MENINGITIS IN AN INFANT DUE TO A HITHERTO
UNDESCRIBED ORGANISM, MICROCOCCUS
FLORENS.

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PLATE 61.

(Received for publication, August 1, 1917.)

The clinical and bacteriological observations which we wish to record were made upon a case of meningitis which was admitted to the Harriet Lane Home of the Johns Hopkins Hospital. The clinical history was as follows:

H. S., age 6 months (Text-fig. 1). Dec. 15, 1916, 8 p.m. Admitted to the Harriet Lane Home in convulsions which had been continuous since 6 p.m. He had been treated in the dispensary for the preceding 3 weeks for otitis media. The temperature had been between 100.8° and 101.8° F. at each visit. Pus had been obtained from both ears by myringotomy.

The convulsions began suddenly on the day of admission. The child had vomited all of his feedings, was feverish, and looked very ill. On admission to the hospital he was found to be well developed and well nourished. He was having general convulsions, most marked in the left arm and leg. The eyes were fixed, staring, and deviated to the left. The convulsions were promptly controlled by sedatives. The physical examination was negative except for the double otitis media. The temperature was 102.4°F. There was no stiffness of the neck, no hyperesthesia, and Kernig's sign was negative. A lumbar puncture was done and a purulent fluid under increased tension obtained. The cells in the fluid were composed in large part of polymorphonuclear leukocytes with a few lymphocytes and several rather conspicuous, large mononuclear phagocytic cells. These became more numerous later in the disease. No organisms were demonstrable either in cultures or films. At the time of puncture, 15 cc. of the antimeningococcus serum of the Department of Health of the City of New York were given intraspinally. On the morning following admission the temperature had fallen to 100.3°F., but the child displayed frank evidences of meningitis, marked opisthotonus, painful rigidity of the neck, painful flexion

of the spine, positive Kernig sign, tache cérébrale, and marked hyperesthesia. The fontanelle was not bulging.

Because of the purulent fluid active serum therapy was continued twice daily in spite of the constant absence of organisms in films and cultures.

Dec. 18, 3rd day after admission. No residual signs of meningitis except slight cervical rigidity. The spinal fluid was clear and no serum was given.

Dec. 21, 7th day of the disease. The temperature rose to 102.5° F. and the child was irritable. The fluid was cloudy but no organisms could be demonstrated. Serum was again given and repeated on the following day.

The thirteenth puncture on the 13th day of the disease yielded fluid which was only slightly turbid. 4 days later, Dec. 31, it was perfectly clear with but 80 cells per c.mm.

Dec. 26-Jan. 3, 1917. Temperature normal; the patient seemed perfectly well.

Jan. 3, 20th day of the disease. There was a rise of temperature to 101.5° F., the child vomited in a projectile manner, became very irritable, and the neck again became stiff and retracted. The spinal fluid was cloudy and 12 cc. more of serum were given.

Jan. 6. The temperature again became normal and remained so for the 5 following days. The one lumbar puncture (No. 17) done during this time yielded almost clear fluid which contained 500 cells per c.mm., but no demonstrable organisms.

On the 29th day of the disease there was an abrupt rise of temperature to 102.8° F. and the child displayed again all the acute signs of meningitis. The eighteenth lumbar puncture gave very cloudy fluid in which, for the first time, organisms were demonstrable in great abundance both in films and cultures. They were Gram-negative intra- and extracellular diplococci, many of them arranged in groups of twos and threes. Serum was given then and for the 5 following days.

The fluid continued to be quite purulent, often as much as 1 cc. of pus settled in the bottom of a 6 cc. tube. Organisms continued to be present in the greatest abundance.

Jan. 14, 31st day. A ventricular puncture was done because it was impossible to withdraw the thick purulent material from the lumbar spine. Purulent fluid containing many organisms was obtained. Serum was given by the same route then and for the 2 days following.

Jan. 18. A Gram-negative diplococcus, identical with that found in the spinal fluid, was isolated from the blood stream.

