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STUDIES ON NEUROMUSCULAR DYSFUNCTION^{1 2}

I. NEOSTIGMINE THERAPY OF NEUROMUSCULAR DYSFUNCTION RESULTING FROM TRAUMA. II. NEOSTIGMINE THERAPY OF HEMIPLEGIA, FACIAL PARALYSIS AND CEREBRAL PALSY. III. NEOSTIGMINE THERAPY OF CHRONIC RHEUMATOID ARTHRITIS AND SUBACROMIAL BURSTITIS

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INTRODUCTION

The value of neostigmine in providing relief from fatigue and weakness of skeletal muscle in myasthenia gravis has been well established. In poliomyelitis, Kabat and Knapp (1) found that neostigmine produced relaxation of muscle spasm, relief from pain, increase in strength, and improvement in muscular coordination. On the basis of these studies on poliomyelitis, as well as preliminary observations of the author on the effects of neostigmine on muscle spasm in chronic rheumatoid arthritis and acute fibrositis, and of Trommer and Cohen (2) on rheumatoid arthritis, it was considered worth while to explore the therapeutic possibilities of neostigmine in a variety of types of neuromuscular dysfunction. In this preliminary investigation it was not intended to obtain definitive information on the indications for and extent of usefulness of neostigmine, but rather to ascertain what disabilities appeared to respond sufficiently to justify detailed, controlled study.

MATERIAL

Patients selected for study were those suffering from chronic neuromuscular disability which had not been responding to routine therapy. In order to limit the work involved, it was decided to select for study patients who on the basis of theoretical considerations might be expected to respond to neostigmine, and whose disability was such that the effect of the drug could readily be evaluated.

¹ From the Division of Public Health Methods.

² The author wishes to express his thanks to Assistant Surg. Gen. R. C. Williams, Medical Director W. S. Bean, and Medical Director W. F. Ossenfort for the cooperation extended at the several U. S. Marine Hospitals. Many of the cases reported were treated at the U. S. Marine Hospital, Norfolk, Va.

Except for a few cases referred to the author by various sources and treated as out-patients, the patients were hospitalized at the United States Marine Hospitals and had been under treatment for some time. The diagnosis had been established and the course of the disability observed by the staff of the hospital. Patients with chronic disability of various types were referred to the author by these staff physicians. From these referrals the author selected patients for neostigmine therapy on the basis of the following criteria:

1. Muscle spasm, contracture, paresis, or muscular pain appeared to play a major role in the disability.
2. There was no obvious evidence of psychiatric factors in the disability.
3. The disability could be demonstrated objectively.
4. The disability had been present for a considerable period of time, had not had spontaneous exacerbations or remissions, and was either not improving or improving so slowly that the effect of therapy could be evaluated.
5. The disability was not complicated by demonstrable anatomical lesions such as ankylosis, bony block, complete loss of innervation, or active inflammation.

METHOD

Careful records were kept describing the disability in detail, including measurements of range of passive motion in angles, and of strength in terms of motion against resistance. During the period of neostigmine therapy, other therapeutic measures, including physical therapy, were discontinued.

Neostigmine was injected subcutaneously once or twice daily. The routine dosage was 2 cc. of neostigmine methylsulfate³ 1:2,000 solution (1 mg.), together with atropine sulfate, gr. 1/100 (0.65 mg.) or gr. 1/150 (0.43 mg.). The atropine was used to eliminate the unpleasant parasympathetic side effects of the neostigmine.

I. Neostigmine Therapy of Neuromuscular Dysfunction Resulting from Trauma

Following fractures and other traumatic conditions, troublesome sequelae frequently persist for a long period of time. These include muscle spasm, contracture, joint stiffness, pain referred to joints and muscles, muscular weakness, and atrophy.

RESULTS

A. FRACTURES.—Eight patients suffering from persistent joint stiffness, pain, weakness, fatigue, and limitation of motion following various types of fractures were given neostigmine therapy. In seven of these cases, significant improvement was noted during 1 to 3 weeks

³ Furnished through the courtesy of Hoffman-LaRoche, Inc., Nutley, N. J.

of drug treatment. In five cases, definite improvement was observed in 24 hours.

Case 1.—C., female, age 47. Left Colles's fracture had been sustained 5 months before. The chief disability was marked weakness and fatigue, and atrophy of the left upper extremity. There was limitation of passive wrist motions, of supination, and of flexion of the fingers. The patient had failed to improve with physical therapy.

After 4 days of neostigmine therapy, she reported that she was using the left arm more normally without strain and fatigue. There was a striking increase in strength, so that some motions of the left arm were equal in power to the right and all motions could be carried out against strong resistance.

After 2 weeks, neostigmine therapy was discontinued. At this time, strength was normal in all motions of the left upper extremity except for slight weakness of grip and wrist motions. The limitation of finger flexion and of supination had disappeared and there was a significant increase in range of motion at the wrist. Two months after cessation of neostigmine therapy there had been no recurrence of disability.

Case 2.—O. C., female, age 33. Fracture of the left olecranon had been reduced by open operation and the fragments wired. After 2½ months, there was severe disability which was not responding to physical therapy. Examination revealed atrophy and marked weakness in all motions of the left upper extremity. The patient complained of pain in the elbow and in the muscles of the forearm and arm, and of weakness and fatigue. At the shoulder, passive abduction was limited at 90°, forward flexion at 100°. At the elbow, the total range of motion was 24° (extension limited at 144°, flexion at 120°). She was only able to reach to within 4 inches of her forehead.

Within 24 hours after the first injection of neostigmine, the limitation of motion at the shoulder disappeared and the patient was able to raise the arm actively to the vertical without pain. She was able, for the first time, to touch her forehead. Pain referred to the muscles was greatly diminished.

After 1 week of drug treatment, there was a significant increase in strength and increase in range of motion at the elbow. After 3 weeks of neostigmine therapy, the total range of motion at the elbow was 54°, an increase of 30°, and there was full range of motion at the shoulder. Muscular pain and fatigue had completely disappeared. The left arm showed great increase in strength and was now just perceptibly weaker than the right.

Case 3.—C., male, age 18. This patient had sustained a fracture dislocation of the left shoulder 3 years before and had injured it again 8 months previously. He had been in the hospital for 4 months receiving physical therapy for the disability, with no improvement. There was severe pain in the shoulder muscles on active and passive motion but no limitation of passive motion. There was marked weakness of the left upper extremity and definite atrophy.

Within 18 hours after initiation of neostigmine therapy, he was able to raise the arm to the vertical with practically no pain. After 1 week of treatment, there was considerable increase in strength and disappearance of the pain.

Case 4.—W., male, age 22. Nine months before, the patient had suffered a fracture of the lower third of the left tibia and fibula with severance of the peroneal nerve. The fractures were well united without displacement. He complained of severe pain in the calf muscles and sole of the foot on weight bearing, and this disability had not been showing significant improvement. The total range of dorsal-plantar flexion at the ankle was 20° and dorsiflexion was limited at 110°.

One week of neostigmine therapy resulted in great relief from pain and an

increase in range of motion at the ankle of 25°. The patient was walking with a cane. After 2 weeks of treatment, he was walking without support and was free from pain. There was no change in the peroneal paralysis.

Case 5.—S., male, age 54. This patient had suffered a compound fracture of the lower end of the left tibia and fibula and dislocation of the ankle joint 4 months before. He complained of stiffness and pain in the ankle which interfered with weight bearing and was not responding to physical therapy. Within 24 hours after starting neostigmine therapy, there was considerable relief from pain in the ankle and an increase in range of dorsiflexion of 12°. After 6 days of drug treatment, he was free from pain, walked without a limp and there was great improvement in range of ankle motion.

Case 6.—B., male, age 30. The patient had fractured the body of the second lumbar vertebra 7 months before. He now had marked lordosis and rigidity of the lumbar spine and severe continuous pain which did not respond to rest and physical therapy. X-ray revealed almost complete disintegration of the lower half of the body of the second lumbar vertebra.

The pain disappeared several hours after the first neostigmine treatment and he was free from pain during 9 days of drug therapy. There was an increase in range of straight leg raising of 15° but no change in the rigid lordotic lumbar spine. One week after stopping the treatment, there had been no recurrence of pain.

Case 7.—H., male, age 34. This patient had had pain and muscle spasm in the back for 3 months from a fracture of the right transverse processes of the third and fourth lumbar vertebrae. The pain was relieved by neostigmine in a few hours and the limitation of motion disappeared in 1 week. One week after cessation of therapy, there had been no recurrence of disability.

Case 8.—W., male, age 20. Fracture of the lower third of the right femur and amputation below the knee had occurred 4 months before. External skeletal fixation of the right femur had been removed several weeks before. He had a flexion deformity of the knee of 15° and marked limitation of knee flexion. The day after starting neostigmine therapy, he was able to straighten the knee and this gain was retained. After 10 days of treatment, there was no improvement in range of knee flexion.

B. KNEE INJURIES.—Three patients suffered from internal derangement of the knee joint. Two to 8 months after meniscectomy, they continued to suffer from pain, weakness, and grinding in the joint. Physical therapy had been unsuccessful in relieving the disability. While neostigmine appeared to have some effect in improving strength and range of motion in these cases, it can only be considered as an adjunct to therapy, since the pain and grinding in the joint persisted unchanged.

