significance with reference to the epidemiology of the disease. At this late period, the virus no longer survives in the nervous system. Indeed, the virus has not been detected in the nervous system after the lapse of three or four weeks, and often not after the first few days following the appearance of the paralysis. We have just demonstrated the virus in the nasal and pharyngeal mucosa of a monkey which survived the paralysis more than four weeks, and failed, in the same animal, to detect it in the spinal cord.

These observations indicate that monkeys successfully inoculated become, in some instances after recovery from the effects, passive carriers of the virus. Whether the same fact will prove to be true of human beings remains to be determined. In no instance has the nasal and pharyngeal mucosa of a person who has succumbed to epidemic poliomyelitis been examined for the virus. It has now become imperative to make such examinations; for on the results will depend in considerable degree the measures which will come to be adopted to control the spread of the infection.

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CULTIVATION IN VITRO OF RAT SARCOMA

A STUDY IN IMMUNITY*

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In a recent note¹ we showed that the method of cultivating tissues *in vitro*, devised by Harrison for the study of the developing nerve-fiber in frog embryos, and applied with modifications to the tissues of higher animals by Carrell and Burrows, could be adapted easily to the transplantable sarcomata of rats and mice. The present paper is concerned with the application of this method to the investigation of the nature of tumor immunity.

The phenomena of resistance and susceptibility to the inoculable tumors of these animals have been exhaustively studied. It may be stated summarily that immunity to tumor growth does not correspond to any of the types of immunity produced by the reaction of the body to infective organisms and their products. Specific antibodies have never been demonstrated in the blood-serum of animals immune to cancer. Moreover, Russell² has shown that, in immune mice, inoculated cancer tissue fails to grow because of the absence of a specific stroma reaction on the part of the host, and not because of the presence of cytotoxic or cytolytic substances acting on the implanted grafts. Or, stated differently, in immune animals, the implanted cancer cells lose their power of calling forth a stroma reaction. Notwithstanding the absence of a stroma, the tumor cells remain alive and proliferate for eight to ten days.

Sarcoma cells growing in blood-plasma find in the fibrin network an artificial stroma, so that the influence of the plasma alone may be held accountable if sarcomatous tissue, which grows very readily in normal plasma, fails to grow in the plasma of immune animals.

Two kinds of immunity to cancer are recognizable, natural and artificial. The percentage of naturally

immune animals (nullers) varies with age and with different varieties and strains. Old animals are, as a rule, less susceptible than young. Artificial immunity may be induced by the injection of suitable quantities of certain tissues, as, blood, spleen, embryonic tissues, etc.

In the present experiments we have used five types of immune animals: (1) nullers from a strain of rats in which sarcoma inoculations yield 80 to 90 per cent. of "takes"; (2) nullers from a hooded variety of rats in which the percentage of "takes" is only twenty to thirty (racial immunity); (3) immune old animals whose immunity was most probably attributable to their age; (4) animals immune to both rat sarcoma and carcinoma, and which had received immunizing doses of mouse sarcoma (pan-immunity); and (5) artificially immunized rats. We have used the plasma from animals of each of these five types of immunity, and have found that rat sarcoma grows in all without exception. The character of growth differed in no essential way from that observed in control specimens in which normal rat plasma was used. These results are in harmony with the observations of Russell which we have mentioned already.

THE INOCULATION OF RATS WITH SARCOMA GROWING IN VITRO

To test the viability of sarcomatous tissue growing *in vitro*, we have inoculated rats with pieces of sarcoma which had grown for three days at 37 C. in normal rat plasma and have obtained tumor growths. In the same way sarcoma growing in the plasma of immune rats has been transmitted to normal animals. The plasma from immune animals does not seem, then, in this short time, to influence deleteriously the subsequent growth of sarcoma tissue when this is inoculated into animals.

SUBCULTURES

Sarcoma growing *in vitro* may be readily grown in subcultures by transferring the original piece or a portion of the outgrowth to new plasma. Prolongation of life seems dependent only on the renewal of the medium. We have specimens growing at present which have been subcultured in this manner five times at intervals of two to four days. The plasma used was obtained from normal and immune animals, and the growth was as vigorous in the one as in the other.

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Local Cutaneous Reaction to Sodium Glycocholate in Syphilitics.—Loeper and Desbouis state that intradermal injection of a drop or two of a 0.5 or 0.2 per cent. solution of sodium glycocholate failed to cause any reaction in sixty-three healthy persons or those with non-venereal affections, while a pronounced local reaction followed invariably in eighty-one persons in the first, second or third stage of syphilis, with only a single exception in the latter class. A positive reaction was also obtained in one of nine patients with tabes dorsalis or paresis. The local erythema or ulceration developed from the eighteenth to the thirty-sixth hour and persisted for from two to five days. The findings with this "dermo-reaction," as they call it, paralleled with precision the Wassermann reaction and the Porges precipito-reaction. As there is nothing specific about the sodium glycocholate, the reaction, they state, merely indicates some profound biologic modification of the organism by the parasite and, like all biologic reactions, is not of invariable occurrence. It gave useful information in their experience in several dubious cases, differentiating the syphilitic from tuberculous and other ulcerations, etc. Their communication is published in the *Progrès Médical*, Jan. 21, page 231.

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2. Russell, B. R. G.: Nature of Resistance to the Inoculation of Cancer, Third Scientific Report of the Imperial Cancer Research Fund, 1908.