Western Encephalitis: Report of Eight Fatal Cases:

Saskatchewan Epidemic, 1965

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A SEVERE epidemic of encephalitis in Saskatchewan resulted in the hospitalization of 490 patients in August and September of 1965. Hundreds more were briefly indisposed but not hospitalized. On the basis of virus studies of submitted specimens, western encephalitis (WE) virus was implicated in 72 of the hospital cases. Most cases were mild and the patients recovered completely in a few days. A few were not so fortunate and seven died within 15 days of becoming ill. An eighth patient succumbed to the complications of an acute duodenal ulcer 30 days after apparent recovery from severe encephalitis.

Most of the serious cases in the epidemic and all of the deaths proved to be due to WE virus. WE virus was isolated from the brains of all seven who died within 15 days of becoming ill, and was serologically implicated in the subacute case. This cluster of fatal cases is reviewed here to emphasize the similarities and differences in the development and course of the illness and to report the neuropathological findings in the brains of the victims.

MATERIAL AND METHODS

The brain specimens in this series were obtained from the laboratories of the four largest hospitals in the province, which are located in Saskatoon and Regina. Four complete specimens were studied in considerable detail; of these, in addition to representative blocks of tissue, a number of hemispheric sections of cerebrum and cerebellum were made. Several random paraffin blocks of the other brains were available for examination. Routine staining techniques were used, including hematoxylin and eosin, Nissl's cresyl violet and Heidenhain's hematoxylin stain for myelin.

For virus culture, portions of the cerebrum, cerebellum, pons and medulla oblongata were removed at autopsy and either delivered within hours to the virus laboratory or were placed in a sterile jar, which was sealed, fast-frozen on dry ice and maintained at dry ice temperature until delivered to the Provincial Laboratories. Upon thawing, approximately 1 c.c. portions of each sample of brain tissue submitted were pooled and a 10% suspension prepared by grinding with sterile sand in Hanks' balanced salt solution. The suspension was centrifuged, the supernate harvested and antibiotics added to give a concentration per millilitre of 100 units of penicillin and 100 mg. of streptomycin. After 15 minutes at room temperature, one portion of the supernate was placed in an ampoule for storage at –80° F. and the remainder was used to make up 0.2 ml. inocula for the amniotic sacs of four to six 10-day developing chick embryos (DCE). (Monkey kidney and human amnion cell cultures were also inoculated at the same time but no discernible results were obtained in this series.) The embryos were incubated at 35° C. and were observed daily for sluggishness or death. Serial passages were made after four days' incubation or sooner if the inoculated embryos appeared sluggish or dead. Amniotic fluids from sluggish or dead embryos were pooled, inoculated into more DCE, inoculated intracerebrally into suckling mice, and tested for WE antigen by the complement fixation test using standard antiserum. Final identifications were based on both complement fixation and mouse neutralization tests.

CASE REPORTS

CASE 1.—This 3-week-old female infant was born in hospital four weeks prematurely on August 6. She was the first child of a 20-year-old mother. The infant was discharged to her home on the sixth day and progressed well until the 17th postpartum day, at which time she began to take her feedings poorly. She developed episodes of arching of the back and twitching of the left arm and left leg. There was no fever and the child was not fussing. Two days later the infant was transferred to St. Paul's Hospital, Saskatoon; she was lethargic, dehydrated and jaundiced. The peripheral white blood count was 23,700 with 54% neutrophils and 46% band cells. A lumbar puncture was performed and examination of the cerebrospinal fluid showed xanthochromia, 29 white blood cells per c.mm., a protein of 86 mg. per 100 ml. and a glucose of 40 mg. per 100 ml. The child was started on intravenous antibiotic therapy but failed to improve. She continued to have twitchings

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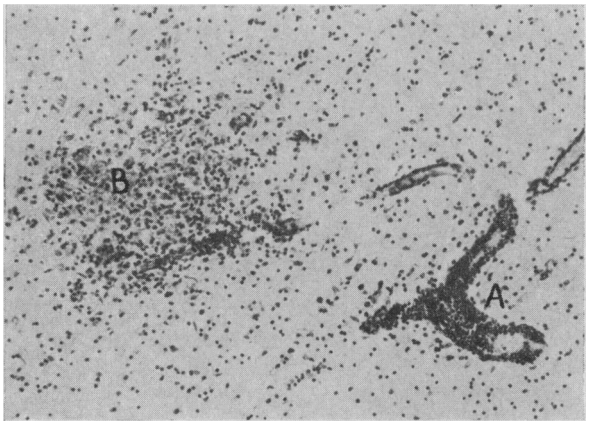


Fig. 1.—Case 1. Two types of inflammatory lesions in subcortical white matter. Note perivascular cuffing of inflammatory cells (A) and a focus of tissue necrosis with microglial and leukocytic infiltration (B). (Nissl's cresyl violet, × 60.)

