viduals. An explanation of this increase in reflex conduction rate during catalepsy is difficult to make. It may be due to increased facilitation of transmission of the nerve impulse, to blocking out of parts of the arc ordinarily traversed by the nerve impulse, or to more obscure and involved alterations of neural, neuromuscular, or muscular factors.

Another study has indicated that the Betz cells in the precentral cortex may constitute part of the arc which subserves the knee-jerk.[2] Studies which we are now carrying on relative to the effects of emotion, stuttering, physical disease, and alcohol upon reflex time show still better that the cortical arcs are involved in the patellar tendon reflex. Thus it would seem that in catalepsy the reduced reflex time is due to blocking out of parts of the arc which ordinarily function in the knee-jerk response.

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The Colonic-Jejunal Reflex in the Dog.*

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(Introduced by A. J. Carlson.)

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In a study of the influence of treadmill running on jejunal Thiry fistula motility in the dog, variable results were secured. Thus at times there was complete inhibition of motility and reduced tone during the running, whereas at other times the motility was little modified. Chance observations, on several occasions, associated balking, attempts to sit down, and defecations while running with reduced jejunal tone and motility. The plausibility of the notion that all of these "misbehaviors" might be expressions of the defecatory reflex and thus have an ultimate seat in colonic activity and that this might help to untangle the mechanism by which exercise operates on the jejunum, led us to investigate more specifically into the influence of colonic stimulation on the jejunal motility and tone. Two approaches appeared obvious: 1. To observe the jejunal mo-

[2] Travis, L. E., Tuttle, W. W., and Hunter, T. A., *Am. J. Physiol.*, 1927, lxxxi, 670.

* A grant from the Laura Spelman Rockefeller Memorial to The Y. M. C. A. College has aided in the conduct of this study.

tility when the colon is expressly stimulated as by distension. 2. To observe simultaneously the spontaneous activity of jejunum and colon at rest and during exercise to determine the interactions resulting from peristalsis, etc., originating in either.

The latter approach, which appears to lead to disclosure of the more natural conditions, is a tedious one and our data is accumulating slowly. The first approach has led us into a field where King[1] has already done careful work. Pearcy and Van Liere[2] and Pearcy and Weaver,[3] working on animals under anesthesia or after decerebration, have also reported several relevant findings.

The observations here reported were made on 3 dogs with completely healed Thiry fistulas. The fistula balloon, essentially as described by Ivy and Vloedman,[4] is connected by rubber tubing with a specially designed water manometer. This manometer (Fig. 1) embodies the principle of the hydraulic press and serves to reduce the amplitude of the writing arm excursions. The instrument has been standardized so that by use of appropriate factors the actual air pressure in the balloon measured in cm. of water is readily calculated; also the work done in a unit of time is quickly figured. The amount of air injected is always the same (16 cc.) and the dogs always stand throughout the tests.

The colon and rectum were stimulated first by the passage of a glass tube and by a discharge of air into the colon, and later by inflation of a special rectal balloon which we devised and later found described by Pearcy and Van Liere[2] in their work on the colonic gastric reflex.

Our findings may be summarized as follows:

1. Mechanical irritation, as by passing or twisting a rod in the rectum or lower colon causes jejunal inhibition.
2. Stimulation by distension or stretching of the rectum or lower colon also causes jejunal inhibition.
3. It appears that mechanical irritiation is most effective in the rectal region and distension proves most effective at a distance of 20 to 30 cm. from the anus, where mechanical irritation is with less effect. A distension pressure effective at 30 cm. from the anus may be without effect at 15 cm. from the anus.
4. All of the reflexes are more easily elicited after 24 hours of starvation than shortly after eating.

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[1] King, C. E., *Am. J. Physiol.*, 1924, lxx, 183.

[2] Pearcy, J. F., and Van Liere, E. J., *Am. J. Physiol.*, 1926, lxxviii, 64.

[3] Pearcy, J. F., and Weaver, M. M., *Am. J. Physiol.*, 1927, lxxxii, 47.

[4] Ivy, A. C., and Vloedman, C. A., *Am. J. Physiol.*, 1923, lxvi, 141.

