TABLE 1

CHANGES IN THE CONCENTRATION OF SODIUM PENTACHLOROPHENATE IN LABORATORY EXPERIMENTS WITH VARIOUS TYPES AND AMOUNTS OF SOIL

Time after applying chemical	(No. of expt.) 1	2	3	4	5	6	7	8	9
	(Proportional volumes of solution and soil) Sol. 3 Mud 1	Sol. 1 Mud 1	Sol. 1 Mud 3	Sol. 1 Mud 7	Sol. 1 Dry Mud 1	Sol. 3 Mixed Mud 1	Sol. 1 Loam 3	Sol. 1 Sand 3	Sol. —
	(Concentration in ppm)								
4 hr	10	10	10	10 –	10 –	T*†	10	10	10
21 "	10	10	10 –	5	1	0	10	10	10
29 "	10 –	10 –	5 +	5 –	1	0	10	10 –	10
2 days	10 –	5	5 –	2 –	T	0	10	10 –	10
3 "	10 –	5	2 +	1	T	0	10 –	10 –	10
4 "	5 +	5 –	2 –	T	0	0	5 +	10 –	10
5 "	5	5 –	1	T	0	0	5 –	10 –	10
7 "	5	2 –	T	T	0	0	T	10 –	10
11 "	5 –	2 –	T	0	0	0	T	10 –	10
17 "	2 –	1	0	0	0	0	T	0	10
21 "	2 –	T	0	0	0	0	T	0	10
30 "	1	T	0	0	0	0	0	0	10

* T = Trace of chemical.
† Reduced to 5 ppm in 1 hr.

organic matter and clays had a much less pronounced effect on the concentration of sodium pentachlorophenate. Other conditions being equal, an increased residual effect could be expected after application of chemicals in waters having sandy beds. During a 72-day period all chemical determinations of the control, Expt. 9, were consistently 10 ppm.

Facilities were not available to determine the manner in which silt and clays reduced the concentration of the salts of pentachlorophenol in solution. Presumably the principal process is adsorption of the chemical by the fine particles of soil, but possibly it could be due to actual inorganic or organic chemical combinations, or a coalition of these factors.

To determine the effects of sunlight on dilute solutions of sodium pentachlorophenate, laboratory preparations identical to those in Table 1 were exposed to about 8 hr of direct sunlight at temperatures not over 38° C. The concentration of the chemical in all the experiments was reduced from the original 10 ppm to 0 or 1 ppm after 8 hr exposure. It may be noteworthy that even a clear aqueous solution containing 10 ppm of sodium pentachlorophenate tested 1 ppm after the same period of exposure. The results were similar when the experiments were repeated. It was also found that following 8 hr of exposure to sunlight these preparations were only 0–20% effective against *Australorbis glabratus* within a 24-hr period.

Under field conditions mud and sunlight may be important factors in reducing the efficacy of some molluscacides. The effects of mud can be minimized by applying the chemicals when the waters are clear and by exercising care not to disturb the mud during the period of treatment. Proper allowance should be made when chemicals must be applied in muddy waters. Indications are that sunlight is a major factor in reducing the concentration of some chemicals in very shallow open waters but not in deep waters. In the field, sunlight appears to be less of a factor than mud in reducing the concentration of chemicals because most of the waters are shaded by rooted and floating vegetation and often by high banks.

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Nonfixation of Carbon Dioxide into Organic Acids in Blood[1]

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Although there is evidence in the literature for the existence of the physiologically important organic acids of the Krebs cycle in blood, data on their physiologic origin or role in this fluid are far from complete. Doubtless the lack of methods of isolation for these acids has contributed to the enigma. The extent to which tissue acids are diffusible into blood, and the scope of the function of the cycle in blood as compared to some other tissue such as liver, have not been considered. One approach to these problems was recognized when labeled organic acids were chromatographically isolated from tissues of mice injected in-

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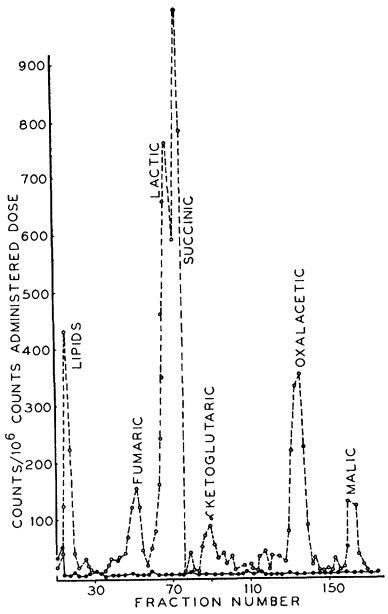

