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The combined effect of magnesium sulphate and sodium oxalate upon rabbits.

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Our communication is concerned not with the prolonged, but with the *immediate* effect of the salts under discussion. The acute death of a rabbit which may occur within one hour or two after a subcutaneous injection of twenty-five or thirty centigrams of sodium oxalate per kilogram body-weight, is often preceded by a series of convulsions which may last fifteen to twenty minutes and which evidently are not due to asphyxia. Sublethal doses of ten or fifteen centigrams, which occasionally may cause some hypersensitiveness, are not followed by any serious symptoms. On the other hand death following subcutaneous injections of magnesium sulphate is ushered in, according to Meltzer and Auer, by paralysis without convulsions. Two grams of the salt (+ crystalline water) is a surely fatal dose; one gram and a half per kilo body-weight usually causes anesthesia and paralysis followed by recovery. Doses of less than one gram per kilo body-weight may cause a more or less definite state of drowsiness and weakness which is generally of short duration only. In no case of magnesium poisoning are the narcotic and paralytic symptoms complicated by convulsions or hyperesthesia.

The results which we have obtained in experiments with the simultaneous injections of both salts can be stated briefly as follows. *Simultaneous injections of small doses of magnesium sulphate and sodium oxalate in separate parts of the animal body seem to produce an effect equal to that of a larger dose of magnesium sulphate alone.* When, for instance, twelve or fifteen centigrams (per kilo body-weight) of sodium oxalate are injected subcutaneously into one side of the rabbit and eight or nine decigrams (per kilo body-weight) of magnesium sulphate are injected into the other side, the result is the development of such a degree of

complete anesthesia and paralysis as follows a subcutaneous injection of fifteen decigrams of magnesium sulphate alone. In other words the result of the injection of subminimal doses of sodium oxalate and magnesium sulphate is a greatly intensified effect, which, however, does not seem to correspond to a combination of the divergent effects of the two salts but corresponds rather to a summation of two subminimal doses of magnesium salt alone. There was this difference, however: the state of anesthesia and paralysis produced by the injection of the two salts lasted definitely longer than is usual after an injection of an effective dose of magnesium alone.

The results were constant; except for one or two failures at the beginning, the outcome of every experiment was in the direction stated above.

The experiments were undertaken on the basis of considerations which follow from the observations of Meltzer and Auer on the antagonistic action of calcium to magnesium, namely that the anesthetic and paralytic action of magnesium is rapidly reversed by an injection of calcium. As a consequence of this fact, it seemed probable that a reduction of calcium within the body might be capable of augmenting the depressing action of magnesium. Now we know that oxalates precipitate calcium salts in crystalloid solutions and also antagonize their effects in animal fluids, as is illustrated in the process of fibrin formation. It was therefore considered possible that oxalates, by reducing in some degree the calcium action within the body, might increase the effect of subminimal doses of magnesium. The results of our experiments seem to support this hypothesis.