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HISTOPATHOLOGY OF THE BRAIN AND SPINAL CORD IN A CASE PRESENTING A POSTINFLUENZAL LETHARGIC ENCEPHALITIS SYNDROME

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The occurrence of small epidemic foci of epidemic encephalitis in Iowa during the spring of 1919 raises the question of a new disease entity that can reach its ultimate solution only by the publication of necropsy studies and careful pathologic examinations, bearing in mind always the toxic or infectious origin of the changes. Clinically it is not always possible to differentiate toxic ophthalmoplegia with lethargy from Heine-Medin's disease, or botulism with ophthalmic symptoms.

REPORT OF CASE

History.—Through the courtesy of Dr. C. P. Howard, professor of internal medicine, it is possible to present the case of F. T. (Clinical No. 6075), a man, aged 37, who in January, 1919, had an attack of influenza followed by pneumonia from which he apparently completely recovered. On March 25, he was admitted to the university hospital complaining of pain and weakness in the arms and legs. Following his admission he became progressively worse, developing a typical syndrome of lethargic encephalitis which included (1) sleeplessness followed by drowsiness with nocturnal delirium, that deepened into a stupor from which he could be roused to answer questions intelligently; (2) cranial nerve involvement shown by early transient diplopia, ptosis, mask-like facies and difficulty in swallowing; (3) spinal cord symptoms shown by a late loss of knee jerks, incontinence of urine and feces and rigidity of the neck. Death occurred April 10, 1919.

Necropsy.—The brain weighs 1,530 gm. The dura is free, thin, with congestion of the blood vessels. The superior longitudinal sinus contains no thrombus. On cutting the dura, a large amount of cerebrospinal fluid escapes. The pia-arachnoid over the base and convexity is thin and transparent, with congestion of the pial vessels. It strips with ease. The convolutions are well formed but slightly flattened. In the left frontal region there is a pin-point cortical hemorrhage. The basal blood vessels show no sclerosis and are moderately filled with blood.

Longitudinal section through the middle of the thalamus shows the gray and white matter well differentiated. The lateral ventricles are normal in size.

The ependyma is smooth and there are no cysts in the choroid plexus. The blood vessels of the cerebrum, especially in the centrum ovale and the basal ganglions, are congested and the lymph spaces widened. The pons and medulla show congestion and hyperemia.

The cerebellum shows no gross pathology.

The blood vessels of the spinal cord, especially those over the dorsolumbar region of the cord, are markedly congested, showing distinctly through the dura mater. On section, the cord shows brownish areas bordering the lateral portion of the horn and in the posterior columns symmetrically placed; and reddish or pinkish areas extending in radially from the periphery of the cord. The differentiation between the gray and white matter is not distinct, and the color is a dirty gray (Fig. 1).

Specimens from the brain and spinal cord were hardened in alcohol or in 10 per cent. formaldehyd and stained with thionin, Mallory's phosphotungstic acid hematoxylin, Herxheimer's fat stain, hematoxylin and eosin and osmic acid.

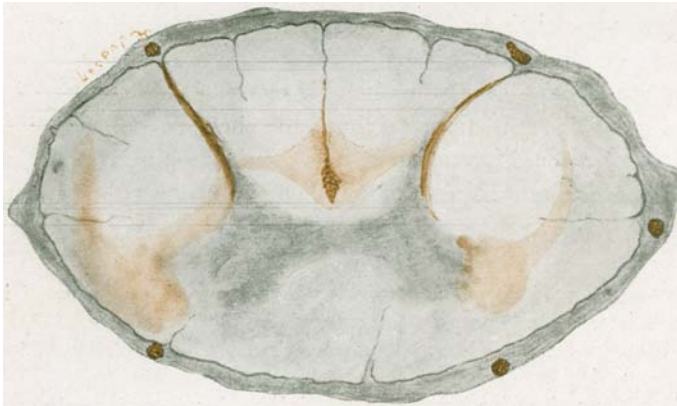


Fig. 1.—Dorsal region of the spinal cord showing a loss of differentiation between the gray and white substance, congestion of the pial blood vessels, and brownish areas of extravasated blood. Drawing from gross specimen, unstained; $\times 8$.

Sections from different portions of the cerebral cortex stained with thionin show, especially in the frontal and anterior central convolutions, a disturbance of the cortical architectonics which is chiefly due to congestion of and infiltration about the blood vessels. There is an increase in the number of nuclei within the vessel walls, and a deposit of bluish staining granules. Yellowish pigment granules are also found either free in the vessel wall or deposited within epithelioid cells. With sudan III these granules are brilliant red. A few lymphocytes and plasma cells are present in the perivascular spaces. There is no new blood vessel formation. The marginal glia feltwork is denser beneath a slightly thickened pia-arachnoid, and there is an increase in the number of nuclei in the marginal zone. The nerve cells in the ganglion layers show a loss of the Nissl bodies. The cell outline is rounded, and the nucleus is often

eccentric. The cytoplasm may show vacuolation or reticulation. Three to five satellite neuroglia cells are occasionally seen at the base of the large pyramidal cells.

Scattered irregularly through the cortex there are small, round, deeply staining masses of nuclear substance, which are about one third the size of a small neuroglia nucleus. In size and staining reaction they suggest neuronophages, but in their distribution they bear no relationship to nerve cells. A few rod cells are present (Fig. 2).

