a simple and possibly a successful method to treat and control this serious epidemic disease. Before applying this method to clinical trial here in China, we have endeavored to study its effectiveness in experimental infections. So far, the results obtained seem to indicate that with the dose employed, a significant protection has been obtained by means of this immune horse serum. The exact dosage and the possible therapeutic use of the serum after the appearance of the fever are subjects now under study.

We wish to acknowledge our indebtedness to Professor Zinsser of Harvard Medical School, Boston, for a liberal supply of immune serum, and to Dr. J. Chang of the Catholic University, Peiping, for the typhus strain used.

8111 P

Effects of Cobra Venom on the Fujinami Rat Sarcoma.

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Calmette[1] has reported that the injection of cobra venom into a mouse carcinoma brought about a very rapid disappearance of the tumor, and he suggested that cobra venom might be of value in the treatment of other tumors. Monaelesser and Taguet[2] injected cobra venom into the carcinomas of man, and they reported encouraging results.

Our experiments were performed for the purpose of determining the effect of cobra venom when injected into the Fujinami rat sarcoma. The minimum lethal dose of cobra venom for white rats, weighing from 150 to 250 gm. each, was found to be one cc. of a 1:10,000 dilution. The solutions of cobra venom used were prepared according to the following technic described by Calmette. A 10% solution of desiccated cobra venom in normal saline was prepared and heated at 72°C. for 30 minutes. The solution, including the precipitate which was formed, was then centrifuged, and the clear portion was placed in ampoules and kept as a stock solution.

Series 1. Five rats were inoculated with bits of the Fujinami rat sarcoma which reached an average size of 0.5 x 0.5 x 1 cm. in

1 Calmette, A., *C. R. de l'acad. de Sc.*, 1933, **197**, 205.

2 Monaelesser et Taguet, C., *Bul. de l'acad. de Med.*, 1933, **109**, 371.

10 days. The injections, which were always made in different parts of the tumor, were then begun, the first of which consisted of 1 cc. of a 1:100,000 dilution of cobra venom. Subsequent injections of 1 cc. were given every other day, but the concentration of cobra venom was gradually increased until at the fourth injection a concentration of 1:25,000 was reached. By the time that the seventh injection had been given the tumors were from 3 to 5 times their size at the time of the first injection, and the skin was beginning to ulcerate. Each animal was then killed. At autopsy, without exception, a large part of each tumor was necrotic. However, there remained a considerable amount of tumor tissue which appeared uninjured.

Series 2. Twelve rats, varying in weight from 100 to 290 gm., were inoculated with bits of Fujinami rat sarcoma. Two weeks later the tumors of 10 of these rats were injected with cobra venom, the doses being from 1 cc. of 1:100,000 to 1:50,000 dilution given every other day. An attempt was made to inject only the peripheral portions of the tumors. The remaining 2 rats had their tumors injected in a similar manner with 1 cc. of physiological saline solution instead of with cobra venom. The 10 experimental animals died after having received from 4 to 8 injections of the venom. The 2 control animals were then killed. The autopsy performed in each instance revealed that there was extensive necrosis in the tumors which had received cobra venom while those in which the normal saline had been injected were free from any damage. However, the size of the tumors in the experimental and in the control animals was the same.

Series 3. Twelve rats, weighing an average of 300 gm. and which had been given cultures of Sporotrichum for over a year in connection with another experiment, were inoculated with the Fujinami rat sarcoma in the usual manner. At the end of 24 hours, and every 48 hours thereafter, injections of cobra venom were made into or around the tumor. During the first 5 days, it was difficult to determine the exact spot where the tumor transplant was, but it then became palpable in every animal.

Four rats were treated with physiological saline solution, and 8 were given cobra venom, beginning with a 1:100,000 dilution and ending with 1:12,000 dilution. Four rats died after receiving only 2 injections of cobra venom, and at autopsy only a small area of necrosis was found in the tumors. Two other animals died after 7 injections of cobra venom. The remaining 2 rats were given no more venom but were kept 36 days longer together with the 4 control rats.

At the end of this time the tumor in each animal occupied the whole abdominal area. There was no ulceration or discharge. The 6 animals were killed and at autopsy no metastases were found. The tumor in each control animal was highly vascular and no necrotic areas were observed. In each experimental rat the tumor consisted of a thin layer of active sarcomatous tissue which surrounded an extensive central area containing a large amount of hemorrhagic fluid.

Conclusions. These data indicate that cobra venom is a destructive agent for the cells of the Fujinami rat sarcoma, but its therapeutic value is limited because of its localized action on the tumor cells, leaving the unaffected cells free to grow at a rapid rate.

8112 P

Effect of Intracisternal Injections of Acetylcholine.

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Dogs under ether anesthesia were used for all the experiments. Blood pressure and respiration were recorded. Intravenous injections of acetylcholine were given through a cannula in the femoral vein and the intracisternal injections were given through a needle previously introduced into the cisterna magna. The needle was kept in place throughout the experiment.

In a series of 11 dogs intracisternal administration of acetylcholine gave an elevation of blood pressure in all the animals. In some of them an exaggeration of respiration, particularly in its amplitude, was observed. There was no case in which respiration was arrested. The initial dose for an appropriate response varied from 1-10 gamma. With subsequent intracisternal injections, increasingly larger doses were required to produce a similar rise of the blood pressure. The rise became less sharp but more prolonged with successive injections. Sectioning the vagi and atropinizing the animal abolished the intravenous but not the intracisternal response to acetylcholine. The intravenous response was invariably depressor.

Acetylcholine applied directly to the floor of the exposed IVth ventricle also produced a rise in blood pressure. The site of stimulation is now under investigation.