FIG. 1. Typical chromatograms for blood and liver extracts from a mouse sacrificed 5 min after a single injection of C^{14}-labeled bicarbonate. ● smooth line, 0.43 g whole blood; ○ dotted line, 1.0 g liver.

traperitoneally with labeled bicarbonate. Such acids containing the isotope were obviously synthesized by the animal, and the extent to which these labeled acids appeared in blood should be a function of their rate of synthesis by, or their diffusibility into, the blood from tissues elaborating them. In this report are presented data which indicate that organic acids labeled *in vivo* by mice injected with $NaHC^{14}O_3$ show concentrations in the blood less than 10% of those in the liver, and CO_2 fixation into organic acids by blood does not occur, or at least is not measurable.

In these studies 0.2 ml of 0.1 *M* $NaHC^{14}O_3$ containing 250 μc as isotopic carbon[2] were injected intraperitoneally into mice weighing approximately 2.0 g. The animals were sacrificed by decapitation 5–10 min following the injection. This time interval was selected because within it the incorporation of carbon into the acids of the tissues studied was maximal, *in the mouse*. Extracts (*1*) of the tissues were chromatographed on silica gel (*2*). Radioactive assay of the effluent, identification of the effluent organic acid, and other experimental details are reported elsewhere (*3*). A chromatogram representing a typical experiment is shown in Fig. 1.

The results (Table 1) indicate that the total activity of the organic acid extracts of whole blood was not greater than 8% of that of the liver extracts. From the percentage of activity shown by each of the several acids, no selective or preferential diffusion of any single organic acid from liver into blood can be adduced. When the blood in three experiments was assayed for labeled bicarbonate, these samples showed 1.8×10^4, 1.9×10^4, and 1.2×10^4 cpm/g blood/10^6 counts administered dose. This would seem to indicate that, although $C^{14}O_2$ was available for fixation of the carbon into the organic acids, there was no such synthesis in the blood. A lack of mechanisms in the blood comparable to those in liver for the fixation of $C^{14}O_2$ into the organic acids could account for this failure of incorporation. The labeled bicarbonate in blood, however, was available to kidney and muscle tissue, both of which showed a greater incorporation per gram tissue than blood, but less than one fourth of that shown by liver. The protein residues from the organic acid extracts of the blood had no appreciable activity, thus ruling out the possibility that the acids synthesized in the liver, after diffusion into the blood, were bound to protein.

In view of what is known of the concentrations (*4*) of organic acids in blood and the above-reported total activities of the organic acids in blood and liver, it might be that those organic acids naturally occurring in blood diffuse largely from the liver. For example, fumaric acid in blood has a concentration of "less than" 0.5 mg% (*1, 4*), whereas in liver the concentra-

[2] The radioactive carbon was obtained as $BaC^{14}O_3$ from the Atomic Energy Commission, Oak Ridge, Tenn.

TABLE 1

COMPARISON OF ORGANIC ACID EXTRACTS FROM LIVER AND BLOOD OF MICE INJECTED INTRAPERITONEALLY WITH LABELED BICARBONATE

Tissue	Time (min)	Tissue (g)	Total extract activity/g tissue	Percentage of total extract*				
				Lipids	Fumaric	Succinic	Oxalacetic	Malic
Liver	10	1.2	11,256	37.5	5.4	5.8	14.0	—
	5	1.0	75,460	3.8	3.8	33.9	40.7	3.2
	5	0.7	78,654	12.9	5.1	29.1	9.2	9.2
	5	0.7	80,318	16.0	14.2	27.7	3.6	3.6
Whole blood	10	0.58	915	5.0	15.0	23.4	19.9	5.0
	5	0.79	645	15.6	15.0	17.4	0.7	0.01
	5	0.57	3,800	10.2	17.2	21.8	2.4	4.2
	5	0.76	5,160	10.0	15.0	25.0	4.6	6.6

* No discrete chromatographic peaks were obtained from blood (Fig. 1). Values shown for blood in the table were obtained by adding the observed radioactivity within each chromatographic zone described by effluent organic acids from liver on the chromatogram.

tion is about 6 mg%, and this ratio of 1 to some value greater than 10 is also reflected in the total activities shown above.

