

TABLE I.
Bromsulphalein Retention Following Phosphorous Poisoning.
10% dye retention before adminis. of P.

Rat No.	Daily s.c. dose of P in sesame oil mg/100 g	No. of days	% dye retention after administ. of P	Liver damage estimated by histological study
1	.375	2	15	0
2	.375	2	10	0
3	.375	4	50	+++
4	.375	4	50	+++
5	.375	5	60	++++
6	.375	5	45	+++
7	.75	2	20	0
8	.75	2	15	0
9	.75	3	40	++
10	.75	3	20	0
11	.75	4	45	++
12	.75	4	60	++++

animals together with the amount of liver damage as judged by study of microscopic sections stained with hematoxylin-eosin, and Sudan IV. These data show a relation in the amount of phosphorus given to the degree of dye retention and to the liver damage as estimated histologically.

Summary. A simple and rapid technic for performing the Rosenthal-White bromsulphalein liver function test on rats and mice is described. The test gives a roughly quantitative estimate of the degree of liver damage and since it can be repeated on the same animal it is of use in following the progress or regression of liver disturbances.

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Current Control in Electroshock Therapy.*

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Electroshock treatment consists in the passage of alternating current for a few tenths of a second through electrodes placed on the temples of the patient. The intensities of the current vary from 200 milliamperes to the neighborhood of 1,000 milliamperes. The customary procedure is to apply a certain voltage obtained from the

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general alternating supply line. If the resistance of the head of the patient could be determined in advance, the current which would flow for a given voltage could be predicted. It is known that this is not the case. The patient's head resistance is variable and unpredictable. A test measurement of resistance with a small current gives high values (roughly from 500 to 5000 ohms) which are not correlated with the resistances actually offered to the large shock current. The resistances for the large shock currents also show appreciable variation, not only from patient to patient, but also in the same patient at different times. For electrodes of 15-25 cm² in area, these resistances vary from about 100 to 300 ohms. It is clear that the application of a given voltage to the electrodes will give fluctuating and uncontrollable values for the shock current (Table I). Of the two factors which determine the effect of the shock, the duration of the current, and the strength of the current, the first is readily controlled by means of a suitable timer; it is, however, just as essential to control the second factor. The physical conditions of the shock would then be fixed, and could be prescribed in advance.

An electroshock apparatus which gives a preassigned current to the patient regardless of the resistance has been designed and constructed in our laboratories, and is now in satisfactory operation at the Patton State Hospital, Patton, California. To obtain a constant current regardless of resistance requires alternating current regulation which may be secured by a variety of circuits. The method of regulation chosen for this apparatus consists in feed-back with low amplification

TABLE I.

Patient	Test resistance, ohms	Shock voltage	Shock duration, seconds	Shock current, milliamperes	Shock resistance, ohms
A	700	100	.3	420	240
	1350	100	.5	450	220
	1700	100	.5	350	290
B	250	90	.2	830	110
	385	90	.2	875	100
	440	100	.2	745	135
C	725	125	.3	900	140
	900	125	.3	550	230
	1000	125	.3	720	170
D	1600	120	.5	450	270
	3000	130	.5	780	170
	2500	130	.5	650	200
E	850	100	.3	400	250
	700	100	.3	580	170

and phase inversion into a pair of 813 transmitter tubes in push-pull which are transformer coupled to the output circuit. A ballast resistor of 125 ohms is in the output circuit when the patient is not connected; the treat button transfers the current from this resistor to the patient for the duration of the shock. The power dissipation provided by the 813 tubes in this compensation circuit is 200 watts, so that the range of resistance compensation is ample for electroshock purposes. The apparatus in its present form gives currents from 120 to 1000 milliamperes. The operator presets the current and measures its intensity with a meter which reads continuously before, during, and after the shock. For the variations in head resistances found in electroshock, the current intensity variations are less than 1%. The durations of the shock available in this apparatus may be changed by steps of 0.1 second from 0.1 to 1.0 second. A test resistance measurement is still used, but only with the purpose of assuring that good contact is maintained through the electrodes to the head.

It may be remarked that even when the physical conditions of electroshock are accurately controlled, as they are in the apparatus here described, there may be variations in the physiological response of the patient. Nevertheless, accurate control of these physical conditions is certainly very desirable, and is clearly a prerequisite of any systematic study of electroshock itself.

Table I summarizes data on a few typical shocks given with an older electroshock apparatus of the non-regulating type constructed in our laboratories. The test resistance is measured with a small alternating current of 1 milliampere or less. The same electrodes (15 cm² in area) were used in all these shocks. A given shock voltage was applied and the resulting shock current was measured. The shock resistance is calculated from Ohm's Law: Shock resistance = shock voltage/shock current.