

not begin before the lapse of six or seven hours. In the rigor after injection of a calcium salt the extensors mostly prevail irrespective of the original position. After treatment with magnesium salts the flexors prevail or the animal remains in the original position. The degree of the final rigidity after injection of a magnesium salt is not less than after similar introduction of calcium. The release from rigor appears earlier after injection of a calcium salt than after similar treatment with a magnesium compound. The administration of curare does not retard the calcium effect but it increases moderately the delaying effect of magnesium. The strong accelerating effect of a developed strychnin tetanus is not interfered with by magnesium. But the tetanus of a strong dose of strychnin can be completely suppressed and then the delaying effect of magnesium remains unimpaired. Calcium salts also hasten the heart rigor and magnesium salts delay it.

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**Restraint and promotion of tumor growth.**

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At a previous meeting of this society, we reported upon the promoting influence of heated tumor emulsion upon tumor growth in rats.<sup>1</sup> This evening we wish to report briefly the results obtained upon the re-inoculation of rats having tumors or having recovered spontaneously from them as affected by the injection of the heated emulsion of tumor cells and other substances.

The rats were grouped into several series as follows :

- (a) Rats with tumors undergoing spontaneous absorption.
- (b) Rats from which tumors after a degree of growth had disappeared spontaneously.
- (c) Rats which failed to develop tumors on primary inoculation.

At the time these experiments were carried on, the sarcoma was at maximum virulence and gave approximately one hundred per cent. of successful implantations. Of these a certain number later underwent retrogression, as always happens with this tumor.

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<sup>1</sup> Flexner and Jobling : This journal, 1907, iv, p. 156.

Before the effects of tumor and other emulsions are described, it is desirable to give the results of a control series of observations.

Into 249 rats already having one tumor were implanted second tumor fragments; 59 per cent. of these rats developed a second growing tumor. It was subsequently found that at the time of the second implantations some of the tumors were already undergoing retrogression, and as the rats which have recovered spontaneously are more refractory than rats with growing tumors, this percentage of successful secondary transplantations should properly be stated still higher.

Into each of 70 rats which had recovered spontaneously from growing tumors, a second implantation of tumor particles was made; 17 per cent. of these were successful.

Into 201 rats which had been inoculated once unsuccessfully with the tumor while its virulence was below the maximum, second implantations of the virulent tumor were made; 49 per cent. were successful.

With this series is to be compared the next to be given.

A group of rats in which the tumors were being absorbed or were entirely stationary was divided into halves. One half was injected with heated emulsion and ten days later with tumor. The tumor grafts grew in 60 per cent. of these animals. The other half received the tumor but no emulsion; the grafts grew in 36 per cent. The control series gave 100 per cent.

Taking a second group of rats in which the growing tumor was later absorbed, the same experiment was carried out. The rats not receiving the heated emulsion developed tumors in 9 per cent., while those receiving the emulsion developed tumors in 30 per cent.

We now return to a group of rats which having been injected with the heated emulsion and successfully inoculated with tumor subsequently recovered. A second injection of heated emulsion was given to one part and none to another. At the expiration of the ten day period, new tumor grafts were implanted with the effect of producing 30 per cent. of tumors in both series. Here again the control rats gave 100 per cent. of tumors. Hence it appears that no such discrepancy in promoting effects arises from a second as from a first injection of the heated emulsion. But what is equally surprising is the high percentage of successful secondary

graftings in this group of animals as compared with the low percentage in those spontaneously recovering without the emulsion, namely 30 as compared with 9 per cent. If, however, this group be compared with the group in which after spontaneous recovery heated emulsion was injected for the first time and followed by new grafts, the percentage of successful re-inoculations is identical in both, namely 30 per cent.

It would be premature to attempt a discussion of this interesting and unexpected fact, since it seems to imply that by the injection of the heated emulsion a state of susceptibility to tumor implantations can be preserved while, at the same time, the originally implanted tumor has suffered spontaneous absorption.

The next experiment was devised to determine the effects to be obtained from rat serum. Four sera were employed: (*a*) From normal rats; (*b*) from rats which did not develop tumors after repeated inoculations (normally immune); (*c*) from rats in which the tumors disappeared spontaneously (artificially immune); and (*d*) from rats with growing tumors. Bouillon and horse serum were used as controls. All specific effects were absent, that is, the sera neither inhibited nor promoted the growth of the grafts, while the bouillon seemed to be somewhat, and the horse serum rather more, inhibitory.

Finally, heated and unheated emulsions of various organs, liver, spleen, kidney, muscle and testicle were tested. No promotion or inhibition of growth was noted. With this experiment was combined still another test with the heated and unheated tumor emulsion. All the animals, controls included, received grafts of the same tumor on the same day, that is, ten days after injection of the emulsions. The control rats and the rats injected with organic emulsions gave 80 per cent. of successful implantations. The rats which received unheated tumor emulsion showed 60 per cent. and those which received heated tumor emulsion showed 100 per cent. of growths.