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Nuclear Changes of Nerve Cells in Acute Poliomyelitis.

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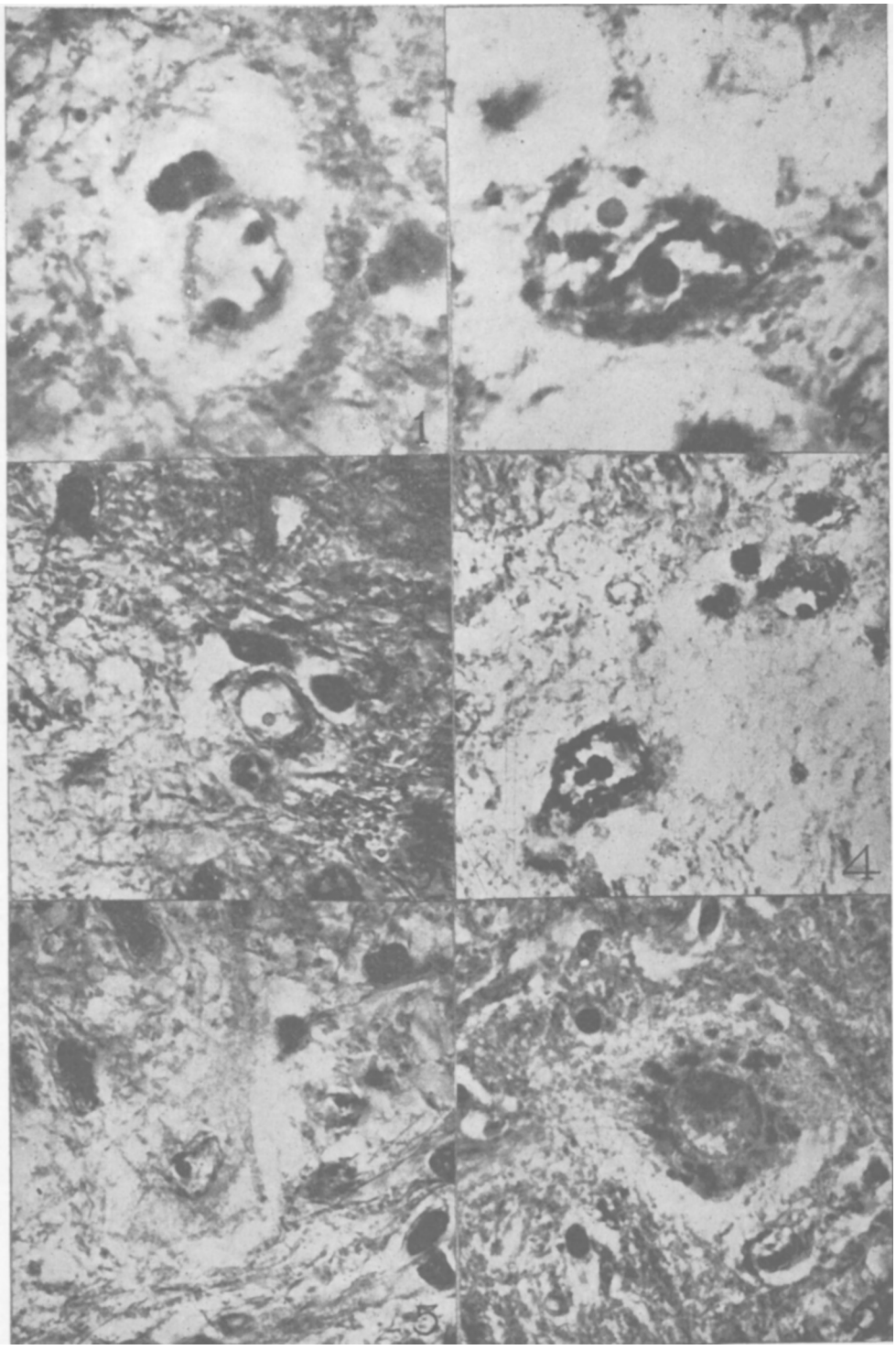
The pathology of acute poliomyelitis in monkeys has recently been described by Hurst[1] with special reference to changes in microglia. The object of the investigations reported here has been to supplement the above by a description of the injured nerve cells which so far in the course of the disease have escaped digestion by neuronophages. Thus certain nuclear changes in ventral horn cells and cells of the medulla have been found to follow or occur simultaneously with the more easily recognized cytoplasmic degeneration which may be profound.