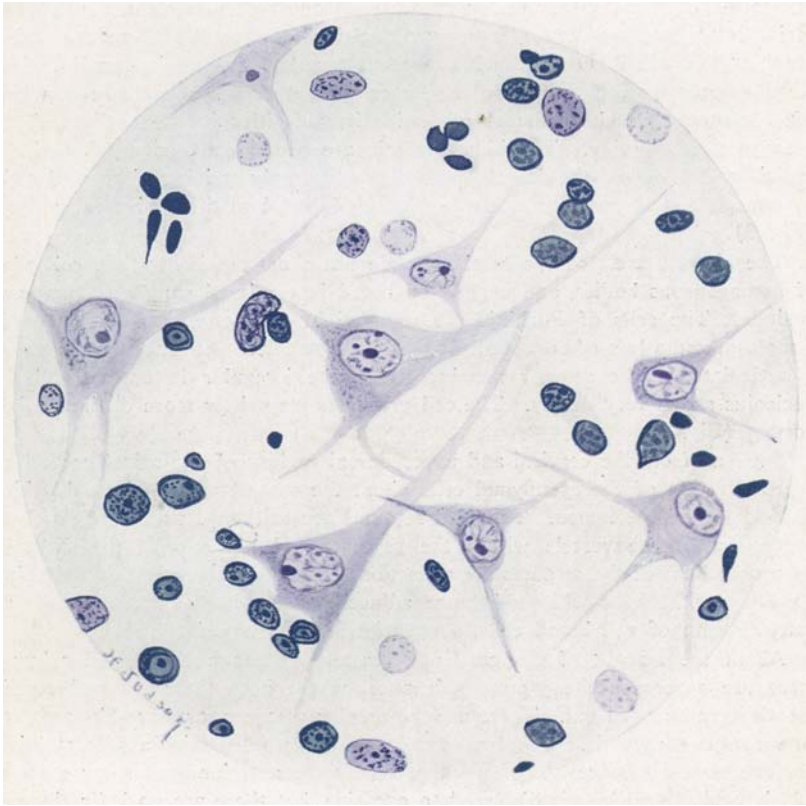


Fig. 2.—Section from the cortex showing nerve cell changes, satellite neuroglia, two types of neuroglia cells and the small, deeply staining cells which may be Maximow's polyblasts. Stain, thionin. Zeiss obj. D D; oc. 4.

In the white substance there is a deposit of granules in the vessel walls and some round nuclei in the perivascular spaces. One section shows a miliary hemorrhage at the cortical margin.

Sections through the basal ganglions show the blood vessels in the gray matter standing out sharply because of the presence of round, homogeneous, deeply staining bodies in the adventitia and in the perivascular spaces. There is also an increase in the cells in the vessel walls. Under the low power the

homogeneous bodies give the appearance of a perivascular infiltration of lymphocytes and plasma cells, but under the high power only a few cells are found (Fig. 3).

The nerve cells have lost their angular outline, are rounded and stain a diffuse blue with thionin. A few of the ganglion cells contain yellow pigment granules, and about some of them there are from 5 to 7 neuroglia nuclei. The small, deeply staining glial forms predominate over the large, pale nuclei. (Fig. 4).

The upper part of the pons shows the blood vessels sharply outlined by an infiltration of mononuclear cells and homogeneous bodies in the adventitia and perivascular lymph spaces in the gray nuclei of the pons. There are a few granule cells filled with yellowish pigment granules in the infiltration. The blood vessels are congested. In the lower portion of the pons there is a proliferation of the subependymal glia with irregularities in the outline of the ependymal glia lining. The blood vessels are prominent, congested, and the nuclei in the floor of the fourth ventricle show deeply staining pigmented cells. In one portion there is an extravasation of blood into the perivascular space (Fig. 5).

The blood vessels of the cerebellum do not show the infiltration, collection of homogeneous bodies, and congestion noted in the basal ganglions, pons and medulla. The cells of Purkinje are rounded in outline, with a homogeneous cytoplasm and a loss of almost all of the Nissl granules. At times the cytoplasm is reticulated. The nuclear membrane may be irregular in outline and the nucleolus stains very deeply. The cell processes may show more distinctly than normal (Fig. 6).

Sections from the cervical and upper dorsal regions of the spinal cord show a proliferation of the ependymal cells about the central canal, with a blocking and closure of the lumen. The glial septums are thickened as a result of both congestion of the vessels within the septums and a neuroglia proliferation. Along the lines of the septums are collections of homogeneous bodies and a few lymphocytes. In the white substance adjacent to the lateral horn there is an extravasation of red blood cells, some of which have disintegrated.

About the margin of the cord and scattered through the lateral columns there are spaces in the ground substance, where both the axon and myelin sheath have dropped out. These are the areolar plaques, or sieve-like areas of an infiltrative myelitis. The spaces are sometimes filled with a pale staining, homogeneous substance. The ganglion cells in the anterior horn show chromatolysis, and the nucleus is displaced to one side, but there are no indications of neuronophagia, and no hemorrhages into the gray matter. The pia arachnoid is thickened and homogeneous in appearance, with few nuclei. The posterior roots show areolar plaques and many deeply staining homogeneous bodies. There are no secondary column degenerations.