Case 9.—D. R., male, age 19. Meniscectomy had been performed 5 months before. Five days of neostigmine therapy increased the range of knee motion 20° and enabled him to walk on the toes and the heels for the first time since the injury. The pain and grinding in the knee joint were unchanged.

Case 10.—B. S., male, age 22. Meniscectomy had been performed 8 months before. There was marked weakness of the right lower extremity. The knee tended to give way at each step and there was rapid fatigue on motion. He was unable to bear weight on the right leg in walking upstairs. After 6 days of neostigmine therapy, the patient was able to walk up three flights of stairs, bearing weight on the right leg without buckling at the knee and without fatigue. The pain and grinding in the knee joint remained unchanged.

Case 11.—B., male, age 21. Meniscectomy had been performed 2 months before. One week of neostigmine therapy resulted in an increase in motion at the knee of 10° but no improvement in the pain or the limp.

C. ANKLE SPRAIN.—In one case of ankle sprain, with disability persisting for 21 months despite intensive and continuous therapy, the dysfunction disappeared after 3 weeks of neostigmine treatment.

Case 12.—M., female, age 23. The patient had sustained a severe left ankle sprain without apparent fracture 21 months before. She had failed to improve from immobilization and physical therapy. She suffered severe pain in the ankle on weight bearing and walked with a decided limp. Dorsiflexion at the ankle was limited at 132° and the total range of dorsal-plantar flexion was 20° . Inversion and eversion were greatly limited. She was unable to walk on the toes or heel of the left foot and there was only the slightest flicker of active motion in the toes. There was definite atrophy of the calf muscles.

After 1 week of neostigmine therapy, she was moving her toes normally and there was an increased range of dorsiflexion of 20° . After 3 weeks of neostigmine treatment, the patient was able to use the ankle normally without pain. She walked without a limp and could walk on toes and heel with ease. There was no limitation in range of any motion at the ankle (dorsiflexion 98°) and motion of the toes was normal. The patient had danced for 3 hours one evening without disability or fatigue.

Two months after cessation of neostigmine therapy, there had been no recurrence of the disability.

D. NEUROMUSCULAR DYSFUNCTION FOLLOWING CHRONIC INFECTION.—Four patients had had chronic infections persisting for months or years which had finally healed. Disability consisting of joint stiffness, pain, marked weakness, and atrophy persisted. Neostigmine therapy was followed by rapid improvement in the disability in these cases.

Case 13.—R., male, age 36. Pain and disability in the left leg which had persisted for 4 months were found to be related to a deep abscess of the gluteal region. The abscess had been drained 1 month previously and the infection cleared up. However, the patient continued to complain of shooting pains down the leg, pain and muscle spasm in the hamstrings and anterior tibial muscles, and limitation of motion at the ankle. He walked with a decided limp. Eighteen hours after beginning neostigmine therapy, the disability had completely disappeared. Treatment was continued for 5 days and the patient was then discharged from the hospital to full activity.

Cases 14, 15, and 16.—Three patients had had chronic osteomyelitis⁴ for from 1 to 5 years. Severe disability, consisting of marked limitation of motion, pain, and weakness persisted after the infection had cleared up. One patient had osteomyelitis of the femur, another of the tibia, and a third of the cervical spine. After 5 days of neostigmine therapy, there was striking relief from pain, increase in range of motion, and increased strength in all of these cases.

E. PHANTOM LEG PAIN.

Case 17.—W., male, age 30. The patient had had an amputation through the upper third of the right thigh 3 months before. Since the operation, he complained of continuous severe pain in the right ankle ("like a vise clamping the ankle"). He required a great deal of sedation and was routinely awakened at

⁴ These patients were treated at the U. S. Marine Hospital, Baltimore, Md., through the cooperation of Surgeon (R) Robert T. Henkle.

night by the pain in spite of the sedative. At 10 o'clock one morning he was given the first dose of neostigmine, and by 3 p. m. he noted marked relief from the phantom leg pain. During 6 days of treatment, he was free from pain and required no sedation. He was seen 6 weeks after neostigmine therapy was discontinued and had remained free from pain.

F. MISCELLANEOUS TRAUMATIC CASES.

Case 18.—K., male, age 18. The chief complaint was severe pain and tenderness in the left posterior calf, of 4 months' duration, resulting from direct trauma. Neostigmine therapy failed to relieve the pain and tenderness, but 6 days of treatment resulted in an increase of 20° in range of ankle dorsiflexion and enabled the patient to walk on his toes for the first time since the injury.

Case 19.—L., male, age 27. The patient had pain and limitation of motion of the left hip of 3 weeks' duration, related to severe exertion and muscle strain. He walked with a decided limp. Pain disappeared after 3 days of neostigmine therapy. After 8 days of treatment, he was free from pain and walked with only a slight limp. Range of left straight leg raising had increased 30°; right straight leg raising had increased 35°. Pain and limitation of motion on external rotation at the left hip had disappeared. Range of left hip flexion with the knee flexed had increased 35°.

II. Neostigmine Therapy of Hemiplegia, Facial Paralysis and Cerebral Palsy

The persistent disability in hemiplegia is based on muscular spasticity, which resists and limits passive motion, on various degrees of paresis, and in some cases on muscular pain. Since these types of neuromuscular dysfunction in poliomyelitis (1), chronic rheumatoid arthritis (2), and in disability following trauma have been observed to respond to neostigmine therapy, it was considered worth while to explore the possibilities of neostigmine therapy in hemiplegia and in the spastic type of cerebral palsy. Ward and Kennard (3) have reported that recovery of function following ablation of the motor cortex in monkeys is accelerated by administration of a cholinergic drug, doryl. The therapeutic action of doryl in experimental hemiplegia was not affected by atropine. Kremer (4) investigated the central action of neostigmine in man by intrathecal administration of the drug to 37 patients with evidence of pyramidal tract involvement. In all cases, neostigmine produced a striking depression of tonus of skeletal muscle and of deep reflexes by direct action on the spinal cord. Strength of voluntary motion was also depressed by the drug. Kremer made no attempt to apply these observations to therapy. Wolf (5) has reported a case of chronic facial paralysis that showed improvement from neostigmine administration.

RESULTS

A. HEMIPLEGIA.—Seven patients with hemiplegia have been treated with neostigmine and atropine administered subcutaneously once or twice daily. The drug was found to depress muscle tonus and thereby relieve spasticity, increase range of passive motion and decrease deformity. There was also relief from muscle pain and definite in-

crease in power of voluntary motion. Improvement was evident in some cases within 24 hours after initiation of neostigmine therapy.

Case 20.—L., male, age 34. Right hemiplegia, ptosis, lower facial paralysis, dysarthria, and lingual paresis had developed suddenly 5 months before. The patient suffered from chronic hypertension and hypertensive encephalopathy. There had been no apparent improvement in the neurological condition for several months.

(a) *Cranial nerves.*—Before neostigmine treatment, there was paralysis of the right side of the face below the brow. Ptosis was present and the right corner of the mouth was drawn down and did not move in attempting to show the teeth. He had considerable dysarthria, difficulty in moving food from one side of the mouth to the other, and was unable to suck fluids through a tube. He stated that his tongue felt thick as though it filled his mouth, and he had trouble controlling it.

Subcutaneous injections of neostigmine methylsulfate, 1 cc. of 1:2,000 solution, and atropine sulfate, gr. 1/150, were administered twice daily. After 1 week of treatment the facial paralysis had greatly improved. There was no ptosis, and eyelid movements were stronger. The right corner of the mouth was not drawn down. In attempting to show his teeth, the right corner of the mouth moved almost as well as the left. The difficulty in moving food about in the mouth was no longer observed. He was able to suck fluids through a tube with ease. Speech was markedly improved: enunciation was clear and he was able to speak more rapidly. The feeling of thickness of the tongue had disappeared. After 3 weeks of neostigmine therapy, the only sign of facial paralysis was a slight weakness in moving the right corner of the mouth when showing the teeth. The eyelids, tongue, and speech were normal.

(b) *Range of passive motion.*—At 5 months after the onset of the spastic paralysis, there was marked limitation in range of passive motion (table 1). At the wrist, there was limitation of passive extension and ulnar deviation. The hand showed a flexion deformity and it was impossible passively to straighten the fingers or extend them at the metacarpophalangeal joints. At the hip, there was considerable limitation of internal and external rotation.

The increase in range of passive motion brought about by neostigmine is evident in table 1. Measurements of angle of limitation of motion were made with a goniometer. Some improvement was apparent in 24 hours and most of the improvement occurred in the first week of drug therapy. The increase in range of motion was usually 15° to 20°.