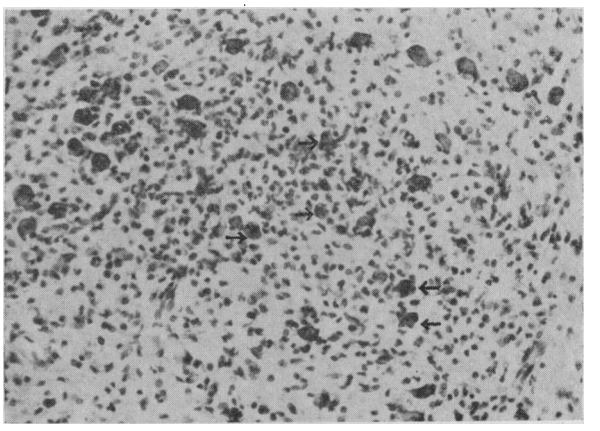


Fig. 2.—Case 1. Inflammatory area in the left inferior olive illustrating infiltration of microglial cells, macrophages and granular leukocytes. Degenerating or necrotic nerve cells are seen within infiltrate (arrows). (Nissl's cresyl violet, × 150.)

which necessitated large doses of paraldehyde. The jaundice cleared on hydration. She became comatose and in spite of endotracheal intubation and cardiac massage died on the third day of her illness on August 27.

The only gross extracerebral finding at autopsy was interstitial pulmonary edema. Microscopically, moderate fatty degeneration of the liver was found, as well as prominent myeloid hyperplasia of the bone marrow. The brain weighed 420 g. The pia-arachnoid was faintly cloudy but externally glistening with no apparent exudate or hemorrhage. The meningeal vessels were diffusely hyperemic and stood out sharply against the pale cerebral and cerebellar cortex. The brain and spinal cord were otherwise structurally unremarkable. No gross lesions were apparent on serial cut surfaces of the brain.

Histologically, apart from hyperemia of the leptomeningeal blood vessels and a moderate lymphocytic infiltration of the pia-arachnoid, there was a widespread encephalitis affecting essentially all areas of the cerebrum, brain stem and cerebellum. There were two main types of lesions (Fig. 1), one consisting of perivascular "cuffs" made up predominantly of lymphocytes with certain admixture of polymorphonuclear leukocytes. The other type of lesion was characterized by small focal areas of tissue necrosis with proliferation of rod-shaped microglial cells and inflammatory cell infiltration, among which fairly numerous granular leukocytes were found. Many of the granular leukocytes were in a stage of disintegration. Occasionally a centrally located blood vessel, usually of capillary type, was demonstrable in the central part of such infiltrates. In scattered fields, coalescing of a few necrotic foci or extension of inflammatory reaction into the depth of brain tissue around the perivascular cuffs was seen. Such lesions were always of relatively small dimensions, discrete and well circumscribed. Within those focal infiltrates located in the cortex or subcortical masses of grey matter, or within the nuclei of the brain stem, the nerve cells had frequently undergone variable degenerative change such as chromatolysis or shrinkage and hyperchromasia. Occasional necrotic nerve cells were observed in the centre of the inflammatory foci (Fig. 2). No intranuclear or intracytoplasmic inclusion bodies were seen.

Concerning the distribution of the lesions in general, the perivascular cuffs and the necrotic foci were more concentrated in the digitate white matter of the convolutions than in the cortex itself, and these tended to be more numerous in the subcortical white matter than in the deep white matter (Fig. 3). Within the cortical ribbon the lesions were found more often in the deeper than in the superficial layers. A large number of inflammatory infiltrates were present in the basal ganglia and in the thalami. Occasional foci were seen in the hypothalamus. The hippocampi and the substantia nigra did not appear to belong to the most vulnerable areas, for only a few lesions were seen in these structures. The brain stem was severely affected. There were scattered foci of necrosis and perivascular cuffs in the quadrigeminal plate, the base and tegmentum of the pons, under the floor of the fourth ventricle in the vestibular, cuneate nuclei and in the inferior olives. The white matter and the dentate nuclei of the cerebellum were similarly involved, while the upper cervical segment of the spinal cord, which was available for examination, appeared to have been spared.

CASE 2.—A 61-year-old, mildly diabetic Saskatoon woman was well until August 18, when she developed dizziness, vomiting and a temperature of 104° F. She became increasingly drowsy and, one week later, was transferred in a semistuporous state to St. Paul's Hospital. She responded to the spoken command only periodically by opening her eyes, with no other indication of recognition. Her pupils were equal and reactive to light. Her reflexes were present and symmetrical and her plantar responses downgoing. She was able to move all four of her extremities. Lumbar puncture yielded a slightly xanthochromic fluid with 20 white blood cells per c.mm. and a protein content of 18 mg. per 100 ml.