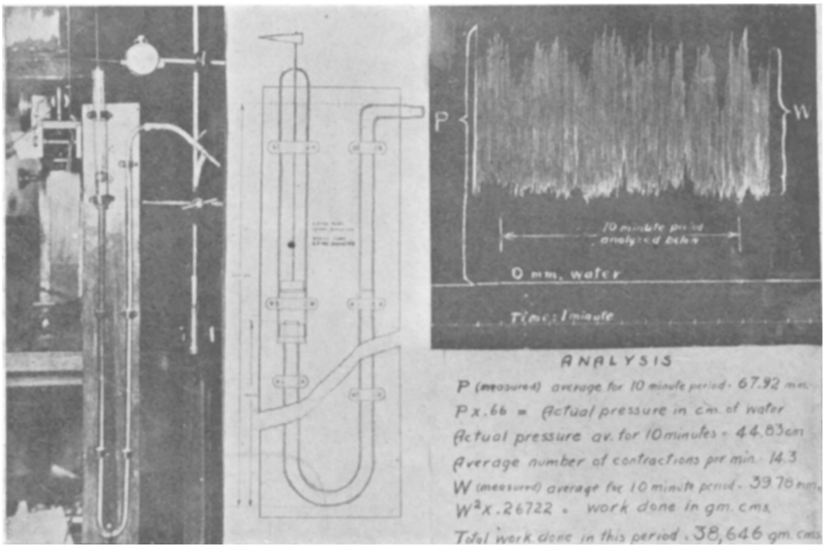

FIG. 1. The special water manometer designed to reduce the amplitude of the contraction record and a sample tracing with formulae for calculating actual pressure and work done. A manometer of this type permits of a more isotonic contraction of the gut musculature than does the average instrument of uniform diameter.

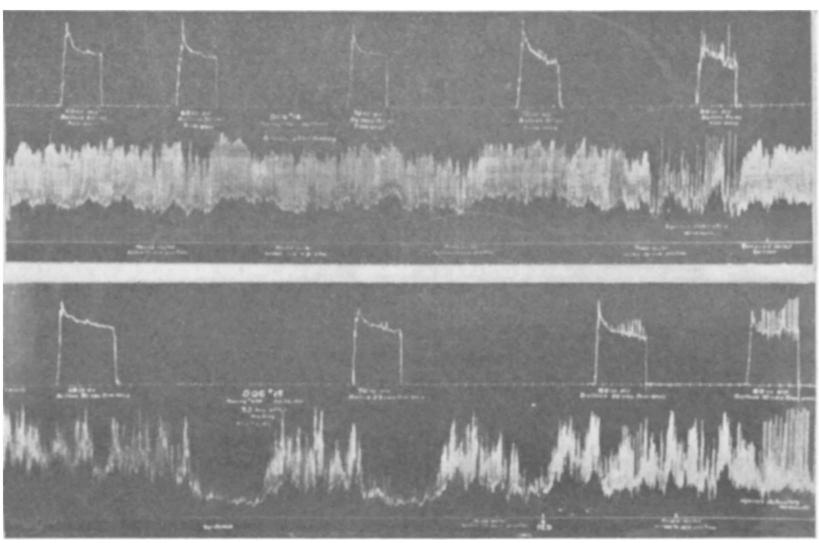

FIG. 2. Simultaneous record of jejunal activity and colonic distension stimuli. The upper line in each tracing is the record of a mercury manometer connected with the colonic balloon. The average pressure is 90 mm. Hg. The lower line is written by the special water manometer (Fig. 1) and records an average pressure around 400 mm. H_2O and the highest about 500 mm. H_2O.

The upper tracing, taken 6 hours after eating, shows exaggerated jejunal motility in place of inhibition following colonic distension (compare with Fig. 3 from same dog before eating). With distension applied 30 cm. from anus there is some inhibition. Presence of the uninflated balloon (mechanical stimulus due to moving balloon) 5 cm. from anus causes jejunal inhibition marked by defecatory contractions.

In *the lower tracing* two apparently spontaneous inhibition periods of identical configuration are recorded and a third which began in typical fashion was instantly terminated when the dog was fed at point marked by arrow.