TABLE 1.—Case 20. Hemiplegia of 5 months' duration. Angle of limitation of motion (in degrees)

			Neostigmine therapy				
			Before	1 day	1 week	2 weeks	3 weeks
Shoulder	Abduction	Passive	75	90	95	90	90
		Active	40		55	65	60
	Forward flexion	Passive	105		115	110	110
		Active	30		45	45	50
	Extension	Passive	65		75	70	80
		Active	30		45	50	45
Elbow	Flexion	60	45	40	45	45	
Knee	Extension	160		170	180	180	
Ankle	Dorsiflexion	120		110	100	95	
Bending forward, knees straight			12		8	6	7

¹ Single reading. No significance is attached to changes of less than 10°.

² Distance of fingertips from floor in inches.

Within 24 hours, there was definite improvement in the flexion deformity of the fingers. The hand was warmer and felt "less clammy" to the patient. After 1 week, the limitation of passive motion at the wrist and in rotation at the hip was no longer present. After 2 weeks, the flexion deformity of the fingers practically disappeared.

(c) *Active motion.*—One of the striking changes observed following neostigmine therapy was the increased power of voluntary contraction of the muscles. This patient, in attempting to touch his forehead, was able to reach only to 15 inches from his head. He was also incapable of actively touching the opposite shoulder. The first injection of neostigmine was given one evening, and the next morning the patient could actively touch the forehead and opposite shoulder for the first time. The increase in strength was also evident from the angle of limitation of active motion (table 1).

Before drug treatment was initiated, the patient was unable to stand up or walk without support. He was able to walk with great difficulty with a cane in the right hand if he supported himself against the wall with his left hand and pulled himself along. After 1 week of neostigmine therapy, he was able to walk well with a cane, his gait was stronger and more stable, and the limp was less marked. At 2 weeks, his gait was greatly improved and the ankle clonus which had occurred at each step was no longer present. At 3 weeks, he was able to walk at least 100 feet without the cane and with only a slight limp and had walked up stairs and on rough ground without difficulty, using the cane.

There was a definite improvement in strength and coordination of all the affected muscles; this was evident to the patient and readily demonstrable objectively. Before treatment, the grip was very weak and finger coordination very poor. The patient was unable to stand on the toes or heel of the right foot. He was able to turn the shoulder wheel only about one-third of one turn. He had great difficulty in balancing himself on the stationary bicycle, his right foot came off the pedal at almost every turn and he was able to try it only for 1 or 2 minutes. After 1 week of neostigmine therapy, there was increase in strength and better coordination. The grip was definitely more powerful. The patient was now able to walk on the toes but not on the heel of the right foot. After 2 weeks of drug treatment, there was further improvement in strength of grip, and better coordination and greater rapidity in rhythmic movements of the fingers. He rode the stationary bicycle without difficulty for 15 minutes and made 2 consecutive turns on the shoulder wheel. He could stand up straight and bend forward with the knees straight and the arms extended without support and with good balance. After 3 weeks of neostigmine therapy, the patient was able to turn the shoulder wheel at least 24 times, and had greater strength, coordination, and endurance on the stationary bicycle. There was progressive increase in strength and better coordination in both the right arm and leg.

(d) *Reflexes.*—The biceps, triceps, knee, and ankle jerks were markedly hyperactive on the right side. The Hoffman reflex was positive but the Babinski, Chaddock, Gordon, and Oppenheim reflexes were negative on the right side. Sustained ankle clonus was readily elicited on the right. In walking, the right foot showed clonus at each step.

During neostigmine therapy, there was no apparent change in these reflexes except for the ankle clonus. At 2 weeks after beginning the drug treatment, it was noted that the right ankle clonus was no longer present in walking. In the supine position, it was definitely more difficult to elicit ankle clonus than it had been previously, but the clonus was still sustained.

(e) *General condition.*—This patient had had hypertension for a long time and suffered from headaches and dizziness. He was markedly undernourished and

weighed only 107 pounds. His appetite was poor. His usual blood pressure was 220/150.

During the period of neostigmine therapy, no untoward reactions were noted from administration of the drugs. His blood pressure was measured frequently and did not rise above 220/150. At 3 weeks after initiation of therapy, blood pressure was 200/150. There had been no increase in the symptoms of hypertensive encephalopathy. His appetite was still poor and he weighed 106 pounds.

During 2½ months after cessation of drug therapy, the improvement in passive and active motion had been retained.

Case 21.—S., male, age 56. Patient had a right hemiplegia of 17 years' duration. There had been no change in his condition for many years.

The right foot showed a marked equinus deformity, with the heel 2½ inches from the floor. There was a slight flexion deformity of the knee, tilted pelvis, scoliosis, and kyphosis. There was an extreme flexion deformity of the right hand and wrist.

After 1 week of neostigmine therapy, the equinus had disappeared and the patient was able to stand up much straighter with both heels on the floor. The flexion deformity of the knee was no longer present and there was considerable improvement in the flexion deformity of the hand and wrist.

After 1 month of treatment, he could stand up straight with both heels on the ground, both knees straight, and only slight kyphosis. The fingers could be fully extended but there was moderate flexion at the metacarpophalangeal joints. The flexion deformity at the wrist was greatly improved.

The patient was able, for the first time in many years, to carry out the following motions 24 hours after beginning neostigmine therapy: touch top of head, opposite shoulder, opposite buttock, mouth, and chin, put cigarette in mouth, abduct the hip, and elevate the scapula. At this time, there was a striking decrease in resistance to passive motions of the upper extremity and measurable increase in range of passive motion.

After 1 month of treatment, the range of passive shoulder abduction had increased 15°, forward flexion 15°, extension 15°. Rotation at the shoulder was no longer limited and resistance to passive motion at shoulder and elbow had disappeared. Range of passive supination increased 90°, wrist extension 40°, hip flexion 40°, knee extension 20°, and ankle dorsiflexion 45°. Whereas there had been complete limitation of external and internal rotation at the hip and inversion and eversion at the ankle before treatment, all of these passive motions could be carried out through the full normal range after 1 month of neostigmine therapy.

On the first examination, the right ankle jerk was difficult to elicit and ankle clonus was not obtained. After 1 week of treatment, with marked increase in range of motion at the ankle, the right ankle jerk was hyperactive and sustained ankle clonus was readily elicited.

Before treatment, if the patient held an object in the right hand he was unable to release it voluntarily, but had to remove it with the left hand. After 1 week of treatment he was able to release objects held in the right hand without difficulty.

There was a striking increase in strength of all motions at the shoulder and elbow, only slight improvement in strength of motions of wrist and fingers. In the lower extremity, there was marked increase in strength of hip flexion, extension and abduction, and of plantar flexion at the ankle. After 1 month of treatment, he had no power in the interossei of the right hand, no active motion in hip rotation, and ankle dorsiflexion, inversion, and eversion. The gait was definitely improved.

Case 22.⁵—R., male, age 68. Right hemiplegia of 4½ months' duration due to cerebral thrombosis showed very little improvement from routine therapy. The patient was given daily injections of placebos (saline) for 5 days with no subjective or objective improvement. On the day following the first injection of neostigmine, the patient reported spontaneously that he was stronger, had less pain, and could move more easily. On the third day of neostigmine therapy, there was increased range of passive motion, a definite increase in strength, less pain in the spastic arm and leg, and improved strength and coordination of tongue and eyelids. Further rapid improvement in strength, range of motion and gait, and relief from pain were observed during 1 month of neostigmine therapy.

Case 23.—This patient had a hemiplegia of 3 months' duration that developed shortly after a series of head injuries. After 1 week of neostigmine therapy, there was striking improvement of dysarthria and facial paralysis, increased range of and decreased resistance to passive motion, and striking increase in strength. He reported that there was definite improvement in the hemihypesthesia. At 1 month following cessation of treatment, the improvement had been retained.

Case 24.—Another patient⁶ with hemiplegia of 1½ years' duration had precordial pain at night from pressure on the chest caused by the spastic arm. Neostigmine rapidly relieved these symptoms and caused increased range of motion of the upper extremity and significant improvement in gait.

Cases 25 and 26.—Definite and rapid improvement in range of motion and strength has been observed in two other patients with hemiplegia.

B. MONOPLÉGIA.

Case 27.—M., male, age 56. This patient had a monoplegia of the left upper extremity of obscure etiology, which had been present for 21 months. Before treatment, all motions of the left arm could only be carried out against slight or moderate resistance. He could bend forward to reach 10 inches from the floor. After 2 days of neostigmine therapy, all motions of the left upper extremity could be carried out against strong resistance, and were just perceptibly weaker than the right. Muscle pain had disappeared. The patient could bend forward to reach to 3 inches from the floor. After 9 days of treatment, the left arm was equal in strength to the right.

Case 28.—This patient with a monoplegia and facial paralysis of 3 weeks' duration due to neurosyphilis showed no response to saline injections but showed a striking increase in strength in the monoplegic arm after 3 days of neostigmine therapy. There was no improvement in the facial paralysis.

C. FACIAL PARALYSIS, DYSPHONIA, DYSARTHRIA AND DYSPHAGIA.

Case 29.—P., female, age 42. This patient had a right facial paralysis of lower motor neuron type and a dysphonia of 10 years' duration. The disability was caused by a head injury with basal skull fracture.