Central nervous system tissues of 33 monkeys dead of poliomyelitis, or sacrificed at various stages during the course of the disease, were fixed in Zenker's fluid and stained with Giemsa for routine work. For comparison the tissues of 10 normal monkeys were available. Fixation has been supplemented by methods of Carnoy, Champy, A. O. B., Regaud, etc., and numerous staining methods have been employed including erythrosin-azur, phloxine-methylene blue, hematoxylin-eosin, phosphotungstic hematoxylin, etc. Sections for study were cut 3 to 5μ in thickness.

Areas of the cord showing lesions typical of acute poliomyelitis contain a number of faintly stained nerve cells. The cytoplasm of these cells is badly damaged and in some instances appears to be lacking. The nucleus, on the other hand, is usually severely altered but retains a nuclear membrane. It may be large and clear, presenting an appearance similar to a nuclear change described by Cowdry and Kitchen,[2] Plate V, Fig. 48, for liver cells, in cases of yellow fever. The nucleolus may be absent, broken up and plastered against the nuclear membrane, or displaced in position and ragged in shape. Usually the nucleus of these cells contains one or more acidophilic-staining bodies (Figs. 1-5), definite in their outline, and measuring from about 0.25μ to 3μ in diameter. They are surrounded by a distinct halo. The bodies can be seen in freshly isolated ventral horn cells. In fixed preparations they react negatively to the Feulgen test for thymonucleic acid, and are not doubly refractile to polarized light.

[1] Hurst, E. W., *J. Path. and Bact.*, 1929, xxxii, 457.

[2] Cowdry, E. V., and Kitchen, S. F., *Am. J. Hygiene*, 1930 xl, No. 2, 227.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The presence of these bodies in considerable numbers in cords of animals sacrificed shortly after the onset of paralysis, with fewer in animals sacrificed in later stages of paralysis (1 to 3 weeks), indicates a fluctuation in their numbers with the course of the disease. They have been observed in tissues of all monkeys sacrificed at the onset of paralysis. Whether these bodies are pathognomic of the disease remains to be determined. In any case their relation to the formation of inclusion bodies described for other filterable virus diseases might prove of value, since a splitting of the acidophilic and basophilic fractions of the nucleus is a step in the formation of specific inclusion bodies for many of these diseases. Perhaps they represent a form of oxychromatic degeneration similar to that described by Nicolau and Galloway[3] for Borna disease, and might occur in other virus diseases as well. So far, it is true that they are to be seen only in cells undergoing marked degenerative changes, but further studies may reveal earlier stages in less altered cells.

DESCRIPTION OF PLATE.

FIG. 1. Ventral horn cell from the lumbar region of the cord. Its cytoplasm is badly damaged and contains a single polymorphonuclear cell. The nucleus is clear and large with an acidophilic body at either end. Remnants of basophilic chromatin are to be seen on the nuclear membrane. X 1600.

FIG. 2. Nerve cell of the medulla containing two acidophilic bodies separated by a basophilic strand. Note the presence of the nucleolus slightly below and to the left of the upper body. X 2400.

FIG. 3. Ventral horn cell containing a single acidophilic body in a clear nucleus, with basophilic chromatin arranged on the nuclear membrane. Three neuronophages are to be seen in the cytoplasm. X 1150.

FIG. 4. Two nerve cells in the area of a lesion of the medulla, containing acidophilic bodies with basophilic chromatin in large amounts about the nuclear membrane. X 1150.

FIG. 5. Ventral horn cell with a single body at this focus. The cytoplasm is vacuolated and severely damaged. X 1150.

FIG. 6. A ventral horn cell showing the normal appearance of the cytoplasm and considerable acidophilic chromatin. X 1150.

[3] Nicolau, S., and Galloway, I. A., Medical Research Council, Special Report Series, No. 121, 1928.