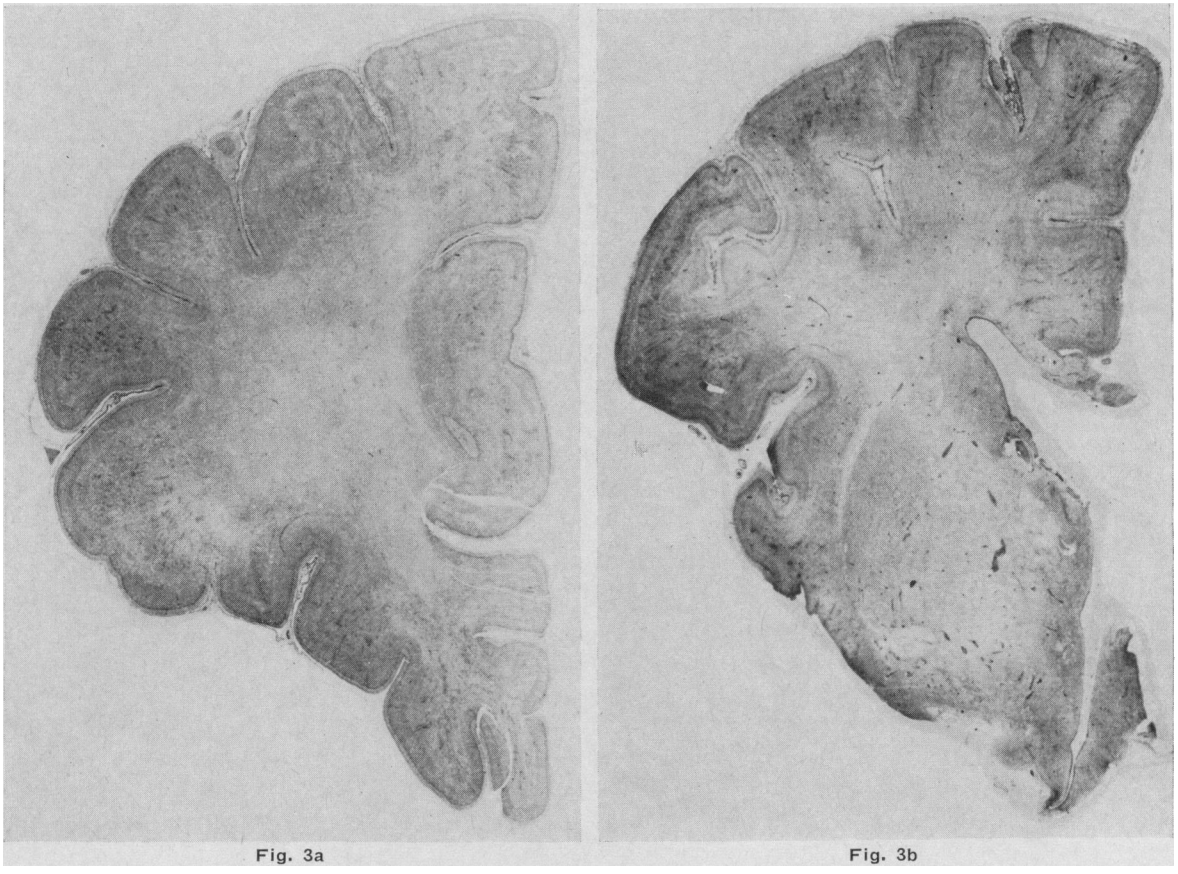


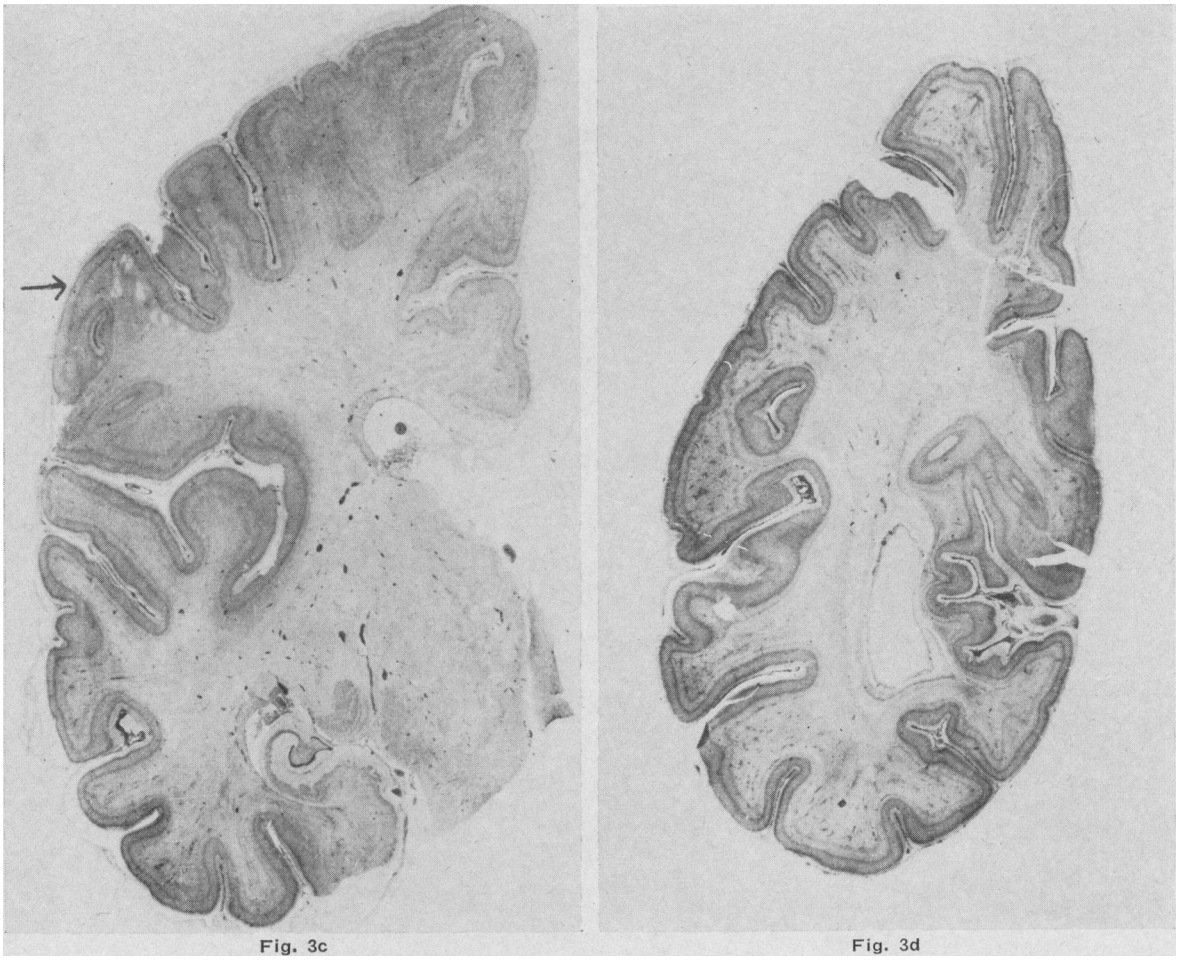
Fig. 3a Fig. 3b

Figs. 3a and 3b.—Case 1. Left cerebral hemisphere. Concentration of inflammatory infiltrates in subcortical white matter. (Nissl's cresyl violet, × 2.)

The initial pressure was 230 mm. of water. Urinalysis was negative; the hemoglobin was 11.9 g. per 100 ml. and white blood cell count 7800 per c.mm. with a normal differential. The patient was treated empirically with tetracycline, intravenous fluids and plain insulin supplements. Although her temperature returned to normal, she went into a coma and died 12 days after the onset of her symptoms.

The general pathological findings were those of a mucopurulent tracheobronchitis, early aspiration pneumonia, pulmonary edema and moderate fatty degeneration of the liver. The brain weighed 1190 g. and apart from some meningeal hyperemia and diffuse general prominence of vascular markings, it was free from any definite gross abnormality. Histologically, there was a combination of two types of lesions – perivascular cuffings composed predominantly of lymphocytes, and small inflammatory infiltrates. These lesions were much more numerous in the white matter than in the cortex and were likewise frequently found in the basal ganglia, in the thalami and in the internal capsules. The Ammon's horns were only slightly affected. The focal inflammatory infiltrates consisted of rod-shaped microglia, macrophages and occasionally lipid phagocytes. Endothelial swelling was present in the blood vessels traversing the inflammatory infiltrates. In the midbrain, including the substantia nigra, and in the region of the third nerve nuclei, there was a dense concentration of inflammatory lesions. Fairly numerous distintegrating melanin-containing nerve cells were present in the substantia nigra. The pons and medulla oblongata also contained moderately numerous, randomly scattered lesions which were found in the base and tegmentum of the pons, in the hypoglossus nucleus and inferior olives, and in the pyramids. The cerebellar cortex and the white matter were severely damaged. Typical "microglial shrub formations" were occasionally seen in the molecular layer of the cerebellar cortex, indicating phagocytosis of dendrites of disintegrating Purkinje cells (Fig. 4).