Before treatment the right side of the face had a stiff, boardlike quality. There was no motion of raising the right eyebrow, of frowning, or of the right ala nasi. Eye closure was very weak and the right eye could not be closed completely. The right corner of the mouth was drawn down and there was very little motion in smiling. If the patient rinsed her mouth, fluid streamed out through the right corner of the mouth.

The voice was always hoarse and the patient stated that it required a "strenuous effort in the throat" in order to speak. The voice fatigued very easily and frequently would crack, or no sound was emitted at all despite intense effort.

⁵ This patient was treated at the U. S. Marine Hospital, Stapleton, S. I., N. Y., through the cooperation of Passed Assistant Surgeon (R) Henry I. Russek.

⁶ This patient was treated at the U. S. Public Health Service Dispensary, Washington, D. C., through the cooperation of Passed Assistant Surgeon (R) R. M. Thomas.

Four days after initiating neostigmine therapy, the right side of the face lost its boardlike quality and became softer and more mobile. The mouth was straighter in repose and the patient was able to pucker the lips and hold fluid in the mouth for the first time. The dysphonia was greatly improved.

After 3 weeks of treatment, she was able to frown and elevate the eyebrow slightly. The right eye could be closed completely and with increased strength. The right ala nasi now moved slightly and the nasolabial sulcus was much deeper, giving the face a more symmetrical appearance. In repose, the mouth was straight. She could pucker the lips more strongly and had no difficulty in holding fluid in the mouth or in drinking pop from a bottle. There was definite improvement in motion of the right side of the mouth in smiling and showing the teeth. The stiffness of the right side of the face was no longer present. The dysphonia had practically disappeared. The hoarseness was almost gone, there was no fatigue, and speech required no effort. She no longer noticed cracking or loss of the voice.

During 3 months following cessation of neostigmine therapy, the improvement had been retained.

Case 30.—M., female, age 46. Left Bell's palsy was of 3½ years' duration. Neostigmine therapy for several weeks resulted in slight but definite increase in motion of the left side of the nose and cheek.

Case 31.—S., male, age 45. Bilateral lower motor neuron facial paralysis, dysarthria, and dysphagia had developed following heat exhaustion and had been present for 5 weeks. The dysarthria was severe and no words could be understood. The tongue could not be protruded or moved from side to side, and there was no motion of the soft palate.

After 1 day of neostigmine therapy, there was striking improvement in the dysphagia. After 2 days, he was able to say a number of words fairly clearly and had more motion of the soft palate and tongue.

After 8 days of neostigmine therapy, the patient's speech was greatly improved. He could say almost any word clearly and was using phrases and short sentences, although he still had to speak slowly. The voice was louder and the nasal tone less marked. The dysphagia had disappeared. He was able to protrude the tongue and move food about the mouth without difficulty. The bilateral facial paralysis showed no significant improvement.

D. CEREBRAL PALSY.—Because of the similarity of the disability in the spastic type of cerebral palsy to hemiplegia, it was of interest to determine the action of neostigmine in cases of cerebral palsy. Five cases of cerebral palsy have been treated with neostigmine through the cooperation of three physicians.⁷ Definite improvement of spasticity and some improvement in strength and coordination has been observed in these cases.

Case 32.—A 9-year-old male with severe contractures from congenital cerebral palsy, under the care of Dr. Lloyd. It was impossible to separate the legs because of adductor contractures, the knees were in maximal flexion, the arms and hands in extreme flexion, and the back in hyperextension with opisthotonos. The boy had never been able to lie flat on his back. After several weeks of neostigmine therapy, the adductors relaxed and the knees could be separated a distance of about 12 inches. There was relaxation of the hamstrings and increased range of knee extension of about 70°. The opisthotonos disappeared and the hyper-

⁷ The author wishes to thank these physicians for their cooperation. Two cases of cerebral palsy were under the care of George Boines, M. D., of Wilmington, Del., 2 cases under the care of Philip Trommer, M. D., of Philadelphia, Pa., and 1 case under the care of Allen Lloyd, M. D., of Washington, D. C.

extension of the spine improved so that the patient was able for the first time to lie on his back. There was no significant improvement in the upper extremities.

Case 33.—A 2½-year-old female with hemiplegia of congenital origin under the care of Dr. Boines. The child had a flexion deformity of the left hand and did not use the left arm at all. She had great difficulty in learning to walk because of the spastic left leg. After 1 month of neostigmine therapy there was striking improvement in the flexion deformity and the child was using the left arm a great deal, and had almost normal use of the arm. There was a definite improvement in gait. The case has been followed for 1 year and the improvement was retained after neostigmine was discontinued.

III. Neostigmine Therapy of Chronic Rheumatoid Arthritis and Subacromial Bursitis

In many cases of chronic rheumatoid arthritis, neuromuscular dysfunction plays a major role in the disability. Muscle spasm and contracture and muscle pain apparently restrict motion at the joints and cause deformity long after the joint inflammation has subsided and the need for splinting of the inflamed joint has passed. In addition, muscular atrophy and weakness are of importance in increasing the disability. Similar types of neuromuscular dysfunction prolong and intensify the disability in chronic subacromial bursitis.

Neostigmine has been found useful in the inhibition of muscle spasm and in the relief of muscular pain as well as in increasing strength of voluntary motion in poliomyelitis (1). Relief of muscle spasm by neostigmine has been reported in chronic rheumatoid arthritis (2).

RESULTS

A. CHRONIC RHEUMATOID ARTHRITIS.—Six patients with chronic rheumatoid arthritis, three patients with chronic spondylitis, and one patient with chronic arthritis of the hip of unknown etiology, were treated with neostigmine. All of these patients had suffered from the disease for many years, had severe disability and no longer had acute inflammation of the joints. The condition had been stable for a long period of time and no recent progress had been observed from various types of therapy.

Case 37.—M., female, age 66. Rheumatoid arthritis was of 13 years' duration. This patient had ankylosis of the right knee in extension. There was limitation of ankle and hip motion, flexion of the spine, flexion deformity of the hands, and limitation of abduction in the right shoulder at 90°. She was very unstable and was unable to stand up or walk without a cane for support. There had been no improvement for a number of years.

After 1 week of neostigmine therapy, the limitation of shoulder motion had disappeared. After 2 weeks of treatment, she was able to stand up straighter and walk without support. After 1 month of treatment, the patient was free from pain, could stand up straight, and walk without support. There was a definite increase in strength and decreased fatigue. She was able to bend forward and reach almost to the floor with good stability and without support.

There was increased range of motion at ankle, hip, and shoulder, and improvement in the fingers. There was no change in the ankylosed knee joint.

The patient has been followed for 6 months since neostigmine therapy was discontinued and has retained the improvement.

Case 38.³—This elderly woman had rheumatoid arthritis for many years and had been confined to bed and wheel chair for 6 years. She suffered from severe joint and muscle pain, marked limitation of motion, and deformities. She was given placebos for 1 week with no response. Then neostigmine was given and in a few days there was striking relief from pain and increase in range of motion at many joints. After 2 weeks of neostigmine therapy, the patient was able to stand up and walk for the first time in 6 years.

Case 39.³—This man was severely deformed by chronic rheumatoid arthritis, with ankylosis of the cervical spine in extreme flexion. He had been confined to bed for 16 years. Within 1 week after initiation of neostigmine therapy, there was a significant increase in range of motion at both shoulders and the patient had the strength, for the first time, to raise his right arm and to touch the top of his head with the left hand.

Case 40.—This middle-aged female with chronic rheumatoid arthritis suffered from muscular and joint pains, muscular cramps, weakness, and fatigue. All of these symptoms were strikingly improved in a few days from neostigmine therapy. The improvement was retained for several months after treatment was discontinued.

Case 41.—E., male, age 42. Arthritis of right hip of unknown etiology had been present for 27 years. Vitallium cup had been placed on head of femur 2 years before. He had limitation of motion at the right hip and knee and could reach only to 10 inches from the top of his right shoe. When he walked one-third or one-half of a block, he had to stop because of severe pain from spasm of the right biceps femoris muscle.

After the first neostigmine treatment, he was able to walk 15 blocks without spasm of the biceps femoris. After 1 week of neostigmine therapy, he was able to reach the top of his right shoe. There was increased range of motion of the right knee and hip and less pain. He was practically free from spasm of the biceps femoris. There was a definite increase in strength and decreased fatigue.

Case 42.—This middle-aged man had had rheumatoid arthritis for 9 years with marked limitation of motion, weakness, and atrophy. Neostigmine therapy resulted in slight increase in range of motion and strength in the upper extremities but there was little significant improvement.

Case 43.—This man had severe flexion deformities of the hands from chronic rheumatoid arthritis. There was definite improvement of this disability from 1 month of neostigmine therapy.

Case 44.—N., female, age 35. Spondylitis had been present for 11 years with bony ankylosis of lumbar and thoracic spine. Patient had very marked limitation of all motions of the head. Weakness and fatigue of arms and legs were marked and pain required aspirin many times a day. She had not suffered from acute arthritis for 1½ years.

After the first neostigmine treatment, patient noted disappearance of pain and fatigue, and more free and normal use of the extremities. After 1 month of therapy, there was a definite increase in range of rotation, flexion, and extension of the cervical spine. The patient was able, for the first time in 5 years, to cut her own toenails and stand up and see her shoes. She was free from pain and no longer required aspirin. There was a striking increase in strength and decreased fatigue. Posture and gait definitely improved.