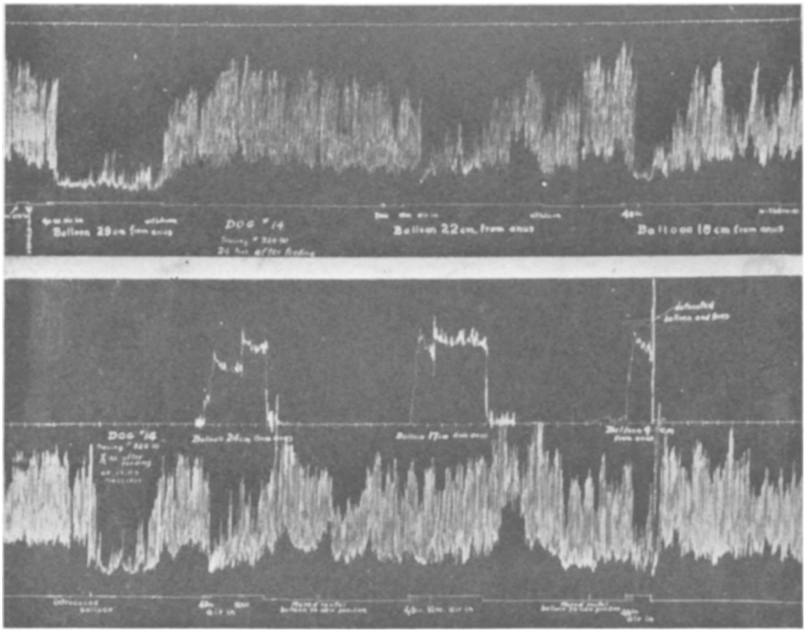

FIG. 3. Tracings from a dog (same as in Fig. 2 upper) taken immediately before and after feeding.

In *the upper tracing* no record is made of the colonic pressure. It was essentially equal to that in the lower tracing, averaging 90 mm. Hg. It shows the graduated inhibition response which is greatest when the distension is high in the colon (complete at 30 cm. from anus) and less when it is at lower levels.

The *lower tracing* (after feeding) shows exaggerated motility without inhibition following distension at the same level which before feeding showed marked inhibition. The manometer here recorded a pressure close to 600 mm. H_2O produced by jejunal contractions.

5. In the starving animal there are frequent spontaneous periods of jejunal inhibition. Because such a spontaneous period may be immediately terminated by feeding the animal suggests that hunger contractions may be responsible. We intend to pursue this point farther.

6. Following a period of inhibition induced by colonic stimulation the jejunum shows a period of exaggerated activity lasting as long as 10 minutes.

7. A distension stimulus insufficient to cause jejunal inhibition may cause increased motility even during the time of its application in the colon. There is some indication of this in the work of King. The view that the post-stimulation hypermotility is also the positive result of milder stimulation bringing into action an accelerator system rather than a "rebound" or "after-effect" phenomenon, is made more tenable and deserves further consideration.

8. Distension of the rectum results in contractions at this point. We have, however, been unable to verify the claim of Pearcy and Van Liere that contractions arise wherever the gut is distended. In fact, 15 to 30 cm. from the anus distension was followed by progressive relaxation. Defectory contractions were observed only when the balloon was close to the anus.

9. The jejunal contraction rate is remarkably constant varying very little from an average of 15.5 contractions per minute. This is not influenced in any way by changes in the respiratory rate.

Numbers 1, 2, and 6, corroborate the findings of others whose work is here cited.

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Dietary Requirements for Fertility and Lactation.* XVI. Potency of "Vitavose"† versus Dehydrated Yeast in Vitamin B.

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Yeast and wheat embryo are the 2 most potent sources of vitamin B. I have demonstrated[1] that, while a cold 75% ethyl alcoholic extract of 6.5 gm. whole wheat embryo per animal per day furnishes enough vitamin B for excellent growth, it is necessary to supply the same alcoholic extract of at least 22.4 gm. per lactating rat daily to furnish enough vitamin B for normal lactation.

* Research Paper No. 61, Journal Series, University of Arkansas.

† "Vitavose" is a commercial wheat germ extract manufactured by E. R. Squibbs & Sons, New York. It is used extensively by some nutritional laboratories as a source of vitamin B for growth.

[1] Sure, B., *J. Biol. Chem.*, 1927, lxxiv, 55.