process. Very instructive in this connection is the work of Woglom. The spleen extirpated and then inoculated subcutaneously into the same animal induces resistance against growth of tumor. Extirpation of the spleen does not induce any resistance. If resistance is caused in this case by the live functions of the cells of the spleen, then they can act most effectively when the spleen is in situ, and the mice ought to have been naturally resistant. The explanation forces itself on one's mind that the spleen transferred under the skin is autolyzed or undergoes some other similar change.

That autolysis may be one of the means to which the organism resorts in order to elaborate protective substances, is shown by the very interesting investigations of Blum. He demonstrated that products of autolysis of normal tissue possess the power to neutralize tetanus and diphtheria toxins and cobra venom, and it is possible to save animals from death by injecting the products of autolysis subsequent to the injection of toxin.

This investigation is still in its beginning. Different tissues are tried and different methods employed to liberate the endocellular ferments. But the view-point, while new, seems to be correct and capable of stimulating further research, and it is therefore deemed advisable to give this short preliminary report of the present state of this investigation.

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The inhibitory effect of magnesium upon indirect and direct irritability of frog muscle and the antagonistic action of sodium and calcium upon this effect.

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Several series of experiments were carried out on frogs. In the first series magnesium chloride was injected into a lymph sac and subsequently nerve and muscle were stimulated at various times by induction shocks. Of the results obtained two will be mentioned: One is that indirect irritability gradually disappeared completely while direct irritability remained practically unchanged,

that is, on stimulation of the nerve plexus there was no response while on stimulating the muscle directly there was a good contraction. Such a result was seen by many observers and was spoken of as curare-like action. In a previous paper we have called attention to the fact that similar results can be obtained also by *perfusion* of the leg with solutions of sodium chloride and even with calcium chloride. The magnesium effect, however, is somewhat more pronounced. The second result is that the subsequent infusion of the muscles through the abdominal aorta, with calcium chloride, restores rapidly the abolished indirect irritability. This is similar to the observation of Auer and Meltzer on the antagonistic action of calcium to magnesium in mammals and is also similar to the antagonistic action of calcium to the curare-like action of sodium chloride.

In another series of experiments the muscles of the leg of completely curarized frogs were perfused with magnesium chloride. There was, of course, on account of the curare, no indirect irritability from the start. In these experiments it was found as an invariable result that magnesium definitely abolished or reduced the direct irritability. There was then a definite difference with regard to the direct irritability between the action of magnesium and that of curare and the problem presented itself as to how to reconcile this experience with that of the first series of experiments in which the lymph sac injection of magnesium chloride had practically no effect upon the direct irritability of the muscle.

In the following series of experiments, however, facts came to light which are capable of explaining this apparent contradiction. In this series, legs of normal frogs were perfused with magnesium chloride through the aorta and were later perfused with calcium chloride and sodium chloride in various orders. The following results were obtained. In the first place, in all cases magnesium chloride reduced definitely or even completely abolished also the direct muscle irritability ; but this effect was somewhat slower and not as pronounced as the effect of the magnesium upon the indirect irritability. Furthermore, when after the depression caused by magnesium, calcium chloride was perfused, it caused no recovery either of the indirect or direct irritability. When instead of the calcium the perfusion of sodium chloride followed that of mag-

nesium the direct irritability soon returned, but not the indirect. However, when now the perfusion of calcium chloride followed, the indirect irritability recovered also and quite rapidly. The meaning of these experiments seems to be simply this: magnesium depresses the direct irritability as well as the indirect, the latter, however, somewhat more effectively than the former. Sodium restores the depressed direct irritability and when used alone, exerts no effect upon the indirect irritability. Calcium alone helps neither the direct nor indirect irritability but when it follows sodium (or when given with sodium) it restores promptly the indirect irritability. We can now interpret satisfactorily the results of the lymph sac injections. In these intact animals sodium chloride is present in sufficient quantity in the blood to prevent the depressing action of the magnesium upon the direct muscle irritability and, furthermore, the accumulated quantity of the sodium is still sufficient to assist the subsequent injection of the calcium in the restoration of the indirect irritability. In this connection we may also suggest further that even the striking antagonistic results obtained by Auer and Meltzer with calcium in mammals might not be due to the calcium alone but to the combination of the injected calcium plus the sodium present in the serum.

The last mentioned facts are an instructive example of the difference in the results obtained by injecting into an animal with intact circulation and by perfusion of bloodless organs, a difference which is not always kept in mind by many experimenters.

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On the vaso-motor nerves of the stomach.

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In order to demonstrate the existence of vaso-motor nerves in the stomach, the following method was resorted to: Quantitative measurements of the vascularity of the stomach were made by means of a stromuhr; while at the same time attempts were made to vary the normal bloodflow through this organ by means of stimulation of the splanchnic nerves.

The stromuhr was inserted in the vena gastro-lienalis between