A section of the lumbar cord shows the dura mater thickened and homogeneous, with a round cell infiltration about some of the blood vessels. The outer layer of the pia arachnoid is infiltrated with lymphocytes, while the inner layers are thickened, hyaline in appearance and closely adherent to the cord, especially in the region of the posterior roots. The posterior nerve roots show congestion of the blood vessels, and in the entrance zone there are sieve-like areas and many homogeneous bodies. There is proliferation of the ependymal cells with obliteration of the central canal (Fig. 7). The nuclei in the vessel walls, espe-

cially in the gray matter, are increased, and some of the endothelial cells show double nuclei. Small, deeply staining particles of nuclear matter resembling neuronophages are present in the anterior horn, but nowhere are they seen in definite relationship to the nerve cells. The ganglion cells show the same change seen at higher levels. At the top of one of the posterior horns there is a small collection of red blood cells. The glial septums are widened and in places hyaline in appearance, and there are a few red blood cells along some of the septums. There are areolar spaces and swollen myelin sheaths along the periph-

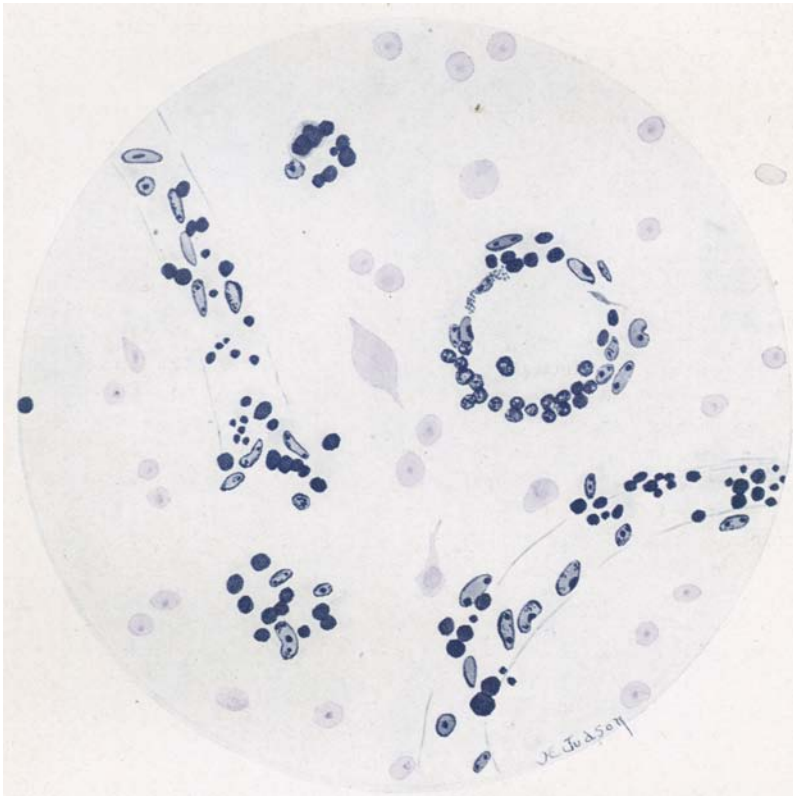


Fig. 3.—Perivascular infiltrations in the basal ganglia showing homogeneous bodies, endothelial cells and lymphocytes in the adventitial and perivascular spaces. Stain, thionin. Zeiss obj. D D; oc. 4.

ery of the cord and in the posterior columns. Some of the spaces are filled with a delicate, homogeneous substance staining a pale pink with eosin (Fig. 8).

Section through the cauda equina and the tip of the conus has a widened central canal, with proliferation of the ependymal lining and of the subependymal glia. The blood vessels about the central canal as well as those of the pia arachnoid and of the nerve trunks in the cauda are congested, but there is only slight infiltration (Fig. 9).

A section of a posterior root ganglion includes a large nerve trunk in which there is a calcareous deposit. There are also lime salt deposits in the connective tissue surrounding the nerve trunks. The ganglion cells show chromatolysis and loss of Nissl bodies.

Summary of Pathologic Changes.—This includes: Congestion and edema of both meninges and brain substance; acute encephalitis with perivascular infiltrations which are more marked in the basal ganglions and the nuclei of the pons and the medulla; nerve cell changes consisting of chromatolysis, cloudy swelling, and axonal reactions such as are found in the toxic states and with