³ These patients were treated at the U. S. Marine Hospital, Baltimore, Md., through the cooperation of Passed Assistant Surgeon (R) C. W. Jones.

Cases 45 and 46.—Two middle-aged males had had spondylitis with ankylosis of lumbar and thoracic vertebrae for many years. Neostigmine therapy resulted in relief from pain and muscle spasm, increased range of motion of the head, and decreased fatigue.

B. ACUTE RHEUMATOID ARTHRITIS.—Two patients with acute rheumatoid arthritis were given a trial of neostigmine therapy. No beneficial effects were noted.

C. SUBACROMIAL BURSTITIS.—In two patients with chronic subacromial bursitis, no improvement was observed during neostigmine therapy. On the other hand, in three other patients with this disease, definite improvement was noted following a short course of neostigmine treatment. Complete disappearance of the disability was not observed in any of these cases.

Case 49.—S., male, age 39. Left subacromial bursitis began 8 months before, following immunization. Severe pain in shoulder, weakness of arm, and limitation of motion of the shoulder were observed. No significant improvement was noted from 2 weeks of neostigmine therapy.

The other patient with subacromial bursitis who did not respond to neostigmine was an elderly woman who had had the disability for many months.

Three patients, all males, showed relief from pain, increased range of motion, and increased strength from neostigmine therapy. One patient had subacromial bursitis for 1 month, another for 5 months, and the third patient for 4 months.

Case 53.—F., male, age 35. Right subacromial bursitis of 4 months' duration. Acute pain in the region of the bursa had disappeared in a few days but limitation of motion and muscular pain on activity persisted.

Within 24 hours after initiation of neostigmine therapy, there was definite increase in range of passive forward flexion and external rotation, and decrease in muscular pain. After 1 week of treatment there was significant improvement in range of motion at the shoulder—forward flexion increased 25°, extension 20°. He was able to use the arm more normally without pain. After 1 month of therapy, there was no further improvement, and considerable disability persisted.

DISCUSSION

The purpose of this investigation was to study, in a preliminary way, the efficacy of neostigmine therapy in a variety of types of chronic neuromuscular dysfunction. Observation of 53 patients under this treatment has revealed that improvement in range of motion, relief from pain, and increase in strength and endurance may occur rapidly in cases of disability following trauma, of hemiplegia and related neurological conditions, and of chronic rheumatoid arthritis and subacromial bursitis. Most of these patients suffered from severe neuromuscular dysfunction for a long period of time, did not have spontaneous remissions, and had failed to improve with other types of therapy.

The results have been encouraging enough to warrant further investigation, and an evaluation of neostigmine therapy is now in progress. Control procedures are being utilized to evaluate possible psychogenic factors. Cases suitable for this treatment must be se-

lected with care, since the drug can only be expected to cause improvement in certain types of neuromuscular dysfunction.

Disability resulting primarily from muscle spasm or hypertonus, muscular pain, and certain types of paresis frequently appears to respond to neostigmine therapy. Many patients with chronic disability following trauma or resulting from arthritis or neurological disorders have other conditions, such as bony or fibrous ankylosis, active inflammation, and loss of innervation, as primary causes of their disability, and these cannot be expected to benefit from neostigmine therapy.

No conclusions should be drawn from this preliminary investigation about the percentage of cases of various types of disability which will respond to neostigmine. Further study is needed to establish this point.

The mechanism of action of neostigmine in relaxation of muscle spasm or contracture, in relief of muscle, joint, or nerve pain, and in increasing the power of voluntary contraction of paretic muscles in a variety of pathological conditions, is not established. The inhibitory action of neostigmine on cholinesterase at the synapses in the central nervous system as well as at the myoneural junction may be of importance. Since the action of neostigmine on the central nervous system in man is inhibition of muscle tonus and deep reflexes (4), it appears likely that the relaxation of muscle spasm which was observed in this investigation is a manifestation of the central action of the drug. Such a central inhibitory action on muscular hypertonus is apparently effective, regardless of whether the hypertonus is of peripheral origin, as in cases of trauma, arthritis, etc., or of central origin, as in poliomyelitis (1, 6) and hemiplegia.

Recovery of function following cerebral infarction is usually attributed to formation of new pathways and the taking over by other areas of the brain of the functions of the region destroyed. Cholinergic facilitation at synapses may conceivably accelerate the formation of new pathways in the central nervous system.

In cases of cerebral infarction, one may predict that the possibilities of neostigmine therapy will be distinctly limited. The drug can only improve function within the limits imposed by the irreversible brain damage and the possibilities for formation of new neural pathways to the abnormally functioning motor units. Since the localization and extent of the lesion will vary from case to case, one should expect differences in the efficacy of the drug therapy in different cases of cerebral infarction. It is worthy of note that, in one case (case 31), dysphagia and dysarthria showed improvement without corresponding improvement in the facial paralysis. The most that one can hope for is that neostigmine therapy may perhaps result in full and efficient

utilization of the remaining central nervous tissue and thereby make it possible to bring about maximal functional recovery.

It is worthy of note that neuromuscular dysfunction appears to play a more important role in many chronic disabilities than has been generally realized. Neuromuscular dysfunction is frequently a major factor in the disability in chronic rheumatoid arthritis and following various types of trauma, as well as in spastic paralysis of neurological origin. Muscle spasm, which may be a necessary and beneficial means of splinting a joint following acute injury and inflammation, may, in the chronic stage, itself become the major factor in disability by restricting joint motion and causing pain. More intensive investigation of the mechanisms involved in chronic disabilities is indicated.

The fact that doryl has been found to be effective in accelerating recovery of function in hemiplegic monkeys (3) and that neostigmine appears to produce similar effects in hemiplegia in man suggests the possibility that a variety of cholinergic drugs may eventually be found useful in the treatment of neuromuscular dysfunction.

SUMMARY

Neostigmine therapy has been applied to 53 selected patients suffering from chronic neuromuscular dysfunction. The results of this preliminary study have been encouraging.

Neostigmine therapy may be followed by increased range of passive motion, increased voluntary power, and relief from pain in selected chronic cases of disability following trauma, of hemiplegia and related conditions, and of rheumatoid arthritis and subacromial bursitis.

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DEATHS DURING WEEK ENDED NOVEMBER 25, 1944

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Nov. 25, 1944	Correspond- ing week, 1943
Data from 93 large cities of the United States:		
Total deaths.....	8,477	8,763
Average for 3 prior years.....	8,648	-----
Total deaths, first 47 weeks of year.....	421,420	428,828
Deaths under 1 year of age.....	566	616
Average for 3 prior years.....	606	-----
Deaths under 1 year of age, first 47 weeks of year.....	29,104	30,963
Data from industrial insurance companies:		
Policies in force.....	66,911,354	66,063,813
Number of death claims.....	11,202	9,571
Death claims per 1,000 policies in force, annual rate.....	8.8	7.6
Death claims per 1,000 policies, first 47 weeks of year, annual rate.....	10.0	9.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

Summary

The incidence of meningococcus meningitis, although fluctuating from week to week, continues high, and presages a second successive year of epidemic proportions. The geographic distribution has been more general than that of poliomyelitis. To date a total of 15,298 cases has been reported, as compared with 16,530 for the same period last year and a 5-year (1939-43) median of 1,880 cases for the corresponding period. For the current week 172 cases were reported as compared with 141 cases for the preceding week and a 5-year median of 53 cases. The monthly death rate (annual basis) for meningitis this year, as computed by the Bureau of the Census on a 10-percent sampling of death certificates, has gradually declined from 4.2 per 100,000 population in January to 0.6 in August.

The seasonal decline in poliomyelitis continues, with 174 cases for the current week as compared with 221 last week and a 5-year median of 116 cases. A total of 18,885 cases has been reported to date, as compared with 12,134 for the same period last year and a median of 8,805 for the corresponding period. About 76 percent of the cases this year occurred in the Middle and South Atlantic and the East North Central States.

The figures for most of the other important communicable diseases reported weekly by the State health officers are below or close to the median expectancy, with the exception of the dysenteries and endemic, or murine, typhus fever. A total of 4,885 cases of endemic typhus fever has been reported to date as compared with 4,187 for the same period last year. The current incidence of influenza (2,200 cases) is about half that reported last year (4,489) and less than the 5-year median for the week (2,756).

A total of 9,406 deaths was reported during the week in 93 large cities in the United States, as compared with 8,477 last week and a 3-year average of 9,462.