CASE 3.—A 74-year-old, mildly hypertensive man had been well until September 5, 1965, when, on arising in the morning, he complained of general malaise and aches, and had a temperature of 104.5° F. He spent the day in bed and on the following evening he was found to be drowsy and unresponsive. On admission to a local hospital, the patient was semicomatose and unable to respond verbally. He had a definite neck rigidity. The following day he was transferred to St. Paul's Hospital, Saskatoon. He responded only to painful stimuli and was restless. The deep tendon and plantar responses were normal. External ocular movements were normal and the patient was able to move his limbs. Laboratory



Figs. 3c and 3d.—Case 1. Left cerebral hemisphere. Concentration of inflammatory infiltrates in subcortical white matter. In 3c arrow indicates confluence of pale necrotic areas in subcortical white matter of the gyrus. Unusual prominence of the blood vessels in basal ganglia and thalami is the result of heavy perivascular inflammatory cell infiltration. (Nissl's cresyl violet, × 2.)

investigations disclosed a hemoglobin of 14.3 g. per 100 ml., and a white blood cell count of 16,000 with 82% neutrophils, 1% band cells, 9% lymphocytes, and 8% monocytes. Lumbar puncture revealed a clear fluid under a normal pressure, with 40 white blood cells per c.mm. and a protein of 31 mg. per 100 ml. Other laboratory data were reported normal. The day after admission the patient went rapidly downhill and died despite vigorous resuscitative efforts.

Autopsy revealed chronic pulmonary emphysema, acute bronchopneumonia and an old scar of the anterior myocardium. The brain, which was edematous, weighed 1550 g. and showed a diffuse meningeal and cortical hyperemia without evidence of free inflammatory exudate. On coronal sections of the cerebral hemispheres and horizontal sections of the brain stem and cerebellum, no additional gross abnormality was seen. Microscopically, in the cortex and in the white matter of the cerebral hemispheres there were multiple scattered small foci of necrosis and inflammatory infiltration by microglial cells and perivascular cuffs composed mainly of mononuclear cells. The basal ganglia, apart from similar cellular infiltrates, contained several small foci of spongy tissue softening in the stage of resolution, with a few lipid phagocytes and lymphocytes. In the sub-

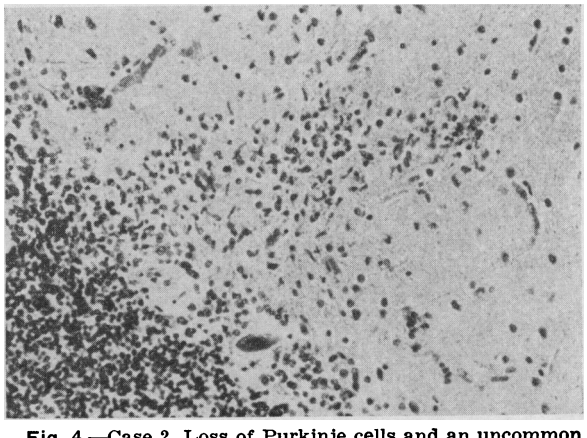


Fig. 4.—Case 2. Loss of Purkinje cells and an uncommon observation of Spielmeyer's "microglial shrub formation" in molecular layer of cerebellar cortex. (Nissl's cresyl violet, × 150.)

stantia nigra there were observed perivascular lymphocytic infiltrates, focal areas of microglial proliferation, and several small resolving foci of necrosis. There were several scattered glial nodules, and perivascular lymphocytic cuffs were seen in the pons and medulla oblongata. Moderately numerous inflammatory infiltrates were present in the white matter of the cerebellum.

CASE 4.—A 30-year-old man was admitted to the Regina General Hospital on August 29, 1965, with a history of severe headache, anorexia and neck stiffness of one week's duration, and with fever, dizziness and confusion one day before admission. He was disoriented and irrational, and had a blotchy, red rash on his trunk; his throat was congested. The cervical lymph nodes were enlarged. He appeared to be photophobic and his pupils were contracted. The patient was incontinent of urine. His blood pressure was 120/80 mm. Hg, his pulse 85 and his temperature 103° F. The spinal tap on admission yielded clear colourless cerebrospinal fluid with 30 white blood cells per c.mm., of which 80% were lymphocytes and 20% were polymorphonuclear leukocytes. The protein level was 50 mg. per 100 ml., the chlorides 118 mEq. per litre. The hemoglobin was 86%, the hematocrit 42.5 ml. per 100 ml. and the white blood count 11,150 per c.mm. with a normal differential. The patient was confused, with periods of euphoria or lethargy. His pyrexia persisted. Stiffness and tremor of the extremities were observed. On the eighth hospital day, generalized convulsions were recorded and the patient developed shortness of breath and circulatory collapse. He died on September 6, 1965, 15 days after the onset of the illness.