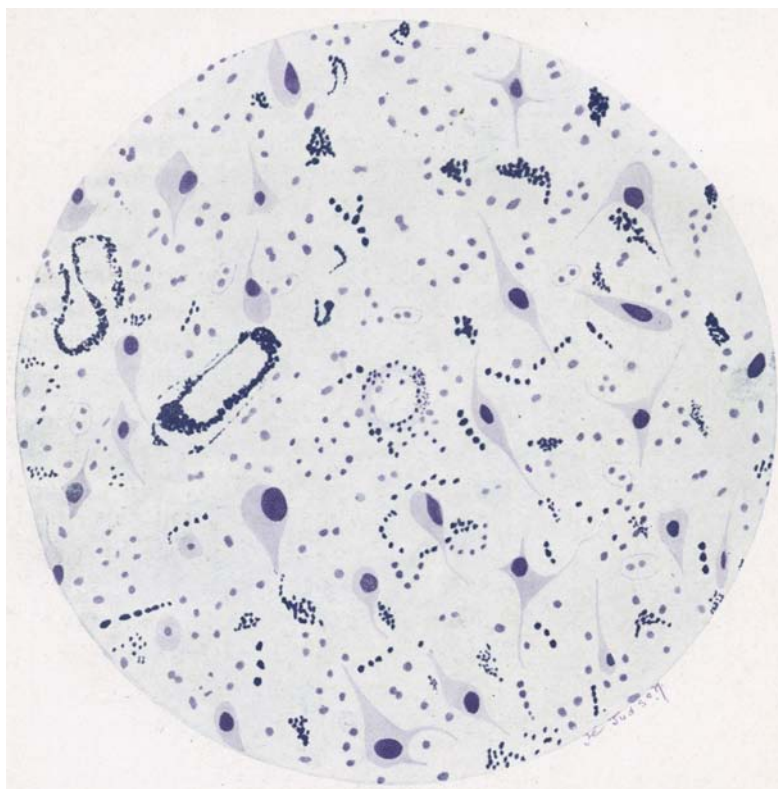


Fig. 4.—Section through the basal ganglions showing prominence of the blood vessels due to deposits in and about the vessel walls, nerve cell changes and focal collections of round cells and homogeneous bodies in the interstitial tissue. Stain, thionin. Zeiss obj. A; oc. 4.

breaks in the continuity of the nerve fiber; alterations in the cells of Purkinje similar to those in fatigue and exhaustion; granular ependymitis of the fourth ventricle; acute diffuse infiltrative myelitis with extravasations of blood into the white substance; deposits of homogeneous bodies in the posterior roots, posterior root zones, and diffusely through the cord substance and perivascular collections of lymphocytes and plasma cells; closure of the central canal

throughout the entire cord, with widening at the tip of the conus medularis; nonsystemic areolar plaques; calcareous deposits in the posterior root ganglion; edema and thickening of the pia arachnoid with perivascular infiltrations of the pial blood vessels.

FINDINGS IN EPIDEMIC ENCEPHALITIS

The most constant findings reported in necropsy cases of epidemic encephalitis are congestion and edema of the brain and meninges. Microscopically, there is an infiltration of the adventitial and peri-

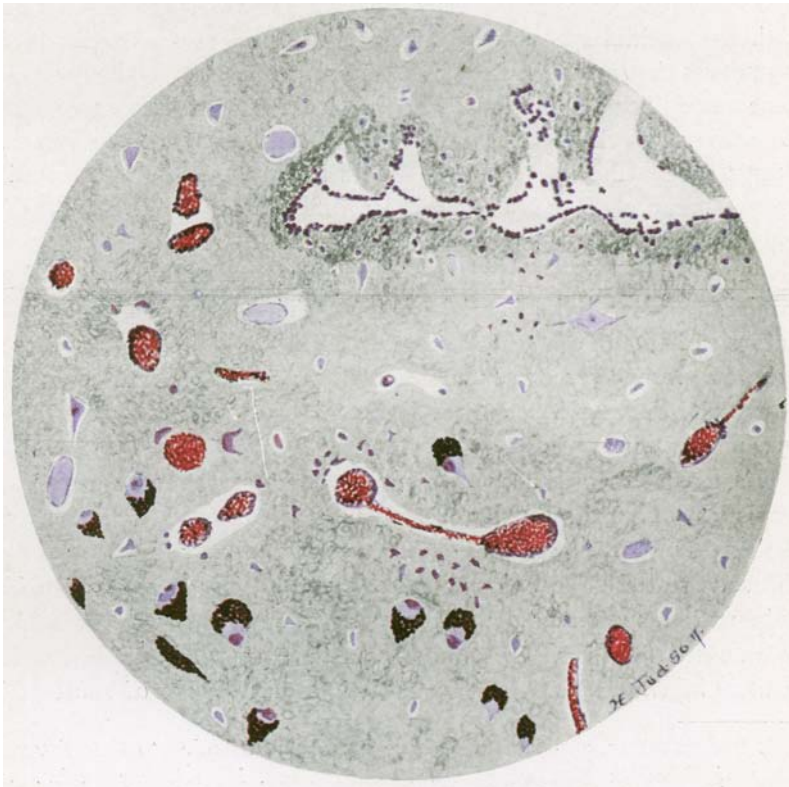


Fig. 5.—Section from the lower pons showing congestion of the blood vessels and granular ependymitis with proliferation of the subependymal glia. The nerve cells packed with pigment are part of the motor nucleus of the fifth cranial nerve. Drawn from a hematoxylin and eosin preparation. Zeiss obj. A; oc. 4.