Telegraphic morbidity reports from State health officers for the week ended December 2, 1944, and comparison with corresponding week of 1943 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1939-43	Week ended—		Median 1939-43	Week ended—		Median 1939-43	Week ended—		Median 1939-43
	Dec. 2, 1944	Dec. 4, 1943		Dec. 2, 1944	Dec. 4, 1943		Dec. 2, 1944	Dec. 4, 1943		Dec. 2, 1944	Dec. 4, 1943	
NEW ENGLAND												
Maine.....	0	1	0		1	1	14	132	125	1	3	0
New Hampshire.....	0	0	0				12	0	3	1	0	0
Vermont.....	0	0	0				0	0	19	0	0	0
Massachusetts.....	9	5	4				75	258	226	9	13	2
Rhode Island.....	0	0	1	27	1		0	66	20	1	5	0
Connecticut.....	0	0	0	1	52	3	11	9	33	6	12	1
MIDDLE ATLANTIC												
New York.....	12	10	14	11	114	14	83	352	352	21	31	12
New Jersey.....	10	1	5	1	17	14	18	366	31	9	10	3
Pennsylvania.....	18	8	12	2	5		35	242	289	11	33	5
EAST NORTH CENTRAL												
Ohio.....	12	17	21	7	1	13	16	417	45	3	9	1
Indiana.....	16	11	16	16	59	16	11	157	21	2	2	1
Illinois.....	6	7	30	8	18	14	28	132	31	20	14	3
Michigan ¹	14	9	10	1	7	4	8	465	133	6	23	0
Wisconsin.....	0	0	0	11	37	17	20	326	128	2	4	1
WEST NORTH CENTRAL												
Minnesota.....	9	15	4	1	273	2	2	603	61	0	2	0
Iowa.....	1	2	4				10	70	24	0	4	1
Missouri.....	3	5	5	2	21	2	1	9	9	7	5	0
North Dakota.....	24	2	2	20	23	16	1	187	1	0	0	0
South Dakota.....	0	2	3				7	59	6	0	1	0
Nebraska.....	2	12	4	5	88		4	7	3	0	0	0
Kansas.....	1	9	9	4	31	5	7	17	21	1	2	0
SOUTH ATLANTIC												
Delaware.....	0	1	0				2	15	3	0	1	0
Maryland ¹	9	7	7	1	6	5	2	24	8	4	8	2
District of Columbia.....	0	0	0		4	1	1	13	4	2	2	1
Virginia.....	9	9	27	133	651	184	6	388	20	2	8	2
West Virginia.....	4	7	7	71	1	3	5	228	4	1	4	1
North Carolina.....	33	20	37	1	1	7	8	99	99	5	3	1
South Carolina.....	5	7	11	297	453	378	1	26	12	2	2	1
Georgia.....	9	14	14	12	105	40	0	32	10	1	5	1
Florida.....	11	4	4		6	6	2	16	2	3	7	1
EAST SOUTH CENTRAL												
Kentucky.....	4	10	13	2	3	3	3	8	37	4	3	2
Tennessee.....	13	11	11	26	155	43	21	35	15	8	8	1
Alabama.....	18	11	23	56	270	97	3	109	31	5	3	1
Mississippi ²	6	8	10							2	1	1
WEST SOUTH CENTRAL												
Arkansas.....	17	4	14	75	184	73	3	36	12	0	1	0
Louisiana.....	20	10	10	30	35	5	4	1	1	3	1	1
Oklahoma.....	15	6	19	67	29	60	4	2	2	1	3	1
Texas.....	58	50	50	1,138	1,298	769	33	66	24	6	4	1
MOUNTAIN												
Montana.....	6	1	1	18	2	8	2	112	15	1	2	0
Idaho.....	0	0	1	1	2	1	1	8	9	0	0	0
Wyoming.....	0	0	0	10	2	4	2	13	8	0	0	0
Colorado.....	2	4	10	20	238	50	9	84	60	1	3	1
New Mexico.....	3	1	2	21	2	2	0	4	4	1	1	1
Arizona.....	1	4	4	83	313	143	4	11	11	2	0	0
Utah ²	0	0	0	20	1	3	8	8	62	1	0	0
Nevada.....	0	1	0				0	4	0	0	0	0
PACIFIC												
Washington.....	13	1	2		6		38	39	39	4	4	0
Oregon.....	2	7	3	9	4	24	22	78	58	0	2	1
California.....	44	33	29	24	51	51	363	101	101	13	25	1
Total.....	439	347	461	2,200	4,489	2,756	910	5,434	3,717	172	274	53
48 weeks.....	12,580	12,643	14,346	356,312	102,897	165,468	599,273	572,427	487,003	15,298	16,530	1,880

¹ New York City only.² Period ended earlier than Saturday.

Telegraphic morbidity reports from State health officers for the week ended December 2, 1944, and comparison with corresponding week of 1943 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever ²		
	Week ended—		Median 1939-43	Week ended—		Median 1939-43	Week ended—		Median 1939-43	Week ended—		Median 1939-43
	Dec. 2, 1944	Dec. 4, 1943		Dec. 2, 1944	Dec. 4, 1943		Dec. 2, 1944	Dec. 4, 1943		Dec. 2, 1944	Dec. 4, 1943	
NEW ENGLAND												
Maine.....	0	0	0	31	23	12	0	0	0	1	1	0
New Hampshire.....	0	1	0	15	8	7	0	0	0	0	0	0
Vermont.....	0	1	0	17	0	2	0	0	0	0	1	0
Massachusetts.....	5	3	1	218	166	166	0	0	0	4	0	1
Rhode Island.....	0	0	0	13	6	6	0	0	0	0	1	0
Connecticut.....	1	4	0	50	45	37	0	0	0	1	0	0
MIDDLE ATLANTIC												
New York.....	66	11	11	290	298	230	0	0	0	6	10	10
New Jersey.....	10	1	2	104	81	101	0	0	0	2	0	1
Pennsylvania.....	9	4	4	287	200	196	0	0	0	6	4	7
EAST NORTH CENTRAL												
Ohio.....	6	4	4	301	320	240	0	0	0	1	3	4
Indiana.....	0	0	1	93	71	93	0	2	2	0	1	1
Illinois.....	4	9	6	215	176	217	0	1	1	1	3	3
Michigan ²	7	5	4	148	139	153	0	2	2	3	4	2
Wisconsin.....	2	9	3	118	149	149	0	1	1	0	0	0
WEST NORTH CENTRAL												
Minnesota.....	1	0	1	72	84	73	0	0	0	0	0	0
Iowa.....	4	1	1	48	71	65	0	0	0	0	0	1
Missouri.....	3	6	1	55	43	54	0	0	1	1	0	3
North Dakota.....	2	0	0	20	7	11	0	0	0	0	1	0
South Dakota.....	0	1	1	9	29	29	0	0	0	0	0	0
Nebraska.....	3	1	2	32	28	15	0	2	0	0	0	0
Kansas.....	1	2	2	78	128	76	0	1	1	0	2	1
SOUTH ATLANTIC												
Delaware.....	0	0	0	10	1	17	0	0	0	0	0	0
Maryland ²	2	0	0	66	58	51	0	0	0	1	1	4
District of Columbia.....	2	0	0	18	25	19	0	0	0	0	0	1
Virginia.....	4	0	1	56	49	54	0	0	0	2	1	4
West Virginia.....	1	0	1	91	77	69	0	0	0	3	0	1
North Carolina.....	2	0	0	90	132	108	0	0	0	2	0	1
South Carolina.....	1	0	0	10	11	12	0	1	0	1	0	0
Georgia.....	1	0	0	27	29	38	1	0	0	0	1	3
Florida.....	0	0	0	12	6	6	0	0	0	1	2	2
EAST SOUTH CENTRAL												
Kentucky.....	4	1	3	49	47	71	0	0	0	1	1	4
Tennessee.....	1	0	1	53	77	64	0	0	0	3	1	3
Alabama.....	1	1	1	30	17	39	0	0	0	0	1	1
Mississippi ²	2	0	1	8	16	14	0	0	0	2	3	3
WEST SOUTH CENTRAL												
Arkansas.....	2	0	0	31	6	17	0	0	2	1	3	4
Louisiana.....	0	2	1	14	15	15	1	0	0	4	1	8
Oklahoma.....	0	4	0	28	10	22	0	0	0	1	1	4
Texas.....	7	6	4	82	52	54	0	3	0	6	2	7
MOUNTAIN												
Montana.....	1	0	0	20	28	20	0	0	0	1	0	0
Idaho.....	0	0	0	46	22	12	0	0	0	0	4	0
Wyoming.....	0	1	0	9	3	5	0	0	0	0	0	0
Colorado.....	0	3	1	76	25	25	0	1	0	4	1	1
New Mexico.....	0	1	1	18	10	11	0	0	0	0	1	2
Arizona.....	0	1	1	15	16	4	0	0	0	0	0	0
Utah ²	1	12	3	13	45	26	0	0	0	0	7	1
Nevada.....	1	0	0	0	1	0	0	0	0	10	0	0
PACIFIC												
Washington.....	6	3	1	44	115	39	0	0	0	0	1	2
Oregon.....	2	14	1	17	52	17	0	0	0	1	1	1
California.....	9	29	15	317	227	153	0	0	0	5	3	3
Total	174	141	116	3,462	3,244	2,903	2	14	19	75	67	121
48 weeks.....	18,865	12,134	8,905	175,567	128,170	128,170	361	701	1,298	5,176	5,222	8,099

² Period included earlier than Saturday.

³ Included paratyphoid fever reported separately as follows: Massachusetts, 4; New York, 3; Michigan, 1; Louisiana, 1; Nevada, 1.