The child's condition gradually became worse. He was stuporous, lying in a position of marked opisthotonus (Figs. 1 and 2). He paid no attention to his surroundings, but the fundi presented a normal appearance. The child was extremely hyperesthetic. His neck was very rigid, the extremities were quite spastic, and reflexes hyperactive. The fingers were tightly flexed at the wrist. It was necessary to pad the palms to prevent the finger nails from cutting into the palms.

Although food was well taken there were frequent attacks of projectile vomiting. There were no convulsions.

The opisthotonus increased until the soles of the feet almost touched the occiput. Fluid from the ventricle and lumbar spine 3 days before death was purulent and full of organisms.

Jan. 28, 45th day of the disease. The child died after the temperature had risen to 105.8° F. Autopsy was denied.

The bacteriology of the Gram-negative micrococcus repeatedly isolated from the spinal fluid of this case is of especial interest, inasmuch as the reactions of this organism do not correspond with those heretofore described by Weichselbaum and Ghon,¹ Jaeger,² Gordon,³ Dopter and Pauron,⁴ von Lingelsheim and Leuchs,⁵ Shennan and Ritchie,⁶ Elser and Huntoon,⁷ and other investigators.⁸ Because of its luxuriant growth on all media tested, we have tentatively called this organism *Micrococcus florens*.

As appears from Table I, this organism was isolated from four lumbar punctures, four ventricular punctures, and one blood culture. Three of these cultures were studied extensively; namely, one from the lumbar puncture on January 15, 1917, 13 days before death; one from the ventricular puncture on January 25, 3 days before

¹ Weichselbaum, A., *Fortschr. Med.*, 1887, v, 573; *Wein. klin. Woch.*, 1905, xviii, 992. Weichselbaum, A., and Ghon, A., *Wien. klin. Woch.*, 1905, xviii, 625.

² Jaeger, H., *Z. Hyg. u. Infektionskrankh.*, 1895, xix, 351; *Die Cerebrospinal-meningitis als Heereseuche*, Berlin, 1901; *Z. Hyg. u. Infektionskrankh.*, 1903, xlv, 225.

³ Gordon, Great Britain National Health Insurance, Medical Research Commission, Special Report Series, No. 3, London, 1915-16.

⁴ Dopter, C., *Compt. rend. Soc. biol.*, 1910, lxi, 546, 600; *Paris méd.*, 1911-12, ii, 211, 461. Dopter and Pauron, *Comp. rend. Soc. biol.*, 1914, lxxvii, 157, 231.

⁵ von Lingelsheim, W., *Klin. Jahrb.*, 1906, xv, 373; *Z. Hyg. u. Infektionskrankh.*, 1908, lix, 457. von Lingelsheim and Leuchs, *Klin. Jahrb.*, 1906, xv, 489.

⁶ Shennan, T., and Ritchie, W. T., *J. Path. and Bacteriol.*, 1908, xii, 456.

⁷ Elser, W. J., and Huntoon, F. M., *J. Med. Research*, 1909, xx, 371.

⁸ Arkwright, J. A., *J. Hyg.*, 1907, vii, 145; *Brit. Med. J.*, 1915, i, 494; *Proc. Roy. Soc. Med.*, 1914-15, viii, Sect. epidemiol. and state med., 69. Flexner, S., *J. Exp. Med.*, 1907, ix, 142; *Med. Rec.*, 1915, lxxxvii, 137. Wollstein, M., *J. Exp. Med.*, 1907, ix, 588. Du Bois, P. L., and Neal, J. B., *Am. J. Dis. Child.*, 1915, ix, 1; *J. Immunol.*, 1916, i, 307. Robinson, G. H., *J. Immunol.*, 1917, ii, 451 (also in *J. Am. Med. Assn.*, 1917, lxxviii, 1660).

TABLE I.

