residue. Comparisons with the adjacent stained serial sections show that these cross bands of heavy ash deposit correspond very well with the Q, or anisotropic discs seen in ordinary preparations. The striations which are ash-free are in all probability the remains of the J, or isotropic bands.

In favorable preparations a fine line of ash may be seen traversing the J band. This disc corresponds to the Z, or intermediate band of the J striation. In some instances a differentiation of the Q band of ash can be distinguished. When this happens there is a definite row of twin deposits of mineral material. This appearance is especially striking in cardiac muscle. In skeletal muscle the sarcolemma shows as quite a distinct line of whitish ash in which there are some deposits of silicates. Cardiac muscle does not present as sharp an outline of each muscle fiber. In many instances it is possible to find isolated myofibrils with their characteristic bands of ash-bearing and of ash-free substances.

Thus far it has not been possible to distinguish any deposits of ash similar in form to the intercalated discs of cardiac muscle. Structures which are in all probability motor end plates show as a fine, heterogenous mass of mineral material with little or no orientation of the deposit. The nuclear ash of the skeletal muscle cell shows as a dense deposit at the periphery, while in heart muscle it is found in the center of the fiber. Simple chemical tests indicate that the nuclear ash is largely calcium. No striking differentiation of the ash deposit of the Purkinje fibers has yet been noted.

5881

Evidence of Possible Occurrence of Anaphylactic Phenomena in Poliomyelitis Immune Monkeys.*

WM. B. BREBNER. (Introduced by E. V. Cowdry.)

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In connection with a series of experiments whereby monkeys are injected intrasplenically with poliomyelitis virus and subsequently develop an appreciable immunity, my attention has been drawn to a phenomenon which may be evidence of an anaphylactic reaction.

Monkeys convalescent from an experimental infection and there-

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fore immune, monkeys experimentally immunized, and a small group of monkeys proving naturally immune, if injected intrasplenically or intraperitoneally with virus will invariably die. Death may be either sudden while injection is still in progress or may follow the injection by some days when the intervening period is characterized by increasing weakness. Sudden death is usually seen when the virus is administered intrasplenically and the lingering one is typical of the intraperitoneal administration.

This reaction has only been observed after 47 days or more have elapsed since immunization was commenced or the abortive infection occurred. Immediate death has always taken place while the animal was under ether anesthesia. Respirations become rapid and shallow, soon inspiration becomes spasmodic and expiration passive and prolonged. The interval between inspiratory efforts increases, and finally efforts cease. Post mortem reveals that the lungs are collapsed and the heart is still beating. Microscopically in these cases one finds mucosal hemorrhages in the gut, a degree of central necrosis in the liver and hemorrhage into the medulla of the suprerenal. The spleen shows the same changes as do all monkeys which have received polio virus.

The first group consists of 3 monkeys. The first two had recovered from an infection with the well-known Flexner "mixed-virus", receiving an intracerebral dose of 0.01 cc. and 0.3 cc. respectively of a Berkefeld 'N' filtrate of a well-centrifuged 5% suspension. The third monkey had received 1 cc. of a 20% centrifuged suspension of cord material obtained from a human case. The first 2 monkeys died while receiving the intrasplenic dose, the third survived 4 days, growing progressively weaker, finally became moribund and had to be sacrificed.

The second group consists of 4 experimentally immunized monkeys. These animals had received virus intrasplenically from 72 to 200 days previously and had a slight but recognizable titre of circulating antibodies as revealed by the neutralization test. The first 3 received the second dose of virus intrasplenically and died on injection. The fourth received virus intraperitoneally and growing gradually weaker was killed after 8 days while in a moribund state.

The third group consists of 2 monkeys which were apparently naturally immune for on 2 occasions each was injected intracerebrally with potent virus and showed no signs of infection. Monkey No. 167 died immediately on receiving the intrasplenic injection, while No. 253 survived a similar injection for 4 days and finally had to be sacrificed because of extreme weakness.

In an attempt to ascertain whether this reaction was induced by virus, or the nerve tissue necessarily mixed with virus, the convalescent monkey, first group, was injected intrasplenically with a heavy suspension of normal monkey brain and cord tissue. There was no reaction at the end of 5 days so the animal was re-injected in the same fashion with virus and death was immediate. One additional monkey which had been injected with virus intrasplenically without showing detectable virucidal antibodies at any subsequent date was also injected intrasplenically with normal monkey brain and again without untoward effect.

From these experiments it would appear that this peculiar reaction is due to the interaction of the virus antigen and antibody. One other possibility exists, namely, a sensitization of the monkey to some particular protein degradation product produced in nerve tissue by virus action. Hindle[1] has described a comparable reaction in monkeys immunized to yellow fever virus and reinjected after 3 to 4 months.

If this reaction be due to virus it may provide a means of determining whether more than one strain exists in this country and abroad. When virus has been sufficiently purified certain of these reactions will be reexamined.

5882

Active Immunity to Endemic Typhus Fever as Produced by Formolized Infected Tissue.

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Formolized tissue *(Tunica vaginalis)* prepared according to Zinsser's method[1] and administered intraperitoneally in 4 weekly doses of 1 cc. each to non-infected guinea pigs brought about in test animals an immunity to at least 200 times enough virus to cause a scrotal reaction in 4 days. One cc. of a 1-10 saline emulsion of tissue taken at the height of reaction contained at least 200 times enough virus to cause a typical typhus reaction in the male guinea pig after 4 days.

[1] Hindle, E., *Med. Res. Council*, 1930, **7**, 460.

[1] Zinsser, H., and Batchelder, A. P., *J. Exp. Med.*, 1930, **51**, 847.