Telegraphic morbidity reports from State health officers for the week ended December 2, 1944, and comparison with corresponding week of 1943 and 5-year median—Con.

Division and State	Whooping cough			Week ended Dec. 2, 1944								
	Week ended—		Median 1939-43	Anthrax	Dysentery			Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularmia	Typhus fever
	Dec. 2, 1944	Dec. 4, 1943			Amebic	Bacillary	Un-specified					
NEW ENGLAND												
Maine.....	80	21	24	0	0	0	0	0	0	0	0	0
New Hampshire.....	4	2	5	0	0	0	0	0	0	0	0	0
Vermont.....	29	43	43	0	0	0	0	0	0	0	0	0
Massachusetts.....	114	138	207	0	0	8	0	1	0	0	0	0
Rhode Island.....	19	19	19	0	0	0	0	0	0	0	0	0
Connecticut.....	76	35	68	0	0	0	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York.....	259	283	436	0	0	27	0	0	0	0	0	0
New Jersey.....	94	100	187	0	10	0	0	0	0	0	0	0
Pennsylvania.....	153	137	371	0	0	0	0	0	0	0	0	0
EAST NORTH CENTRAL												
Ohio.....	96	78	183	0	0	2	0	1	0	0	3	0
Indiana.....	17	35	34	0	0	0	1	0	0	0	1	0
Illinois.....	62	103	195	0	1	10	0	1	0	0	11	0
Michigan ²	62	142	250	0	0	5	0	0	0	0	0	0
Wisconsin.....	92	117	141	0	0	0	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota.....	31	72	69	0	3	0	1	0	0	0	0	0
Iowa.....	5	21	21	0	1	0	0	0	0	0	0	0
Missouri.....	17	16	16	0	0	0	3	0	0	0	0	0
North Dakota.....	10	2	19	0	0	0	0	0	0	0	0	0
South Dakota.....	0	7	7	0	0	0	0	0	0	0	0	0
Nebraska.....	2	9	6	0	0	0	0	0	0	0	0	0
Kansas.....	32	28	29	0	0	0	0	1	0	0	0	0
SOUTH ATLANTIC												
Delaware.....	0	3	6	0	0	0	0	0	0	0	0	0
Maryland ²	55	35	70	0	0	0	1	0	0	0	1	0
District of Columbia.....	4	4	13	0	0	0	0	0	0	0	0	0
Virginia.....	64	82	58	0	0	0	144	0	0	0	3	0
West Virginia.....	19	29	18	0	0	0	0	0	0	0	0	0
North Carolina.....	80	200	136	0	0	0	0	0	0	0	0	8
South Carolina.....	42	43	24	0	0	5	0	0	0	0	0	3
Georgia.....	13	16	16	0	0	1	0	0	0	0	0	12
Florida.....	5	11	9	0	6	0	0	0	0	0	0	7
EAST SOUTH CENTRAL												
Kentucky.....	5	79	79	0	0	0	0	0	0	0	13	0
Tennessee.....	7	59	42	0	0	0	3	0	0	0	2	7
Alabama.....	31	9	12	0	0	0	0	0	0	0	0	16
Mississippi ²				0	0	0	0	0	0	0	0	1
WEST SOUTH CENTRAL												
Arkansas.....	28	9	15	0	0	6	0	0	0	0	0	0
Louisiana.....	0	11	6	0	0	1	0	0	0	0	0	5
Oklahoma.....	1	0	5	0	0	2	0	0	0	0	0	0
Texas.....	174	156	76	1	13	438	13	0	0	0	2	19
MOUNTAIN												
Montana.....	19	15	9	0	0	0	0	0	0	0	0	0
Idaho.....	3	8	5	0	0	0	0	0	0	0	0	0
Wyoming.....	13	4	4	0	0	0	0	0	0	0	0	0
Colorado.....	15	61	17	0	0	1	0	0	0	0	0	0
New Mexico.....	0	5	18	0	1	2	0	0	0	0	0	0
Arizona.....	11	31	9	0	0	0	24	4	0	0	0	0
Utah ²	18	11	20	0	0	0	0	0	0	0	0	0
Nevada.....	0	5	0	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington.....	14	48	48	0	0	0	0	0	0	0	0	0
Oregon.....	13	37	24	0	0	0	0	0	0	0	0	0
California.....	134	97	182	0	1	9	0	0	1	0	0	2
Total	2,022	2,476	3,525	1	36	517	190	8	1	0	36	80
Same Week 1943.....	2,476			0	25	575	101	14	1	0	11	123
Same Week 1942.....	3,525			2	20	111	81	8	0	0	17	64
48 Weeks 1944.....	88,610			40	1,721	22,858	8,491	606	32	453	542	4,885
48 Weeks 1943.....	169,180			62	1,971	16,377	7,186	647	28	433	735	4,187
48 Weeks 1942.....	165,897		165,897	75	1,137	11,642	6,260	540	43	451	806	4,727

² Period ended earlier than Saturday.

⁴ 5-year median, 1939-43.

WEEKLY REPORTS FROM CITIES

City reports for week ended November 25, 1944

This table lists the reports from 88 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Enecephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland.....	1	0	0	0	1	0	2	0	4	0	0	2
New Hampshire:												
Concord.....	0	0	0	0	0	0	0	0	2	0	0	0
Vermont:												
Barre.....	0	0	0	0	0	0	0	0	0	0	0	0
Massachusetts:												
Boston.....	0	0	0	0	63	3	12	1	73	0	0	20
Fall River.....	0	0	0	0	1	0	2	0	1	0	0	0
Springfield.....	0	0	0	0	1	0	0	0	7	0	0	9
Worcester.....	0	0	0	0	0	0	7	0	9	0	0	16
Rhode Island:												
Providence.....	0	1	0	0	0	1	7	0	2	0	0	6
Connecticut:												
Bridgeport.....	0	0	0	0	0	0	2	0	2	0	0	0
Hartford.....	0	0	0	0	3	1	2	0	1	0	0	2
New Haven.....	0	0	0	0	2	1	3	0	7	0	0	11
MIDDLE ATLANTIC												
New York:												
Buffalo.....	0	0	0	0	0	0	4	1	2	0	0	0
New York.....	14	1	1	1	4	21	43	35	100	0	0	64
Rochester.....	0	0	0	0	25	0	3	2	2	0	0	17
Syracuse.....	0	0	0	0	0	0	1	1	7	0	0	10
New Jersey:												
Camden.....	0	0	1	1	0	0	4	0	0	0	0	0
Newark.....	0	0	0	0	1	0	1	0	8	0	0	2
Trenton.....	1	0	1	0	0	0	1	1	2	0	0	0
Pennsylvania:												
Philadelphia.....	2	0	0	2	2	3	12	4	57	0	0	25
Pittsburgh.....	0	0	0	1	0	0	18	1	18	0	0	4
Reading.....	2	0	0	0	0	0	1	0	3	0	0	0
EAST NORTH CENTRAL												
Ohio:												
Cincinnati.....	2	0	0	1	0	3	2	0	30	0	0	7
Cleveland.....	1	0	2	1	0	3	8	1	29	0	0	17
Columbus.....	0	0	0	0	1	0	4	0	9	0	0	13
Indiana:												
Fort Wayne.....	0	0	0	1	0	0	3	0	5	0	0	0
Indianapolis.....	6	0	0	1	2	2	2	1	13	0	0	5
South Bend.....	1	0	0	0	0	0	0	0	0	0	0	0
Terre Haute.....	0	0	0	0	0	0	2	0	0	0	0	0
Illinois:												
Chicago.....	1	0	0	1	9	7	25	1	60	0	0	19
Springfield.....	0	0	0	1	2	0	3	0	3	0	0	0
Michigan:												
Detroit.....	8	0	0	2	0	1	16	3	61	0	0	16
Flint.....	0	0	0	0	0	0	3	0	2	0	0	0
Grand Rapids.....	0	0	0	0	2	0	0	0	6	0	0	0
Wisconsin:												
Kenosha.....	0	0	0	0	1	0	0	0	2	0	0	12
Milwaukee.....	0	0	0	0	1	1	4	0	22	0	0	0
Racine.....	0	0	0	0	3	0	0	0	10	0	0	6
Superior.....	0	0	0	0	0	0	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota:												
Duluth.....	1	0	0	0	0	0	4	0	9	0	0	1
Minneapolis.....	4	0	0	0	2	0	7	5	8	0	0	10
St. Paul.....	0	0	0	1	1	3	2	0	18	0	0	25
Missouri:												
Kansas City.....	5	0	0	0	0	0	8	0	13	0	0	3
St. Joseph.....	0	0	0	0	0	0	0	0	2	0	0	0
St. Louis.....	0	0	1	1	0	0	11	0	5	0	0	4

See footnotes at end of table.

