 to 15 days was at least as great as that obtained with Enheptin-P. Although two weeks of treatment with 0.1% (81 birds) or 0.05% (116 birds) of the thiazole compound did not reduce delayed mortality (after treatment halted) as much as similar Enheptin-P treatments, this may only reflect the lower control mortality of the latter tests. In any event, 0.05% of Enheptin-T suppressed mortality completely during treatment, and for more than one week after treatment halted, in rectally inoculated birds treated for 4 weeks (15 birds), for 6 weeks (11 birds), for 8 weeks (15 birds), or for 12 weeks (14 birds). This indicates the efficacy of 0.05% for long term, continuous treatment. Such treatment, or repeated intermittent treatments, may prove necessary in the field with either of these drugs, since substantial, acquired immunity to severe experimental challenges was absent in drug-treated survivors of experimental infections. (However, our data do not exclude the possibility that such immunity may follow repeated exposure to infection, or may be adequate with the lighter challenges that probably occur in the field.)

Enheptin-T is highly active in enterohepatitis produced with *Heterakis* ova (Table 1). Complete prevention of mortality was obtained when 14 days of treatment was begun not later than 72 hr after a single oral inoculation. With treatments begun later, there was generally some reduction in mortality, and very few deaths occurred until more than one week after treatment stopped, even when treatment was not begun until the appearance of clinical symptoms (13 days). This suggests that longer treatments might have saved most of the birds. The activity of Enheptin-T, and of Enheptin-P, has been confirmed by others in naturally occurring field outbreaks and will be reported elsewhere, as will full details of the above results.

[3] Enheptin-T is a trademarked product.

References

1. GANAPATHI, K. and VENKATARAMAN, A. *Proc. Indian Acad. Sci.*, 1945, **22A**, 354.
2. ———. *Chem. Abstr.*, 1946, **40**, 4058.
3. HALE, W. J. and BRILL, H. C. *J. Amer. chem. Soc.*, 1912, **34**, 91.
4. WALETZKY, E. and HUGHES, C. O. *Amer. J. vet. Res.*, 1946, **7**, 365.
5. ———. Unpublished data.

Effect of Adrenalectomy on Liver Catalase Activity in the Rat[1]

R. W. Begg and E. F. Reynolds

Cancer Research Laboratory,
Department of Biochemistry,
Dalhousie University, Halifax, Canada

Adrenal cortical secretions have been shown to influence enzyme activity, both by removal of the adrenals and by injection of adrenal cortical extracts (*4*, *5*). It has been demonstrated that cytochrome oxidase is diminished in activity by adrenalectomy of the rat (*7*).

In connection with studies on liver catalase activity in normal and tumor-bearing rats, we needed to know whether adrenalectomy could alter liver catalase activity. Accordingly, Sprague-Dawley-Holtzman rats of both sexes were adrenalectomized by the lumbar approach under aseptic conditions. The animals were maintained postoperatively at a constant temperature on a diet high in sodium and low in potassium (*1*). Control rats were maintained in the same environment and on the same diet, but given tap water. The rats were sacrificed 14–21 days after adrenalectomy and liver catalase activity was determined by a titrimetric method (*2*).

The results are presented in Table 1, from which it is evident that adrenalectomy decreases liver catalase activity in the rat. Though a sex difference in liver catalase activity has been reported (*6*), it was not noted in

[1] Aided by grants from the Banting Research Foundation and the National Cancer Institute of Canada.

TABLE 1

LIVER CATALASE ACTIVITY IN THE RAT

	No. of rats	Body wt in g	Catalase activity ($K \times 10^4$)	P*
Control	6	215 ± 28†	2418 ± 114	....
Adrenalectomized ..	8	189 ± 14	1781 ± 251	< 0.05

* P in t test of Fisher.
† Standard error of the mean.

this or other investigations (*3*, *8*). The possible role of strain differences in this discrepancy is not known.

It is improbable that inanition was a factor in the loss of liver catalase activity (*6*), since the animals operated upon continued to gain weight (60 g in 21 days), and in both groups the extracts of liver were adjusted to constant nitrogen content (0.2 mg N/ml).