The brain at autopsy weighed 1630 g., and was edematous and congested. A few random blocks of cerebral cortex were available for histological study. There was moderate meningeal infiltration by lymphocytes and macrophages. In the cortical ribbon and subcortical white matter there were scattered focal and perivascular infiltrates composed predominantly of lymphocytes, macrophages and microglial cells. The picture was histologically essentially the same as that of the other cases in this series.

CASE 5.—This 66-year-old unmarried woman was known to be a mild diabetic and was admitted to a local hospital on August 22, 1965, with a history of four days' pyrexia and loss of appetite. On examination she was perspiring freely. She was drowsy but could be easily aroused. Her oral temperature was 99° F., pulse 84, blood pressure 110/70 mm. Hg. Her pupils were equal, moderately dilated and reactive. There was slight hyperreflexia, with a left flexor plantar response and an equivocal right plantar response. The white blood count was 8300 per c.mm. In the evening of the same day her temperature rose to 104° F. She was treated with intravenous fluids, chloramphenicol and supplements of insulin. The next day, the patient became disoriented and developed spasticity of the extremities affecting initially the right arm and leg and finally the left arm. In addition, facial and glottal palsy were noted. The pupils were sluggish but remained symmetrical. She lapsed into coma overnight and died on August 25, 1965.

Autopsy was performed at the Regina General Hospital. The brain weighed 1290 g. Microscopical examination of several histological sections confirmed the diagnosis of encephalitis. There was slight infiltration of the leptomeninges by lymphocytes and histiocytes. In the cortex and subcortical white matter, moderately numerous perivascular cuffs of lymphocytes and a few granular leukocytes were present, as well as scattered small focal aggregates of microglial cells. Both types of lesion were also found in the basal ganglia and thalami, in addition to several small foci of tissue softening containing a few lipid phagocytes. One section of the substantia nigra was examined, and the damage was found to be of moderate severity in this location.

CASE 6.—This 63-year-old man became ill on August 10, 1965, with fever, headache and vomiting. Four days later he was admitted to hospital, where he was found to have depressed reflexes, partial facial palsy, neck stiffness and a temperature of 101.8° F. He rapidly became comatose. The spinal fluid revealed no cells, a protein content of 35 mg. per 100 ml., and a glucose content of 108 mg. per 100 ml.; the opening pressure was 500 mm. of water and the closing pressure 400 mm. of water. His coma deepened and he died two days after admission.

At autopsy, the leptomeninges were severely congested. There were numerous petechiae of the cerebellum, pons and cerebral hemispheres. The gross weight of the brain was 1590 g. Histologically, the changes in his brain were similar to those of the previous patients, although the cellular inflammatory reaction in the lesions was less prominent. The basal ganglia and the substantia nigra were affected to a moderate degree. The nerve cells, especially the Purkinje cells of the cerebellum, were swollen and pale, and were occasionally found in a stage of disintegration; in some segments of cerebellar folia, the Purkinje cells were reduced numerically, leaving behind empty spaces.

CASE 7.—This was a case of "crib death" of a 5-week-old male infant. The infant had not been noticeably ill, but was found dead on the morning of September 16. At autopsy, the brain weighed 460 g. and was symmetrically shaped, with the leptomeninges deeply congested. There was no purulent exudate or internal hemorrhage. The extradural sinuses, middle ears and mastoid air sinuses were normal. A few blocks of cerebral cortex were preserved for microscopic examination, and for the sake of completeness, blocks of brain tissue were sent to the virus laboratory. A tissue pool from the

TABLE I.—FATAL CASES OF WESTERN ENCEPHALITIS: SASKATCHEWAN EPIDEMIC 1965

Case	Age	Sex	Date of onset 1965	Symptoms on admission	Cerebrospinal fluid: Days after onset	Cerebrospinal fluid: Protein mg./100 ml.	Cerebrospinal fluid: Leukocytes per c.mm.	Days from onset to death	WE virus isolated
1	3 wks.	F	Aug. 23	Temperature 99°F., poor feeding, arching of back, twitching	3	86	29	3	+
2	61	F	Aug. 18	Temperature 104°F., dizziness, vomiting	7	18	20	12	+
3	74	M	Sept. 5	Temperature 104.5°F., malaise, aches, drowsiness	3	31	40	4	+
4	30	M	Aug. 18	Temperature 103°F., dizziness, confusion	7	50	30	15	+
5	66	F	Aug. 18	Temperature 99°F., anorexia, drowsiness	—	—	—	7	+
6	63	M	Aug. 10	Temperature 101.8°F., headache, vomiting, partial palsy	5	35	0	6	+
7	5 wks.	M	Sept. 16	Crib death	—	—	—	1?	+
8	59	M	Sept. 1	Temperature 106°F., malaise, headache, confusion	4	57	16	Apparent recovery in 14 days; death due to complicating ulcer 44 days after onset	—

cerebral cortex, thalamus and brain stem yielded WE virus upon inoculation of chick embryos.

