the bilirubin content of the edema fluid and of the serum, and also that for a given concentration of bilirubin in the serum, its concentration in the edema fluid is in general higher, the higher the protein content of the fluid.

9503 P

The Distribution of Material Inoculated into the Monkey Brain.*

M. SCHAEFFER AND R. S. MUCKENFUSS.

From the Bureau of Laboratories, Department of Health, New York City.

When conducting experiments with poliomyelitis virus, intracerebral inoculations are used extensively since monkeys are most consistently infected by this route. However, no data are available concerning the subsequent distribution of material inoculated in this manner. A large series of experiments was performed by us, in which the resultant neutralizing action of immune serum upon the virus was tested by direct inoculation of the mixtures into the brains of monkeys. During the course of this work numerous discrepancies in the results were observed. In an effort to account for the variations, among other factors, the influence of the method used to inoculate the serum-virus mixtures into the monkey brain and the eventual course of the material from the site of inoculation following its deposition were studied. The dispersion of the inoculum was followed by the addition of India ink to the mixtures.

Experiment I. 1.5 cc. of human serum was mixed with 1.5 cc. of a Berkefeld filtrate of a 5% virus suspension. This was the usual mixture which we had used in our neutralization test experiments. To this mixture 1 cc. of India ink was added. After thorough mixing, the material was injected into the right frontal lobes of 4 monkeys *(Macacus rhesus)*, each receiving 0.25 cc., 0.5 cc., 1.0 cc., and 2.0 cc. respectively, with a tuberculin syringe carrying a ¾-inch, 26-gauge needle which was inserted through a small trephined opening made on the frontal bone approximately 1 cm. to the lateral right of the mid-line and 1 cm. anterior to the coronal suture. At the end of 2 hours, the monkeys were chloroformed and their brains and spinal cords examined at autopsy. The results are summarized in Table I.

Experiment II. A second series of 4 monkeys was inoculated in a

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TABLE I.

The Diffusion of Material Inoculated Intracerebrally (Right Frontal Lobe) Throughout the Central Nervous System as Evidenced by the Distribution of India Ink Contained in the Inoculum.

Monkey No.	Amount of Mixture Injected cc.	Appearance of the Central Nervous System 2 Hours after Injection
1.	0.25	There was evidence of seepage of the material from the brain substance into the subarachnoid space above the site of inoculation. Some hemorrhage at the site of inoculation was also noted. No India ink was observed on the spinal cord.
2.	0.5	When the monkey was chloroformed, leakage was observed to be still taking place externally at the site of injection. Upon flapping back the scalp, India ink was found to be deposited around the trephined opening and the surrounding area. The material had diffused throughout the surface of the brain, cerebellum, and the entire length of the spinal cord. Sections at the site of inoculation showed that the injection had probably been made directly into the lateral ventricle.
3.	1.0	This monkey had been used in a neutralization test 2 months previously and therefore, as is often observed, had a sterile necrotic abscess in the right frontal lobe at the previous site of inoculation. Upon examination it was noted that some India ink had seeped into the subarachnoid space, but the bulk of the inoculum was found to be confined to the cavity on the right side.
4.	2.0	The entire surface of the brain and cord of this animal was covered with India ink indicating the extensive seepage of the inoculum from the site of inoculation into the cerebrospinal fluid.

manner similar to those in Experiment I. In this group, 2 monkeys received 1.0 cc. and 0.25 cc. respectively, of the serum-virus-ink mixture with a ¾-inch, 26-gauge needle and 2 others were injected with 1.0 cc. and 0.25 cc, respectively, using a ½-inch, 26-gauge needle. After 2 hours, the animals were sacrificed and their brains and cords examined at autopsy. The findings are summarized in Table II.

From this study, two points become evident. Firstly, that very little of the material inoculated remains at the site of inoculation, but a large proportion of it finds its way into the cerebrospinal fluid either by seeping backward through the path of inoculation into the subarachnoid space or *via* the ventricles into the spinal canal. This seems to be most marked whenever large amounts or longer needles are employed for inoculation. Secondly, that despite all precautions to obtain uniformity in the manner of injection, the re-

sults of intracerebral inoculations are variable in so far as the ultimate distribution of the inoculum is concerned.

TABLE II.

Comparison of the Diffusion of Material Through the Central Nervous System after Intracerebral Inoculation with Needles of Two Sizes.

Monkey No.	Amount of Mixture Injected, cc.	Size of Needle, inch	Appearance of the Central Nervous System 2 Hours after Injection
1.	1.0	½	The entire surface of the right frontal lobe up to the fissure centralis was covered with India ink. No ink was observed on the opposite hemisphere nor on the spinal cord. Sections examined at the site of inoculation indicated that the inoculum had been deposited in the brain substance and the site of inoculation just below the cortex was slightly distended. Some of the material had seeped backward and entered the subarachnoid space. No ink was found in the spinal canal.
2.	0.25	½	The general appearance of the brain and cord of this animal was similar to the one above, except that there was less distension of the brain tissue at the site of inoculation.
3.	1.0	¾	The entire cerebral hemisphere opposite to the side inoculated was completely covered with India ink. Ink was also present in all of the ventricles, at the base of the brain, and on the surface of the spinal cord.
4.	0.25	¾	No ink was observed on the surface of the brain, but it was abundant on the surface of the spinal cord. Sections of the brain revealed a considerable quantity of ink in the lateral ventricle.

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Converse Effects of Stimulating Opposite Ends of a Cardiac Muscle Band.

JANE SANDS ROBB AND ROBERT C. ROBB.

*From the Departments of Pharmacology and Anatomy, College of Medicine, Syracuse, N. Y.**

No interpretation of a given phenomenon can be considered final until verified by its application to reproduce that phenomenon. Such a demonstration has hitherto not been available to elucidate the mechanism and pathways of cardiac excitation. The problem may

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