vascular spaces with lymphocytes and plasma cells. These perivascular rings, occurring especially in the nuclei of the brain stem, have been considered almost pathognomonic. In the basal ganglion and the cranial nerve nuclei, the vessels stand out sharply differentiated from

the surrounding tissue by the ring of nuclei about a distended vessel lumen. The nuclei in the vessel walls show division forms and an increase in numbers, but there is no evidence of new vessel formation, and epithelioid cells either of vascular or glial origin are rarely seen. The neuroglia nuclei are moderately increased, but in no case is there a record of a double perivascular ring of which the inner circle represents the infiltrating cells and the outer the neuroglia nuclei gathering about the margin of the perivascular spaces. The character of the infiltrating cells varies. Bassoe and Hassen¹ report lymphocytes, plasma cells, polyblasts, fibroblasts and rod cells in the adventitial spaces, perivascular spaces and the adjacent parenchymatous tissue; Marinesco² finds plasma cells and lymphocytes with some vessels floating in a small pool of blood, and von Economo³ shows the adventitial sheaths infiltrated with lymphocytes, leukocytes and plasma cells. The case of F. T. differs from those contained in other reports because of the slight cellular infiltration of the vessel walls, and the presence of masses of homogeneous bodies packed in the adventitia and in the perivascular spaces of the blood vessels of the cranial nuclei and the basal ganglions. These homogeneous bodies stain with thionin and cresyl violet. They are rounded and vary in size, and probably represent accumulations of degeneration products. Low and Mott⁴ described them in a case of sleeping sickness due to trypanosomiasis.

In the spinal cord there are two forms of homogeneous bodies, one consisting of small, round, deeply staining masses found along the glial septums, in the posterior roots, the posterior root zones, and diffusely scattered in the white substance. They take a deep blue stain with hematoxylin, but do not stain with either osmic acid or sudan III. They have been reported as corpora amylacea or amyloid bodies (Marinesco) and were present in Breinl's⁵ case of acute polio-

1. Bassoe, Peter, and Hassen, George B.: A Contribution to the Histopathology of Epidemic (Lethargic) Encephalitis, *Arch. Neurol. & Psychiat.* **1**:24 (July) 1919.

2. Marinesco, G.: Local Government Board Reports on Public Health and Medical Subjects. London. Report on an Inquiry into an Obscure Disease. *Encephalitis Lethargica*, N. S. 121, p. 47, 1918.

3. Von Economo, C.: *Encephalitis Lethargica*, *Wien. klin. Wchnschr.* **31**:850, 1918.

4. Low, George C., and Mott, F. W.: Examination of the Tissues of a Case of Sleeping Sickness in a European, *Brit. M. J.* **1**:1666, 1889.

5. Breinl, A.: Clinical, Pathological and Experimental Observations on the "Mysterious Disease." A Clinically Aberrant Form of Acute Poliomyelitis, *Australian M. J.* **1**:209 (March 16) 1918.

myelitis. The other homogeneous bodies are found in the widened spaces in the ground substance, chiefly of the lateral columns. They take a definite pink stain with eosin and a pale stain with thionin, the effect being that of a faintly staining exudate. Stains for bacteria demonstrate no organisms within this homogeneous substance.

The nerve cell changes are more or less uniform throughout the brain and cord. There is chromatolysis and an axonal reaction found

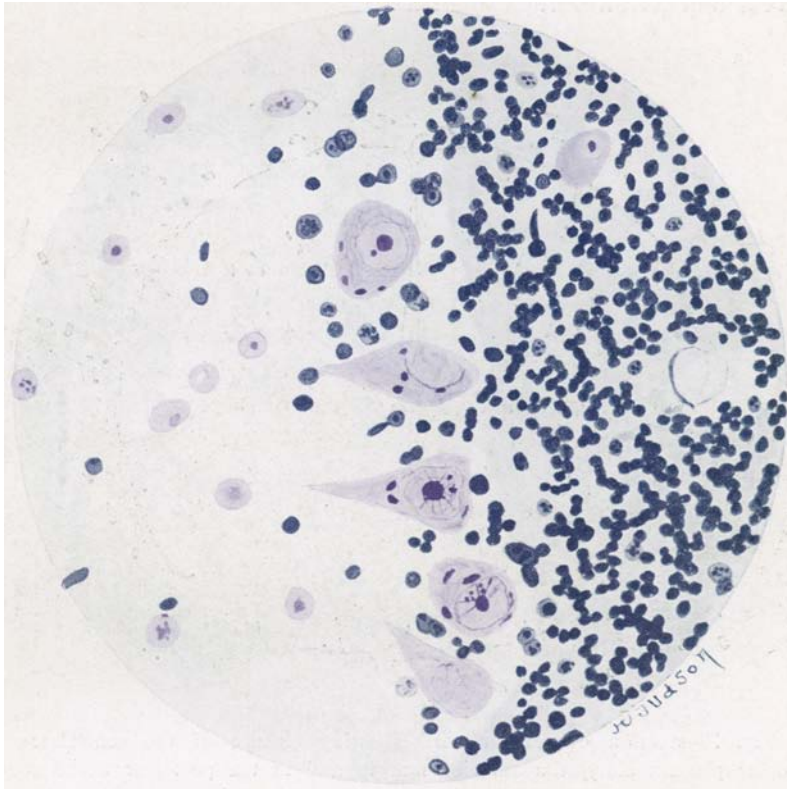


Fig. 6.—Section from cerebellum showing loss of Nissl bodies, chromatolysis and nuclear changes in the cells of Purkinje. Stain, thionin. Zeiss obj. D D; oc. 4.

in the ganglion cells. The early axonal reactions shown by certain cells in the cortex are of especial interest in connection with the myelitic changes. The cytoplasm may be reticulated, and there are slight variations in the nuclear staining reactions. Neuronophagia has been reported in other cases, but is not present in the case of F. T. The small, deeply staining cells scattered through the cortex bear no

relationship to the nerve cells. In both the cord and brain the ganglion cells show a satellite gliosis about the base of the cell, but in no instance are cells seen penetrating the nerve cell or within the nerve cell body. This, associated with the absence of hemorrhages into the nuclei and gray matter, makes an important pathologic differentiation from acute poliomyelitis of the Heine-Medin form. Marinesco emphasizes the constant finding in his cases of changes in the Purkinje cells in the cerebellum, which have already been described in this case. The picture is that seen in fatigue and shock.