Histologically, the sections of brain disclosed no evidence to support the diagnosis of encephalitis. The few available sections, however, might not have been representative, as they were taken at random from the cerebral cortex only. After successful isolation of WE virus, no more brain tissue was left for further histological examination.

CASE 8.—This 59-year-old man was admitted to Melfort Union Hospital on September 3, 1965, with several days' history of fever and malaise. On admission, he was comatose; his temperature was 106° F., pulse 120 per minute, respiration 30 per minute, and blood pressure 170/100 mm. Hg. There was apparently no neck rigidity; the reflexes were present and equal bilaterally. The white blood cell count was 16,000. In the spinal fluid there were 56 cells per c.mm. and 86 mg. per 100 ml. of glucose. Two days later he was transferred to the University Hospital in Saskatoon. He was semicomatose with moderate neck stiffness and a positive Kernig's sign. He moved all his limbs to painful stimuli, and had equal reflexes in the lower limbs. On repeat examination the cerebrospinal fluid showed a cell count of 16 white blood cells per c.mm., 57 mg. per 100 ml. of protein, 78 mg. per 100 ml. of glucose, and 128 mEq. per litre of chlorides. He improved gradually over the next 14 days but at the end of this period he developed melena and hematemesis. Clinically, an active duodenal ulcer was diagnosed and partial gastrectomy was carried out. However, septic bronchopneumonia developed and pulmonary embolism occurred; the patient died on October 16, 1965.

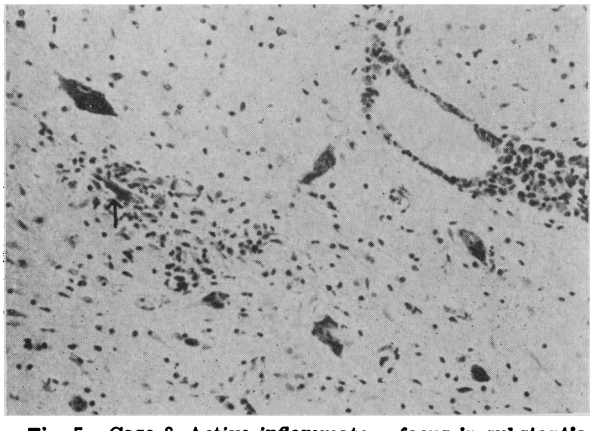


Fig. 5.—Case 8. Active inflammatory focus in substantia nigra. Disintegrating melanin-containing nerve cell (arrow) near centre of microglial inflammatory infiltrate; blood vessel at upper right is surrounded by lymphocytes and macrophages. (Nissl's cresyl violet, × 150.)

The diagnosis of western encephalitis was made on the basis of histopathology and a rising complement fixation titre which after two weeks of the disease had doubled from 1 in 8 to 1 in 16. Pathological examination of the brain disclosed the presence of subsiding encephalitis in the white matter of the cerebral hemispheres, where a few small collections of microglial cells and perivascular cuffs of lymphocytes were present. Scanty numbers of similar lesions were found in other locations, including the medulla and cerebellum. In the substantia nigra, fairly numerous apparently active focal infiltrates were discovered (Fig. 5). In the basal ganglia and in the tegmentum of the pons, there were several small rounded areas of resolving tissue necrosis. The nature of the latter lesions was not clear in view of the coexisting moderate cerebral arteriosclerosis, which was clinically complicated by episodes of circulatory failure secondary to gastrointestinal bleeding. It is possible that the duodenal ulcer was of the "Cushing's ulcer" variety, secondary to cerebral damage.

The clinical data of this series are set out in Table I.

DISCUSSION

The illness progressed rapidly in infants and in people past middle age, and death came more quickly to those at either end of the age spectrum than to those of intermediate age. Two of the victims were less than 2 months old and died within three days of the onset of the disease. Four patients over the age of 60 succumbed between 4 and 12 days after the onset, while the 30-year-old victim survived for 15 days. The eighth patient appeared to recover from a comatose state but developed a bleeding duodenal ulcer and succumbed to complications.

Etiological diagnosis of the acute cases was not possible on a clinical basis or on examination of cerebrospinal fluid. Many clinically similar cases of encephalitis in the same period of time were proved by virus isolation or serology to be due to viruses other than WE. Of the 157 cases where virus isolation or serology was helpful, 50 were attributable to echovirus 6, 13 to mumps virus, 4 to adenovirus type 3, and 11 to other viruses. WE virus could reasonably be incriminated in only 72 (including the eight fatal cases) or slightly less than half of the suspects. Protein content of the spinal fluids from patients critically ill with WE infection was slightly or moderately increased, while the white cell counts were less than 100 per c.mm. Many patients who were recovering within three to five days after the onset of symptoms commonly had higher cell counts.