Date.	Day of dis- ease.	Temperature.		Signs of meningitis.	Lumbar puncture.	Ventricular puncture.	Character of fluid.	Organisms.		Amount of serum given.	Remarks.
		a.m.	p.m.					Films.	Cul- tures.		
1916		°F.	°F.							cc.	
Dec. 15	1		101.8	None.	1		Purulent.	0	0	15	White blood count 29,800.
"	2				2		"	0	0		
"	3			Opisthotonus; positive Kernig sign; rigidity; hyperesthesia, etc.	3		"	0	0	10	
"	4				4		"	0	0	10	
"	5			Cervical rigidity; Kernig.	5		Cloudy.	0	0	10	Von Pirquet sign negative.
"	6				6		"	0	0	10	
"	7			Slight cervical rigidity.	7		Clear.	0	0		No tubercle bacilli found in films; globulin positive.
"	8				8		Turbid.	0	0	12	Nasal culture negative.
"	9			Cervical rigidity; hyperesthesia.	9		"	0	0	10	Urticaria.
"	10			"	10		"	0	0	15	
"	11			"	11		"	0	0	10	
"	12			Bulging fontanelle; spas- tic extremities.	12		600 cells per c.mm.; cloudy.	0	0		
"	13						Less cloudy.	0	0		Urine repeatedly negative.
"	14			Less marked.	13		80 cells per c.mm.; clear.	0	0		Globulin faintly positive.
"	17			None.	14						

1917									
Jan. 3	20	99.3	101.5	Vomiting; stiff neck;	15	Purulent.	0	0	12
" 4	21	101.4	102	hyperesthesia.	1	"	0	0	
" 5	22	100.4	100.8	"	16	"	0	0	Fundi normal.
" 8	25	98.8	98.6	None.	17	500 cells per c.mm.; almost clear.	0	0	Nasal culture negative.
" 12	29	102.8	102.4	All.	18	Purulent.	+	+	Gold chloride gives atypical meningitic curve.
" 13	30	100.3	101.7	"	19	"	+	+	
" 14	31	101.3	101.8	"	20	"	+	+	15
" 15	32	102	101	"	21	"	+	+	10
" 16	33	101.9	101.8	"	22	"	+	+	10
" 25	42	102.3	100	"	23	"	+	+	10
					24	"	+	+	10
					25	"	+	+	10
							+	+	Total serum given 189 cc.
							+	+	Jan. 18. Blood culture positive.

death; and the third obtained from a ventricular puncture made January 28, 5 hours after death. All the reactions of the Gram-negative micrococci obtained from these three punctures were constant. In the last puncture, in addition to this Gram-negative micrococcus, a Gram-positive coccus which subsequently proved to be *Staphylococcus albus* was obtained. Both the Gram-negative and Gram-positive cocci were found intra- and extracellular in the postmortem ventricular fluid.

Morphologically this organism is somewhat larger than the *Diplococcus intracellularis meningitidis* of Weichselbaum, although small forms were found in many of the cultures. It occurs chiefly as a diplococcus, although after subcultures single cocci, tetrads, and often larger groups of many cocci were found. No chains were demonstrable. In films the arrangement often resembled that of staphylococci.

Growth was luxuriant on the surface of 2 per cent agar, serum agar, blood agar, dextrose and other carbohydrate agars, hydrocele agar, and gelatin, and in beef broth and peptone water. On gelatin no growth occurred along the stab; the growth on the surface was luxuriant. No liquefaction was produced. No growth could be obtained beneath the surface of solid media. Growth on the various media was also luxuriant at room temperature. Agar cultures remained alive for more than 48 days.

Single colonies on agar plates at the end of 16 hours were round and moist, with a smooth and uniformly elevated surface, and measured 1.5 mm. in diameter. They were grayish white in color. At the end of 4 or 5 days they became a dirty grayish brown.

Table II shows the fermentation reactions of this organism (*Micrococcus florens*), *Bacillus typhosus*, *Micrococcus catarrhalis*, and *Bacillus faecalis alkaligenes* grown on media from the same batch. The reactions were constant on all the media used; namely, beef broth, peptone water, and 2 per cent agar, containing 1 per cent of the various carbohydrates and 0.1 per cent of Andrade's indicator.⁹

Micrococcus florens did not produce gas in any media, but formed acid in arabinose, dextrose, and galactose. In the agar slant cultures no growth occurred below the surface.

⁹ Andrade, E., *J. Med. Research*, 1905-06, xiv, 551.

Text-Fig. 1. Temperature chart showing the relations of the lumbar and ventricular punctures, the character and bacterial content of the fluid obtained, of the blood culture, and of the serum therapy to the temperature curve.