Since the rate of diffusion of these acids into blood seems to be slow, and since mechanisms for fixing carbon dioxide into organic acids in blood appear to be lacking, studies involving carbon dioxide fixation for the time intervals used above can be carried out *in vivo*, and yet each organ will synthesize its carbon-labeled organic acids appreciably uncontaminated by acids formed at another site in the same animal.

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Decreased Activity and Energy Balance in the Hereditary Obesity-Diabetes Syndrome of Mice[1, 2]

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The hereditary obesity-diabetes syndrome, previously described (*1, 2*), is a recessive Mendelian entity characterized by an adult weight up to three or four times the normal, sterility (*3*), atrophy and ulcers of the skin, and decreased life span. Histopathological studies (*4*) reveal considerably enlarged islets of Langerhans, with no other morphological evidence of endocrine disturbance. Total basal oxygen consumption is low (*5*), with basal metabolic rates 40–50% below normal. Radioiodine uptake is not decreased (*6*). Fasting respiratory quotients are normal, nonfasting respiratory quotients are high (*7*). The caloric intake of the obese mice (*1*) is about 25% higher than that of the nonobese. If the mice are allowed to select nutrients freely, the obese mice choose a higher proportion of fat and a lower proportion of carbohydrate than the nonobese. The animals become diabetic at about the tenth week of life (*2, 7*). The diabetes is characterized by extreme insulin resistance and sensitivity to the amount and the nature of the diet. The obese animals show a decreased ability to oxidize acetate fragments (*8*); these are deposited instead as fatty acids. The hyperglycemia appears to be due to a block of the hexokinase reactions secondary to this primary genetic block and induced by pituitary diabetogenic (growth) hormone (*7, 9*). This secondary block has been implicated in the etiology of the hyperphagia in the light of the glucostatic scheme of regulation of food intake (*10*).

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[2] As in previous studies, the mice used in these experiments were obtained through the kindness of Margaret M. Dickie, of the Jackson Memorial Laboratory, Bar Harbor, Me.

Obese animals are visibly less active than nonobese litter mates. It was the purpose of the study reported here to quantitate this difference in activity between obese and nonobese animals, and to see how it varied with age and degree of obesity. The contribution of this decrease in expenditure for work to the imbalance between energy intake and output could then be evaluated.

Thirty-six mice, 12 nonobese animals 4 months old, 12 obese litter mates, and 12 young (2 months) obese animals of the same weight as the nonobese were placed in activity (squirrel-type) cages equipped with wheels 36 cm in diameter rotating freely enough to prevent any climbing and to insure that all animals sat at the bottom of the wheel under comparable conditions. A counter registered the number of revolutions. The animals were fed Purina chow pellets and were allowed to drink water *ad lib*. The experiment lasted 21 days, with the number of revolutions recorded at 9:00 A.M. and 5:00 P.M. The rooms in which the animals were kept were maintained at constant temperature (24° C) and were illuminated from 9:00 A.M. to 5:30 P.M. Table I gives the starting weights, rates of weight change during the experimental period, average daily activity, and average daytime and nighttime activity rate of the obese, young obese, and nonobese animals.

TABLE 1*

	Obese (4 mo old)	Young obese (2 mo old)	Nonobese (4 mo old)
Starting wt (g)	51.2 ± 2.5	27.8 ± 3.0	26.9 ± 2.2
Wt variation (g/week)	+ 1.8 ± 0.9	+ 3.6 ± 1.4	− 1.2 ± 1.0
Total daily activity (rev/day)	74 ± 40	355 ± 233	4783 ± 1253
Daytime activity rate (rev/hr)	4 ± 2	14 ± 4	102 ± 5
Nighttime activity rate (rev/hr)	3 ± 2	13 ± 2	240 ± 32

* Starting weights, rates of weight change during experimental period, average daily activity and diurnal activity rhythm of obese, young obese, and nonobese mice. The values given are average (mean) values. The figures following ± are standard deviations.

It is immediately apparent that the difference in spontaneous activity between obese and nonobese animals is enormous. In fact, obese animals are practically inactive. This inactivity is not solely the result of extreme obesity but, in fact, precedes it, as is shown by the comparison of activity rates of nonobese animals and of young obese mice of the same weight. Incidental to this difference in average daily activity, the difference in activity rates during night (darkness) and day (illumination) conditions, very marked in nonobese animals, disappears in the obese. Although