Fig. 7.—Section of lumbar cord showing closure of the central canal; areolar plaques along the anterior margin and in the posterior nerve roots; congestion of the blood vessels with slight hemorrhage into the white substance bordering the lateral horn; infiltrations in the lateral and posterior columns and subpial hemorrhages. Drawn from a hematoxylin and eosin preparation; $\times 8$.

Spinal cord involvement was indicated by a loss of knee jerks and incontinence of urine and feces, other symptoms being masked by the coma. The diffuse nature of the process is shown by the dirty gray color of the cord with indefinite rusty discolorations in the white substance, which were present throughout the entire cord. Microscopi-

cally, the thickening of the neuroglia septums along which there are infiltrations of lymphocytes, plasma cells, and red blood corpuscles, the presence of an exudate in the spaces of the ground substance, congestion and perivascular infiltration, and the presence of areolar plaques and swollen myelin sheaths make a picture typical of that of an acute diffuse infiltrative myelitis. This picture is not new, Henneberg⁶ giving a summary of the literature previous to 1911 on similar pathologic changes occurring after influenza. They are probably toxic in origin, the infiltration bearing a definite relation to the vessels arising from the vasocorona, the posterior and lateral vessels showing the greatest change. The thickening and slight infiltration of the pia-arachnoid of the cord presents a picture quite at variance with the severe, often purulent meningitis reported in cases of direct invasion of the meninges with *B. influenzae*.

No secondary degenerations are demonstrable by either Marchi or Weigert's myelin sheath stain. This is to be expected from the brief course and duration of the spinal cord involvement. The initial symptoms of pain may have been of root origin, judging by the collections of homogeneous bodies and the presence of areolar plaques in the posterior roots and posterior root zones.

The ventricular system, including the central canal, shows alterations. The ependymal lining of the fourth ventricle is broken and irregular, with proliferation of the subependymal glia. Granular ependymitis of this type, however, is not uncommon in cases coming to necropsy after 30 years of age. It is chronic rather than acute. The definite proliferation of ependymal cells about a closed central canal, the presence of a slight glial reaction, and the congestion of the neighboring blood vessels, together with the widening of the lower end of the central canal (Fig. 9), must be considered with reference to the theory that the virus of poliomyelitis is carried throughout the cord by way of the central canal, but the changes are so slight in the central gray matter, as compared to those in white cord mantle, that it seems improbable in this case for the spread to have occurred through this portion of the cord. No organisms can be demonstrated in the lumen. Bassoe and Hassin suggest that the amorphous mass in the closed central canal in their case may be made up of bacilli. Additional

6. Henneberg, R.: *Die Myelitis: Handbuch der Neurology* (Lewandowsky) 2: Spezielle Neurologie I, 727, 1911.

necropsy studies are reported by Pothier,⁷ Wilson,⁸ Bassoe,⁹ Netter,¹⁰ Buzzard,¹¹ McCaw and Stebbing,¹² Gordon,¹³ Mott,¹⁴ Marinesco¹⁵ and Marie.¹⁶

ETIOLOGY OF LETHARGIC ENCEPHALITIS

Of the etiology there is little that can be said. Undoubtedly acute infections, especially pandemics such as the influenza in 1918-1919, are frequently followed by the lethargic encephalitis syndrome. Zuelzer¹⁷ talks of the sleepy sickness in 1712, Longuet¹⁸ reviews the Italian epidemic of nona, and Leichtenstern¹⁹ gives a complete summary of the literature on the comatose form of influenza. The case of F. T. and others recently reported differ from the true influenzal encephalitis in the absence of thrombi, softenings, abscesses and organisms. In true influenzal encephalitis Pfeiffer's bacillus has been isolated from the areas of softening and hemorrhage, the cerebrospinal fluid and the meninges by Nauwerck,²⁰ Trouillet and Esprit,²¹ and Pfuhl.²² In the

