At least 3 hypotheses may be offered. *First,* the original one, that the drug paralyzes the smooth muscle of the sphincter papillae. But if it is able to pass through the epithelium of the mucosa it should be absorbed into the circulation and produce a general reaction—a circumstance which rarely occurs. *Second,* that it reacts upon the cells of the mucosa in such a way as to liberate a secretin-like hormone, which activates the musculature of the gall bladder or sphincter. To test the former hypothesis, the common duct of a cat was severed, and the gall bladder filled with iodized oil. Eight hours after the operation, $MgSO_4$ was injected into the duodenum, but the gall bladder failed to respond, although when an equal amount of egg yolk was injected it contracted vigorously (Fig. 4).

The third hypothesis is that the drug stimulates the nerve endings in the intestine, thereby setting up local or spinal reflexes which dilate the sphincter at the end of the common duct. Similarly, the contraction of the gall bladder itself may be explained in 2 ways, either that its musculature is directly activated by a spinal reflex originating in the duodenum, or that the release of pressure in the biliary duct system caused by the opening of the sphincter, stimulates the local nerve net or afferent nerve endings in the wall of the gall bladder, thereby inducing reflex contraction of its tunica muscularis. Whatever the interpretation, there can be no question of the fact that when $MgSO_4$ is injected into the duodenum it induces marked contraction of a distended gall bladder and consequent expulsion of bile.

[1] Boyden, E. A., *Anat. Rec.*, 1926, xxxiii, 201-256.

[2] Boyden, E. A., and Parmacek, L., PROC. SOC. EXP. BIOL. AND MED., 1928, xxv, 462.

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Reflex Inhibition of the Human Gall Bladder.

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In a previous publication, one of the authors reported that merely drinking a glass of water resulted in a discharge of bile from the gall bladder.[1] In extending these observations to a large number of patients (10 in all) considerable variation was found, ranging from an individual with a discharge of 24 cc. of bladder bile after

a glass of water (case *G. B.*, Fig. 1) to one who reacted not by contraction but by dilation of the gall bladder (case *B. B.*, Fig. 1).

In discussing these extreme types with Dr. W. H. Petersen, the latter suggested that we might be dealing with persons who were differently oriented in regard to the autonomic nervous system. And, indeed, when these individuals were subjected to the Goetsch test, it was found that one extreme *(B. B.) was* markedly vagotonic, registering a decided fall of systolic blood pressure and of pulse rate after subcutaneous injection of adrenalin, and that the other *(G. B.)* was markedly sympaticotonic. No generalizations could be made about the intermediate cases.

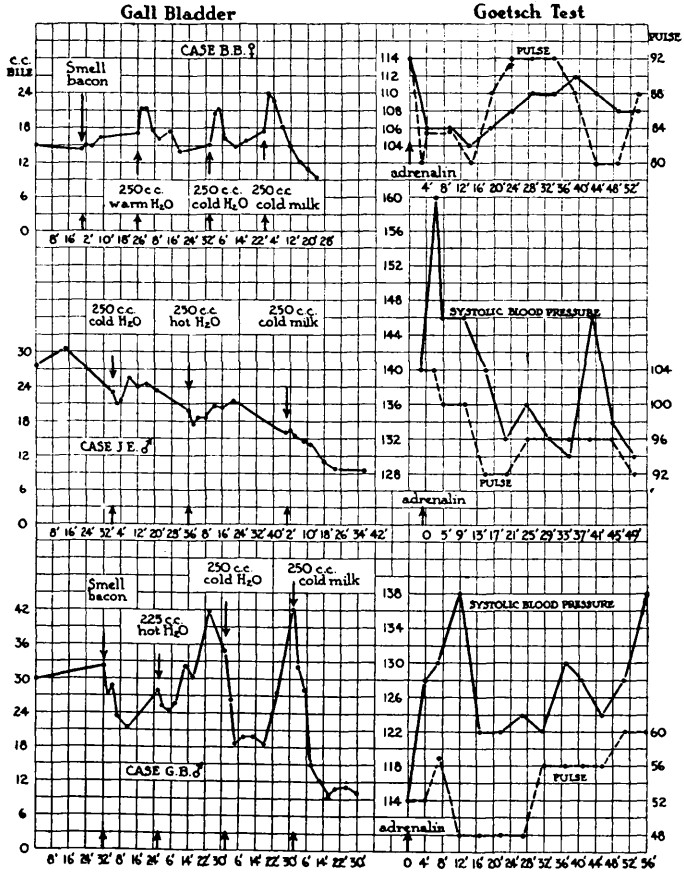

FIG. 1.

Selected graphs showing 3 types of reaction induced by drinking a glass of water. The 3 curves on the left record the changing volumes of the gall bladder; those on the right, the systolic pressure and pulse rate after subcutaneous injection of 0.5 cc. of adrenalin (1:1000). Case *B. B.*, student, age 19, wt. 115; case *J. E.*, student, age 21, wt. 130; case *G. B.*, technician, age 60, wt. 155.

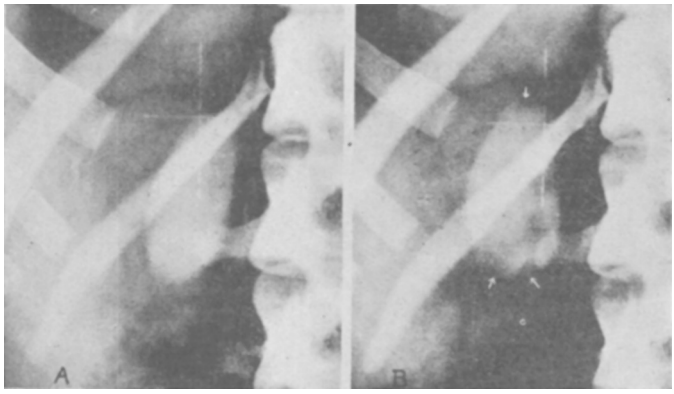

FIG. 2.

Selected cholecystograms (case *B. B.*). *A*, immediately before drinking glass of cold water; *B*, two minutes later. *Cross*, projected center of target engraved upon x-ray table.

Up to the present writing we have not been able to secure a gall bladder record of another case showing so marked a fall in pulse rate. But whether or not this reaction of the gall bladder proves to be characteristic of vagotonics, the present study is of value in that it has revealed a reversed type of response. In the individual in question (*B. B.*, Fig. 1) we secured sudden dilation of the gall bladder, after giving the patient a glass of warm water, of cold water and of milk. That this is not merely a filling of the reservoir following abrupt closure of the sphincter but is due to relaxation of the gall bladder musculature, is indicated by 2 observations: first, the rapidity with which the change takes place (see cholecystograms, Fig. 2); and second, the contrast which it presents to case *J. E.* (Fig. 1) in which there is a slow filling of the gall bladder after each response to water, without marked relaxation of its muscular tonus—a case which is probably characterized by so hypertonic a sphincter that even the contraction of the gall bladder after milk is relatively ineffective.

A similar case of dilation induced by forcible inflation of the duodenum through a Reyfuss tube, is presented in an accompanying paper (case *G. A. K.*, Fig. 1).[2] These 2 cases suggest that the gall bladder is under nervous as well as hormonal control. For we are unable to explain its rapid dilation in any other way than that of reflex inhibition of its musculature.

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[1] Boyden, E. A., PROC. SOC. EXP. BIOL. AND MED., 1927, XXV, 99.

[2] Boyden, E. A., and Saunders, A. M., PROC. SOC. EXP. BIOL. AND MED., 1928, XXV, 458.