City reports for week ended November 25, 1944—Continued

	Diphtheria cases	Ecephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Polliomvellitits cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
North Dakota:												
Fargo.....	0	0	0	0	1	0	1	0	3	0	0	1
Nebraska:												
Omaha.....	0	0	0	0	8	0	6	0	15	0	0	3
Kansas:												
Topeka.....	0	0	0	0	0	0	1	0	4	0	0	0
Wichita.....	0	0	0	0	0	0	4	0	14	0	0	2
SOUTH ATLANTIC												
Delaware:												
Wilmington.....	0	0	0	0	0	1	2	0	1	0	0	3
Maryland:												
Baltimore.....	4	0	3	0	0	0	11	0	35	0	1	56
Cumberland.....	0	0	0	0	0	1	0	0	1	0	0	0
Frederick.....	0	0	0	0	0	0	0	0	0	0	0	0
District of Columbia:												
Washington.....	0	0	1	0	3	2	8	0	21	0	0	4
Virginia:												
Lynchburg.....	0	0	0	0	0	0	1	1	0	0	0	0
Richmond.....	0	0	0	0	0	0	1	2	13	0	0	0
Roanoke.....	0	0	0	0	0	0	0	0	1	0	0	0
West Virginia:												
Charleston.....	0	0	0	0	0	0	0	0	1	0	0	0
Wheeling.....	0	0	0	0	0	0	3	1	4	0	0	0
North Carolina:												
Raleigh.....	0	0	0	0	0	0	0	0	1	0	0	10
Wilmington.....	2	0	0	0	0	2	2	0	9	0	0	0
Winston-Salem.....	0	0	1	1	0	0	0	0	6	0	1	2
South Carolina:												
Charleston.....	0	0	7	0	0	0	1	0	0	0	0	0
Georgia:												
Atlanta.....	1	0	3	0	0	1	1	0	1	0	0	0
Brunswick.....	0	0	0	0	0	0	2	0	0	0	0	0
Savannah.....	0	0	6	3	0	0	1	0	5	0	0	0
Florida:												
Tampa.....	3	0	0	0	0	0	5	0	1	0	2	0
EAST SOUTH CENTRAL												
Tennessee:												
Memphis.....	4	0	1	2	4	1	14	0	2	0	1	8
Nashville.....	0	0	0	1	1	1	4	0	3	0	0	2
Alabama:												
Birmingham.....	0	0	0	0	0	1	6	0	2	0	0	1
Mobile.....	1	0	0	0	0	0	1	0	1	0	0	0
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock.....	0	0	0	0	0	0	4	0	0	0	0	3
Louisiana:												
New Orleans.....	3	0	3	2	0	0	6	0	4	0	0	0
Texas:												
Dallas.....	4	0	0	0	0	0	1	3	6	0	0	0
Galveston.....	0	0	0	0	0	0	1	0	3	0	0	0
Houston.....	4	0	0	0	0	0	3	1	1	0	0	0
San Antonio.....	1	0	0	1	0	1	4	0	1	0	0	0
MOUNTAIN												
Montana:												
Billings.....	0	0	0	0	0	0	0	0	1	0	0	2
Helena.....	0	0	0	0	0	0	0	0	0	0	0	0
Missoula.....	1	0	0	0	0	0	0	0	0	0	0	0
Idaho:												
Boise.....	0	0	0	0	0	0	0	0	0	0	0	0
Colorado:												
Denver.....	2	0	2	1	3	0	6	1	12	0	0	3
Pueblo.....	0	0	0	0	0	0	0	0	2	0	0	0
Utah:												
Salt Lake City.....	0	0	0	0	1	0	6	0	3	0	0	0

See footnotes at end of table.

City reports for week ended November 25, 1944—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle.....	0	0	0	0	3	0	4	1	6	0	0	0
Spokane.....	0	0	1	0	3	0	3	0	5	0	1	0
Tacoma.....	0	0	0	0	3	0	2	0	1	0	1	1
California:												
Los Angeles.....	6	0	8	1	4	2	1	1	27	0	0	8
Sacramento.....	0	0	0	0	1	0	4	0	6	0	0	1
San Francisco.....	0	0	6	3	14	1	7	1	17	0	0	19
Total.....	85	2	48	30	177	64	356	69	862	0	7	455
Corresponding week, 1943.....	106	.....	253	27	1,062	.....	344	.....	806	0	13	586
Average, 1939-43.....	96	.....	261	33	811	.....	392	.....	787	2	22	1,010

1 3-year average, 1941-43.
 2 5-year median, 1939-43.

Dysentery, amebic.—Cases: Boston, 2; Baltimore, 1; Tampa, 1; Los Angeles, 1.
Dysentery, bacillary.—Cases: Fall River, 1; Worcester, 1; Providence, 2; New Haven, 1; Buffalo, 1; New York, 1; Syracuse, 3; Columbus, 1; Detroit, 6; Charleston, S. C., 3; Los Angeles, 4.
Dysentery, unspecified.—Cases: San Antonio, 16.
Typhus fever, endemic.—Cases: Charleston, S. C., 1; Atlanta, 3; Savannah, 3; Tampa, 4; New Orleans, 2; Houston, 5; San Antonio, 5.

Rates (annual basis) per 100,000 population, by geographic groups, for the 88 cities in the preceding table (estimated population, 1943, 34,273,800)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England.....	2.6	2.6	0.0	0.0	186	15.7	96.7	2.6	282	0.0	0.0	173
Middle Atlantic.....	8.8	0.5	1.4	2.3	15	11.1	40.7	20.8	92	0.0	0.0	56
East North Central.....	11.6	0.0	1.2	4.9	13	10.3	43.8	3.6	159	0.0	0.0	58
West North Central.....	19.9	0.0	2.0	4.0	24	6.0	87.5	9.9	181	0.0	0.0	97
South Atlantic.....	16.3	0.0	34.3	6.5	5	11.4	62.1	6.5	163	0.0	6.5	123
East South Central.....	29.5	0.0	5.9	17.7	30	17.7	147.5	0.0	47	0.0	5.9	65
West South Central.....	36.2	0.0	9.1	9.1	0	3.0	57.4	12.1	45	0.0	0.0	9
Mountain.....	25.0	0.0	16.6	8.3	33	0.0	99.8	8.3	150	0.0	0.0	42
Pacific.....	9.5	0.0	23.7	6.3	44	4.7	33.2	4.7	98	0.0	3.2	46
Total.....	13.0	0.3	7.3	4.6	27	9.8	54.3	10.5	132	0.0	1.1	69

PLAGUE INFECTION IN TACOMA, WASH.

Plague infection has been reported proved in a pool of 32 fleas from 6 rats, *R. norvegicus*, taken November 15, 1944.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (rodent).—Rats found in Honokaa, Hamakua District, Island of Hawaii, T. H., have been proved positive for plague as follows: Hamakua Mill area, 1 rat on October 20, 1944; R. H. F. D. District 2A, 1 rat on October 31, 1944; Kukuihaele area, 1 rat on November 6, 1944; Kapulena area, 1 rat on November 7, 1944; Paauiilo area, 1 rat on November 8, 1944.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended November 11, 1944.—During the week ended November 11, 1944, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox.....		20		77	232	44	32	50	30	485
Diphtheria.....	4	30	14	66	7	8	5	1		135
Dysentery:										
Bacillary.....				14					2	16
Unspecified.....					1					1
German measles.....				40	3			4	7	54
Influenza.....		8			32	2			3	45
Measles.....		2		209	27	23	2	9	62	334
Meningitis, meningococcus.....					2					2
Mumps.....				31	57	5	1	22	2	118
Poliomyelitis.....					1	1		3		15
Scarlet fever.....		11	10	58	139	22	9	35	35	319
Tuberculosis (all forms).....			4	47	26	17	8	10	16	128
Typhoid and paratyphoid fever.....				19		2		1		22
Undulant fever.....					4					4
Veneral diseases:										
Gonorrhoea.....		17	11	41	150	47	29	27	76	398
Syphilis.....	3	8	8	100	92	13	6	27	38	295
Other.....				1						1
Whooping cough.....		20		123	37	7	3	20	29	239

¹ Includes 4 cases, delayed reports.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual incidence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

(Few reports are available from the invaded countries of Europe and other nations in war zones.)

Plague

Algeria.—For the period October 11–20, 1944, 16 cases of plague were reported in Algeria, including 12 cases reported in Algiers, 2 cases in Hussein Dey, and 2 cases in Maison Carree.

Palestine.—For the week ended November 11, 1944, 8 cases of plague were reported in Palestine. For the month of October 1944, 44 plague-infected rats were reported in Haifa including the port, 3 plague-infected rats in the town of Jaffa, and 1 plague-infected rat was reported in Tel-Aviv.

Senegal.—For the period November 1–10, 1944, 13 cases of plague with 9 deaths were reported in Senegal.

Typhus Fever

Guatemala.—For the month of October 1944, 109 cases of typhus fever with 15 deaths were reported in Guatemala. The Departments reporting the highest incidence of this disease are as follows: Alta Verapaz, 24 cases, 1 death; Chimaltenango, 21 cases; El Quiche, 16 cases, 1 death; Quezaltenango, 27 cases, 10 deaths.

Yellow Fever

Ivory Coast—Divo.—On November 24, 1944, 1 fatal case of suspected yellow fever was reported in Divo, Ivory Coast.

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