7. Pothier, O. L.: Lethargic Encephalitis, *J. A. M. A.* **72**:715 (March 8) 1919.
8. Wilson, S. A. Kinner: Lethargic Encephalitis, *Lancet*, **2**:7 (July 6) 1918.
9. Bassoe, Peter: Epidemic Encephalitis (Nona), *J. A. M. A.* **72**:971 (April 5) 1919.
10. Netter, A.: Epidemic Lethargic Encephalitis, *Bull. de l'Acad. de méd., Par.* **79**:337 (May 7) 1918; abstr. *J. A. M. A.* **71**:73 (July 6) 1918.
11. Buzzard, E. F.: An Address on Lethargic Encephalitis, *Lancet* **2**:835 (Dec. 21) 1918.
12. McCaw, H. J.: Perdran, J. R., and Stebbing, G. F.: Toxic Bulbar Paralysis (Possibly Botulism), *Lancet* **1**:616 (April 27) 1918.
13. Gordon, M. H.: X Disease, *Lancet* **1**:653 (May 4) 1918.
14. Mott, L. W.: Royal Society of Medicine, Epidemiology and Pathology. Discussion of Encephalitis Lethargica, *Lancet* **2**:590 (Nov. 2) 1918.
15. Marinesco, G.: Pathologic Histology of Epidemic Lethargic Encephalitis, *Bull. Acad. de méd., Par.* **80**:411 (Nov. 5) 1918.
16. Marie, P., et Trétiakoff, C.: Examen histologique des centres nerveux dans deux cas d'encéphalite lethargique, *Bull. et mém. Soc. méd. d. hôp. de Par.* **42**:475, 1918.
17. Zuelzer: Influenza, *Ziemsens Handbuch* **2**:531, 1875.
18. Longuet, P.: La Nona, *Sem. méd.* **12**:275, 1892.
19. Leichtenstern, O.: Influenza und Dengue; Nothnagel's *Specielle Pathologie u. Therapie*, *Wien.* **41**:1, 1896.
20. Nauwerck: Influenza und Encephalitis, *Deutsch. med. Wchnschr.* **21**:393 (June 20) 1895.
21. Trouillet et Esprit: Meningo-encéphalopathie de nature grippale, *Sém. méd.* **15**:170, 1895.
22. Pfuhl: Drei neue Fälle von Gehirn Influenza, *Ztschr. f. Hyg. u. Infektionskrankh.* **26**: 1897.

present epidemic of encephalitis no organisms have been found, if we except von Wiesner's²³ as yet unsubstantiated work, and no one has been able to transmit the disease to monkeys. It may be due to a toxin produced elsewhere in the body by the organism causing influenza, which may not be Pfeiffer's bacillus, or it may be due to an invasion by a new organism scattered to new localities by the world-wide movement of peoples. In the latter event the influenza pandemic by lower-

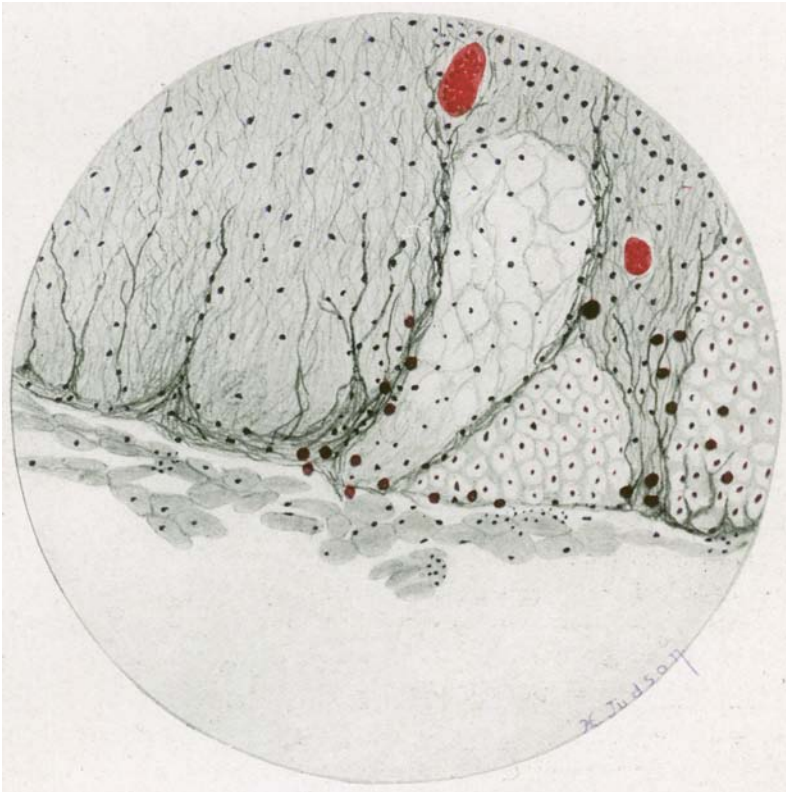


Fig. 8.—Section of cord showing a posterior root with areolar plaques, large purplish pink homogeneous bodies, small, deeply staining homogeneous bodies, thickenings of the pia-arachnoid and the marginal glia feltwork and congestion of the vessels in the cord. Drawn from a hematoxylin and eosin preparation. Zeiss obj. A; oc. 4.

ing resistance acts merely as a contributory factor. The same pathologic changes are found in trypanosomiasis and in the spirochete

23. Von Wiesner, R. R.: Die Aetiologie der Encephalitis lethargica, Wien. klin. Wchnschr. **30**:933, 1917.

infection of general paralysis; the changes differ only in degree and in location.