The amniotic sac of 10-day developing chick embryos (DCE) proved to be an efficient detector of WE virus in clinical specimens. The cerebrospinal fluid of one patient (Case 2) and the brains of all seven who died within 15 days of onset yielded WE virus. The same virus was also recovered from the cerebrospinal fluids mailed in dry ice from seven other patients who recovered, and from the auger-suction of a 5-week-old infant. Other workers[1, 2] have reported successful isolation of WE virus from cerebrospinal fluid. We are not aware of other reports of isolation of the virus from throat washings. Litters of newborn mice inoculated intracerebrally with the same cerebrospinal fluids failed to yield virus, although cannibalism may have removed the evidence in some cases. The larger inoculum of low-titre material accommodated by the amniotic sac of DCE (0.2 ml.) compared to inoculum tolerated by newborn mice (0.02 ml.) may account for the superior performance of the DCE. The virus, once isolated in DCE, was very pathogenic for suckling and newborn mice. New-hatched chicks (wet chicks) or cell cultures of chick embryo fibroblasts tolerant of inocula as large as 1.0 ml. might be even more sensitive detectors, but these were not in use here at that time.

The fulminating course in the infant whose brain was studied in considerable detail (Case 1) might have had some relation to the severity of brain damage which was more extensive than that of the other cases. The few slides available from the "crib death" case were free from microscopic evidence of disease and it is not clear if this was due to an unusually toxic viral infection to which the infant succumbed before the brain tissue had a chance to respond by cellular inflammatory reaction,[3] or whether the few slides available were not representative enough for confirmation of the diagnosis of encephalitis. Our gross and histopathological findings in this series of cases were essentially in agreement with those of previously reported cases.[3-8] The appearance of the lesions was very similar but showed no specific features that would allow making the diagnosis of western encephalitis on the basis of histological changes alone. The perivascular cuffing by lymphocytes and granular leukocytes, along with small, occasionally confluent necrotic or inflammatory microglial foci, appeared to represent a non-specific type of brain tissue reaction to viral infections in general. There were no intranuclear or intracytoplasmic inclusions of any kind. With regard to distribution of the lesions, in the majority of cases the subcortical white matter was more extensively damaged than the cortex itself. In some of our cases, the white matter immediately subjacent to the cortex was more involved than the deeper layers of the white matter; this was particularly prominent in the infantile brain. The observation of severe involvement of the white matter is recorded in previous reports and it makes understandable the finding of extensive cystic destruction or gliosis of subcortical white matter described as sequelae of the disease attacking in the infantile period.[3, 9, 10] The large masses of subcortical grey matter, the basal ganglia, the thalami and the brain stem were affected to a variable extent, usually severely. Of special interest is the degree of damage to the substantia nigra. In the infantile case, the damage was only moderate, but all of the adult patients were more severely affected. Even in the subsiding encephalitis in Case 8, several large active lesions were present in the substantia nigra. It is planned to follow up the survivors of this epidemic for possible subsequent developments of parkinsonism. So far only one of 44 adults has developed generalized parkinsonism within a year of his illness. A review of clinical sequelae of this epidemic is in preparation.[11]

Summary The clinical history and neuropathological findings in eight fatal cases from the Saskatchewan epidemic of western encephalitis occurring in 1965 are reported. Seven patients died in the acute stage of the disease; one patient died in the subacute stage as a result of complications of a duodenal ulcer. The WE virus was isolated in the amniotic sac of developing chick embryos from the cerebrospinal fluid of one adult patient; throat washings of an infant; and the brains of seven patients who died within 15 days of the onset of the disease. The brain lesions were widespread and consisted of perivascular cuffings of leukocytes, and small focal areas of necrosis and inflammatory infiltration. In some of the patients, there was a predominant concentration of the lesions in the subcortical white matter.

Résumé On trouve ici l'histoire clinique et les constatations neuropathologiques de huit cas fatals enregistrés au cours de l'épidémie d'encéphalite de l'ouest de la Saskatchewan de 1965. Sept des malades sont morts pendant la phase aiguë de la maladie, le dernier pendant la phase subaiguë, des complications d'un ulcère duodénal. Le virus de l'EW (encéphalite western) a été isolé (a) dans l'amnios d'embryons de poulet en voie de développement; (b) dans le liquide de lavages de gorge d'un nourrisson et (c) dans le cerveau de sept malades qui sont morts dans les 15 jours suivant le début de la pathologie. Les lésions cérébrales étaient étendues et consistaient en manchons inflammatoires périvasculaires de leucocytes et en petites zones focales de nécrose et d'infiltration inflammatoire. Chez certains des malades, les lésions prédominaient dans la matière blanche sous-corticale.

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