serum in narrow agglutination tubes and add 0.02 c.c. of antigen to each tube. Incubate in water bath and read as in the case of the regular quantities described in the preceding paper. Although the total quantity employed in this test is only about 1/10 of the original one, the precipitates can nevertheless be seen with the naked eye. We would, however, recommend this test only in cases where it is extremely difficult or impossible to obtain larger quantities of serum.

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Contribution to the chemico-pharmacodynamic relationship of atropine and homatropine.

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The classical researches of Ladenburg on the structure of atropine and the synthesis of various tropeins led almost immediately to a wide therapeutic application of homatropine as a mydriatic. Inasmuch as the mydriatic action of atropine is known to be through the parasympathetic nerve-mechanism of the eye, namely, the paralysis of the parasympathetic endings of the oculomotor nerve, it has been generally assumed that the mydriatic action of homatropine or tropin-mandelate was of exactly the same nature. An examination of experimental data on the subject, however, gives no proof to support this assumption. In the present investigation, the author became interested in the pharmacology of homatropine in connection with a study of mandelic acid. This acid is closely related to benzaldehyde and indeed can be readily prepared from the latter by treatment with hydrocyanic acid and water. Inasmuch as the author has already shown that benzaldehyde possesses the antispasmodic or relaxant properties on smooth muscle which are exhibited by benzyl alcohol and certain benzyl esters, it was thought possible that the action of homatropine may be exerted, at least partially, directly on smooth muscle itself. A series of experiments tended to corroborate his view. In the first place, the action of homatropine on other parasympathetic nerve endings, such as the vagus terminals in the heart, is very much weaker than that of atropine. Whereas

a small dose of atropine completely paralyzes the vagus endings in the heart, so that electrical stimulation, even of great intensity, fails to inhibit the heart-beat, it takes about ten times as much homatropine to produce the same effect. In the second place, when such experiments on the vagus are performed it is interesting to note that injections of homatropine are followed by a fall in blood pressure and a vasodilatation which is obvious even to the naked eye, when the intestines are inspected. In the third place, a comparative study of atropine and homatropine on uterine, intestinal and other smooth muscle in vitro showed that the relaxant effect of homatropine was much greater than that of atropine. Furthermore, two other esters of mandelic acid which have been employed therapeutically were also found to exhibit marked antispasmodic effects on smooth muscle. These are antipyrin-mandelate, or *tussol* and eucain-mandelate, or *euphthalmin*. While antipyrin itself and eucain itself have very little effect on smooth muscle the mandelic acid esters of these substances were found to be markedly antispasmodic or depressant for that tissue. Finally, the author has prepared and studied the simple salts of tropic acid and mandelic acid themselves and found that whereas sodium tropate has little or no effect on the contractions and tonus of smooth muscle, sodium mandelate exhibits a relaxant action and when used in strong solution (5 to 10 per cent.), it was found to produce a mydriasis when instilled into a rabbit's eye. The above data indicate pretty conclusively that the mydriatic effect of homatropine is not entirely due to a paralysis of the parasympathetic innervation but is probably, at least in part, to be explained by direct action of the drug on the muscle cells themselves. Further work on the subject is in progress. The author is investigating the properties of benzyl mandelate. This investigation is supported, in part, by a fund from the Research Council of the American Pharmaceutical Society.