Simultaneous records of intestinal motility may be made by substituting for the rod which supports the loop a light metal tube carrying a condom balloon. One projecting end of the tube is closed, the other connected through very flexible rubber tubing (d) to a water manometer or other recording device. Balloon and tubing are filled with air. The tubing is supported in a long loop as it leaves the intestine, so as to damp the movements of the weight recorder as little as possible.

The loop hanging in air is coated with liquid petrolatum to limit drying. It is kept close to body temperature with a three-sided metal shield with open top which encloses the lower half of the animal and in which lamp bulbs are hung as heating elements.

Under some conditions accumulation of secretions in the loop causes a progressive increase in weight throughout the period of observation. It is simpler to work on a steadily rising weight record than to prevent this with drainage. The spring tension may be adjusted from time to time to keep the writing lever in recording position.

Figure 2 shows the type of record obtained with this arrangement. Under optimum conditions, with the gut showing strong rhythmic contractions, rhythmically recurrent changes in weight are recorded, reciprocating with the motility record. These are just visible in the weight record in Fig. 2, during the periods when the motility record shows weak rhythmic contractions.

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Effect of Morphine Sulfate on Serum Choline-Esterase.

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It has been previously reported by Slaughter and Gross,[1] and Slaughter and Munsell[2] that physostigmine and prostigmin respectively potentiate the action of morphine on the intestine, blood pressure, on toxicity and pain. The belief that these effects might be in part due to a depression of choline-esterase by morphine was expressed.

1 Slaughter, Donald, and Gross, E. G., *J. Pharm. and Exp. Therap.*, 1940, **68**, 96.

2 Slaughter, Donald, and Munsell, Donald W., *J. Pharm. and Exp. Therap.*, 1940, **68**, 104.

Bernheim and Bernheim[3] have shown that morphine depresses the brain choline-esterase *in vitro* They used a biological method, employing the guinea pig intestine to demonstrate these effects. Having at hand a series of dogs which had had weekly determinations of serum choline-esterase done for a period of one year, we made a series of *in vitro* tests using morphine sulfate by incubating ½ cc of serum for 15 minutes with 1 mg of morphine sulfate, after which the esterase activity was determined by the method of Hall and Lucas.[4]

After repeated trials, we were unable to confirm the results of Bernheim and Bernheim as regards the *in vitro* depressant effect of morphine sulfate on choline-esterase.

Despite the negative results from experiments *in vitro,* we believed that morphine did have an effect on the acetylcholine-choline-esterase system *in vivo.* Experiments were carried out on a series of 6 dogs: a 4 cc sample of blood was drawn by venipuncture, 5 mg per kilo of morphine sulfate was injected subcutaneously, and after 20 minutes another sample of blood was obtained. The 20-minute interval was

TABLE I.
Serum Choline-esterase in Dogs Before and 20 Minutes After Injection of 5mg/kg of Morphine Sulfate.

Normal	20 min after injection	Difference	Normal	20 min after injection	Difference
Dog 4			Dog 9		
1.84	0.84	1.00	1.95	1.55	.40
1.77	1.48	.29	1.84	1.64	.20
1.67	1.20	.47	1.57	1.45	.12
1.47	1.17	.30	1.68	1.43	.25
1.44	1.05	.39	1.84	1.30	.54
1.70	1.37	.33	1.78	1.60	.18
Dog 7			Dog 10		
1.47	1.26	.21	1.71	1.34	.37
1.85	1.43	.42	1.80	1.55	.25
1.83	1.45	.38	1.50	1.25	.25
1.63	1.31	.32	1.84	1.50	.34
1.54	1.10	.44	1.93	1.31	.62
1.82	1.38	.44	1.96	1.67	.29
Dog 8			Dog 11		
1.85	1.65	.20	2.05	1.97	.08
2.14	1.99	.15	2.48	2.00	.48
2.25	1.93	.32	2.26	2.02	.24
1.93	1.37	.56	2.65	2.04	.61
2.38	1.73	.65	2.76	1.70	1.06
2.35	1.73	.62	2.90	2.60	.30
		Mean values	1.927	1.536	0.391

[3] Bernheim, F., and Bernheim, M. L. C., *J. Pharm. and Exp. Therap.,* 1936, **57**, 427.

[4] Hall, G. E., and Lucas, C. C., *J. Pharm. and Exp. Therap.,* 1937, **59**, 34.

chosen since preliminary work indicated that depression of choline-esterase activity is most marked at that period. Results are shown in Table I.

To obviate errors in the above series, determinations were made concurrently in which morphine sulfate was added to the blood *in vitro*. In other instances blood samples were drawn at 20-minute intervals to see whether repeated punctures with the needle would cause variations in esterase activity. In 10 experiments *in vitro* the mean change in cholin-esterase activity was (−) 0.10 units; in 6 determinations repeated at 20-minute intervals (using blood withdrawn without the giving of any drug) the mean change in esterase activity was zero. While the differences between the normal values for serum choline-esterase and those following the injection of morphine sulfate are not great (20%), we feel that they are significant because of their consistency.

Summary and Conclusions. 1. Morphine sulfate added to blood *in vitro* produces no consistent change in choline-esterase activity. 2. Serum choline-esterase activity in the dog is consistently lowered following the injection of morphine sulfate. 3. The *in vivo* effect of morphine on serum choline-esterase furnishes another indication that morphine acts through a cholinergic mechanism.

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Response of Sex Characters of the Adult Female Starling to Synthetic Hormones.*†

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The female sex of birds is often remarkable for extensive ambisexual features. In the starling *(Sturnus v. vulgaris)* the females have paired vasa deferentia which enlarge during the breeding season and, as in males, the bills are yellow during the first 6 months of the year. In a previous paper[1] it was shown that bill color as well

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1 Witschi, Emil, and Miller, R. A., *J. Exp. Zool.*, 1938, **79**, 475.