References

1. AGATE, F. J. and ZWEMER, R. L. *Amer. J. Physiol.*, 1935, **111**, 1.
2. GREENSTEIN, J. P. *J. nat. Cancer Inst.*, 1942, **2**, 525.
3. ———. *Biochemistry of Cancer*. New York: Academic Press, 1947. P. 322.
4. KOCHAKIAN, C. D. and VAIL, V. N. *J. biol. Chem.*, 1947, **169**, 1.
5. KOCHAKIAN, C. D. and BARTLETT, M. N. *J. biol. Chem.*, 1948, **176**, 243.
6. MILLER, L. L. *J. biol. Chem.*, 1948, **172**, 113.
7. TIPTON, S. R. *Endocrinology*, 1944, **34**, 181.
8. WEIL-MALHERBE, H. and SCHADE, R. *Biochem. J.*, 1948, **43**, 118.

An Apparatus for Localizing Warm and Cold Receptors

W. W. Tuttle and C. D. Janney

Department of Physiology,
State University of Iowa, Iowa City

Ever since Blix (*1*), Goldschneider (*3*), and Donaldson (*2*) discovered that cutaneous receptors are not distributed uniformly over the surface of the body, but are present as discrete points, laboratory experiments have been devised to demonstrate this fact. Numerous types of equipment have been employed for the purpose of making charts of the distributions of cold and warm points in various regions of the skin. These vary from metal tubes arranged so that water of any desired temperature can be circulated through them to glass and metal rods placed in water and sand baths.

In order to provide a better means for locating cold and warm points on the surface of the body, a new type of apparatus has been devised and is herewith described.

Localization of cold points. The apparatus devised for the localization of cold points is shown in cross section in Fig. 1. It consists of a plastic cylinder (*C*) 2½ in. long by 1¾ in. in diam. A plastic cap (*A*) cut from a rod, and fitted with a gasket (*B*) is made to screw into one end of the cylinder, thus sealing it. A plastic tube (*D*) 3½ in. long, with an inside diameter of ⅜ in. is cemented into a plastic disk, which in turn is cemented into the open end of the plastic cylinder (*C*). A copper fitting (*E*) milled to a point 1 sq mm is threaded and cemented to the free end of the ⅜-in. tube.

The technique for locating cold points is to place an ice cube in the large cylinder together with sufficient water to fill the small tube. The cylinder is tipped and then righted so that the water is cooled by flowing over the ice. When the apparatus is righted, the cold water enters the small cylinder thus cooling the copper tip, which is kept at a uniform temperature of approximately 10° C by tipping the apparatus occasionally.

The experimental procedure for locating cold points is to survey the area in question with the copper tip and to have the subject report "cold" when a cold receptor is contacted.

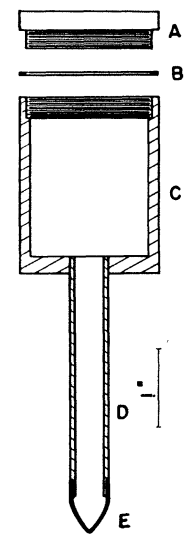

FIG. 1. Apparatus for localizing cold receptors.

Localizing warm points. The apparatus for localizing warm receptors is shown in Fig. 2. It consists of a 22.5-watt Ungar soldering pencil (obtainable from any radio supply company) connected in series with a 3000-ohm, 2-watt potentiometer (R_1) and a 1500-ohm, 5-watt fixed resistor (R_2). The potentiometer and resistor are contained in a small box made of sheet metal. The box is lined with insulating paper (not shown) and is held together by a screw from the back into post (*A*), which in turn is soldered to the front. A chassis mounting type plug (*B*) which fits a standard 110-volt receptacle is placed in the back of the box. Care must be taken either to employ a potentiometer in which the contact arm is insulated from the control shaft or to insulate the shaft from the box and to provide it with an insulating knob so as to prevent any contact between the fingers and the shaft. Otherwise there is danger of electric shock to the experimenter.