TABLE II.

Organism.	Glycerol.	Arabinose.	Dextrose.	Galactose.	Mannite.	Levulose.	Lactose.	Maltose.	Saccharose.	Raffinose.	Dextrin.	Inulin.	Salicin.
<i>M. florens</i> *	0	+ (24 hrs.)	+ (24 hrs.)	+ (24 hrs.)	0	0	0	0	0	0	0	0	0
<i>M. catarrhalis</i>		0	0	0									
<i>B. fecalis alkaligenes</i>			0	0	0	0	0	0	0	0	0	0	0
<i>B. typhosus</i>			+ (24 hrs.)	+ (24 hrs.)	+ (24 hrs.)	+ (24 hrs.)	0	+ (24 hrs.)	0		+ (24 hrs.)		

*These fermentation reactions were tested twelve times by two different bacteriologists. Carbohydrates of two different lots were used. Tests were incubated at 37°C. for 30 days and read daily.

The reactions of *Micrococcus florens* with dextrose and arabinose on solid media were slightly less marked than in the fluid media, but that for galactose was equally well marked on solid and in fluid media.

The media were made and sterilized in the following way: Beef broth, peptone water, and 2 per cent agar were made according to the directions recommended by Hiss and Zinsser.¹⁰ To each of the different series 1 per cent of one of the thirteen carbohydrates was added. Merck's pure carbohydrates were used in these tests. Andrade's indicator was then added up to 0.1 per cent. A small amount of this mixture was measured into a tube, warmed, and the reaction was made neutral with normal sodium hydroxide; *i.e.*, just pink while hot. The amount of normal sodium hydroxide calculated to make the total volume of each series neutral was then added to each lot and the different series were tubed. The media were colorless when cool.

They were sterilized by placing them in an Arnold sterilizer which had first been heated to 100°C. The tubes were sterilized at this temperature for 20 minutes on 3 consecutive days. They were then incubated for 48 hours at 37°C. and proved sterile.

That this method of manufacture and sterilization of the media did not break down the various carbohydrates is demonstrated by the fact that on media of the same batch *Bacillus typhosus*, *Micrococcus catarrhalis*, and *Bacillus faecalis alkaligenes* gave their characteristic fermentation reactions.

Serological Reactions.

The agglutination method used in these tests was that introduced by Dreyer¹¹ in 1904, with the exception that instead of the formalized standardized cultures used by Dreyer, living 24 hour beef broth cultures were employed except for the normal and para meningococci. For the normal and para meningococci a saline emulsion of a 24 hour serum agar slant culture was used. The reason for the

¹⁰ Hiss, P. H., and Zinsser, H., A text-book of bacteriology, New York, 3rd edition, 1916.

¹¹ Dreyer, G., *J. Path. and Bacteriol.*, 1909, xiii, 331 (also Davison, W. C., *J. Am. Med. Assn.*, 1916, lxvi, 1297; *J. Lab. and Clin. Med.*, 1917, ii, 607).

latter exception was the difficulty of growing meningococci in beef broth.

The opacities of all these cultures, both saline emulsions and broth cultures, were made approximately equal, so that the results of these tests may be compared with each other.

All the agglutination tests were repeated several times on different days, and with the exception of a progressive diminution in titer of the patient's serum and spinal fluid due to age, the results of all the tests were constant. Tables III to VII show characteristic agglutination tests made on the same day.

Table III shows the results of agglutination tests made with the patient's serum, obtained 5 hours after death, and living 24 hour beef

TABLE III.

Serum.	Organism.	Dilutions of serum.				Control.
		1:25	1:50	1:125	1:250	
Patient's serum.	<i>M. florens</i> .	T.*	T.	Tr.	0	0
" "	<i>M. catarrhalis</i> .	0	0	0	0	0
" "	Normal meningococcus.	0	0	0	0	0
" "	Para "	0	0	0	0	0

* In the tables T. indicates total, or complete agglutination, the supernatant fluid being absolutely clear and all the bacteria being in the sediment at the bottom of the tube; S., standard, or medium sized flocculi in the fluid without sedimentation; and Tr., trace, or agglutination just visible to the naked eye.

broth cultures of *Micrococcus florens* and *catarrhalis*, and saline emulsions of normal and para meningococci.¹² The patient's serum agglutinated the organism we have isolated and did not affect *Micrococcus catarrhalis* or the normal or para meningococcus.