The combination of lethargy with cranial nerve involvement depends not on a specific virus, but on the location within the brain of the lesions produced by varying causes. Mauthner²⁴ localizes the sleep center in the floor of the fourth ventricle as a result of the findings in cases of nona, but MacNalty²⁵ explains lethargy and sleep as

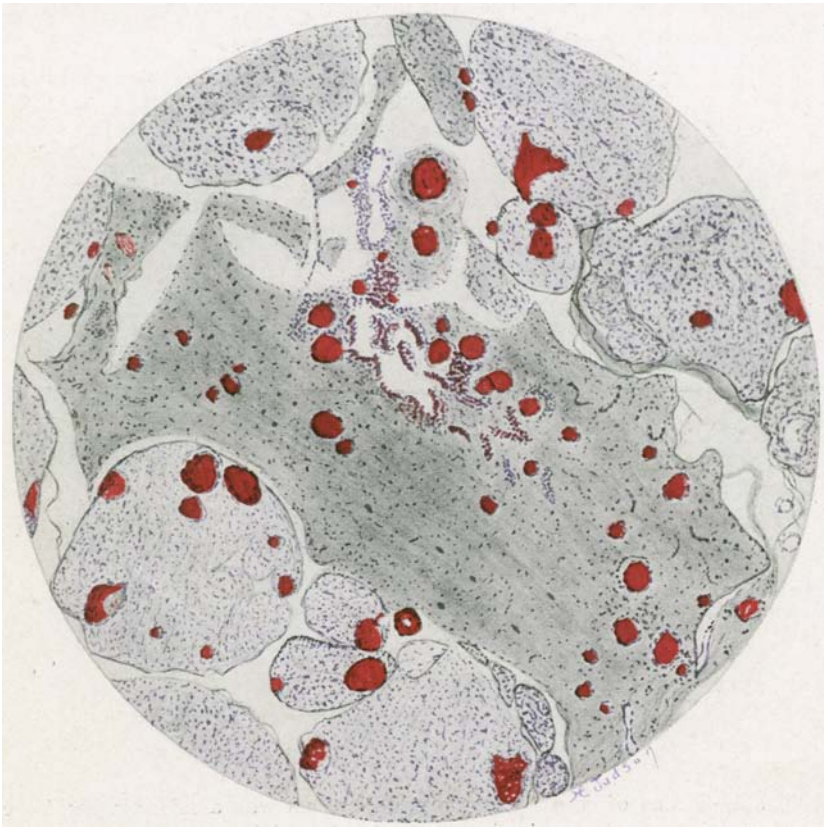


Fig. 9.—Section through the tip of the conus medullaris showing widening of the central canal, round cell infiltration, with congestion of the blood vessels of both the conus and the nerves of the cauda equina. Drawn from a hematoxylin and eosin preparation. Zeiss obj. A; oc. 2.

24. Mauthner, L.: *Zur Pathologie und Physiologie des Schlafes nebst Bemerkungen über die "Nona,"* *Wien. med. Wchnschr.*, **40**:961, 1890.

25. MacNalty: *Local Government Board Reports on Public Health and Medical Subjects.* London: Report on an Inquiry Into an Obscure Disease, *Encephalitis Lethargica*, N. S. 121, 1918.

due, not to a special sleep control center, but to an interruption of the sensory stimuli on the way up to the cortex by lesions in the thalamic region. This shutting off of the outside world reproduces to a pathologic degree the mechanism of normal sleep. Undoubtedly the same syndrome is clinically given by some cases of acute polioencephalitis and botulism. The epidemic in Queensland and New South Wales summarized by Breinl⁵ and the cases reported by Mills and Wilson²⁶ are undoubtedly poliomyelitis with the lesions in the basal ganglions and the cranial nerve nuclei. They are differentiated from this case and the cases variously reported as lethargic encephalitis, epidemic encephalitis, nona, X disease, and toxic or epidemic ophthalmoplegia with lethargy, by the presence of hemorrhages into the gray matter and marked neuronophagia, and by the fact that the virus is transmissible to monkeys in the same manner as that of poliomyelitis. There seems to be at the present time in various parts of the world epidemic foci of Heine-Medin's disease and of epidemic encephalitis which clinically present the common syndrome of ophthalmoplegia and cranial nerve involvements associated with a progressive lethargy; pathologically, they are two distinct processes.

The lethargic encephalitis syndrome should be considered in the same light as Landry's paralysis or the Brown-Séquard syndrome—that is, as a localizing syndrome resulting from varying causes. The pathologic findings of epidemic encephalitis indicate that we are dealing with a new disease for this country, but the relationship to the pathology in trypanosome infections and spirochetal infections must be kept in mind in the search for an etiologic agent.

CONCLUSIONS

1. The term lethargic encephalitis is the name of a clinical syndrome caused by lesions of varying types which are localized in the basal ganglions and the nuclei of the pons and medulla. It is not a disease entity.
2. Included in this syndrome there are cases of epidemic encephalitis, a disease new to this country, whose etiology is unknown, but whose pathology bears a close resemblance to that of African sleeping sickness.

26. Mills, C. K., and Wilson, George: Cerebello-Bulbar Polioencephalitis Originating During or After Epidemics of Influenza and of Poliomyelitis, Including the Record of a Case of Epidemic Encephalitis of the Lethargic Type, *Arch. Neurol. & Psychiat.* 1:567 (May) 1919.

3. The case reported belongs to the new epidemic encephalitis group. The pathology is an acute infiltrative encephalomyelitis, the most marked changes occurring about the blood vessels of the thalamus, the cranial nerve nuclei, the floor of the fourth ventricle and in the white substance of the spinal cord.