Table IV shows the results of agglutinative tests made with the patient's ventricular fluid, obtained 5 hours after death, and *Micrococcus florens*, *Micrococcus catarrhalis*, and normal and para meningococci. The results of this test are similar to, though with a lower titer than those obtained with the patient's serum.

¹² We are indebted to Dr. Harold L. Amoss and Dr. Wilson G. Smillie of The Rockefeller Institute for Medical Research for sending us these cultures of meningococci.

Table V shows the result of similar agglutination tests made with the serum from a rabbit before and after immunization with two intravenous doses of a saline emulsion of agar slants of *Micrococcus florens*. This serum, after immunization, only agglutinated cultures of *Micrococcus florens* and did not affect either *Micrococcus catarrhalis*, *Staphylococcus albus*, or the normal or para meningococcus.

Table VI shows the results of agglutination tests made with the polyvalent antimeningitis serum issued by the Department of

TABLE IV.

Serum.	Organism.	Dilutions of serum.				Control.
		1:25	1:50	1:125	1:250	
Patient's ventricular fluid.	<i>M. florens</i> .	Tr.	0	0	0	0
" " "	<i>M. catarrhalis</i> .	0	0	0	0	0
" " "	Normal meningococcus.	0	0	0	0	0
" " "	Para "	0	0	0	0	0

TABLE V.

Serum.	Organism.	Dilutions of serum.							Control.
		1:25	1:50	1:125	1:250	1:500	1:1,250	1:2,500	
Rabbit serum before immunization.	<i>M. florens</i> .	0	0	0	0	0	0	0	0
" " after "	<i>M. "</i>	T.	T.	T.	T.	T.	Tr.	0	0
" " " "	<i>M. catarrhalis</i> .	0	0	0	0	0	0	0	0
" " " "	Normal meningococcus.	0	0	0	0	0	0	0	0
" " " "	Para "	0	0	0	0	0	0	0	0
" " " "	<i>S. albus</i> .	0	0	0	0	0	0	0	0

Health of the City of New York and *Micrococcus florens*, *Micrococcus catarrhalis*, and the normal and para meningococcus. This serum agglutinated only the normal and para meningococcus emulsion and did not affect the organism of our case (*Micrococcus florens*) or *Micrococcus catarrhalis*.

Table VII shows the result of an agglutination test made with The Rockefeller Institute polyvalent antimeningitis serum and *Micrococcus florens*, *Micrococcus catarrhalis*, and the normal and para

meningococcus. The results in Table VII are similar to those in Table VI.

Table VIII shows the results of autolysis experiments.¹³ The growth from 16 hour sheep serum agar slant cultures of each organism was suspended in 10 cc. of normal saline solution, seven drops of toluene being added to each tube and the tube well shaken. The tubes were incubated and examined at the end of 4 and 6 hours.

TABLE VI.

Serum.	Organism.	Dilutions of serum.					Control.
		1:25	1:50	1:125	1:250	1:500	
Polyvalent antimenigitis serum (Department of Health, New York City)	<i>M. florens.</i>	0	0	0	0	0	0
“ “	<i>M. catarrhalis.</i>	0	0	0	0	0	0
“ “	Normal meningococcus.	T.	T.	S.	Tr.	0	0
“ “	Para “	“	“	T.	“	0	0

TABLE VII.

Serum.	Organism.	Dilutions of serum.							Control.
		1:25	1:50	1:125	1:250	1:500	1:1,250	1:2,500	
Polyvalent antimenigitis se- rum (Rockefeller Institute).	<i>M. florens.</i>	0	0	0	0	0	0	0	0
“ “	<i>M. catarrhalis.</i>	0	0	0	0	0	0	0	0
“ “	Normal meningococcus.	T.	T.	T.	T.	Tr.	0	0	0
“ “	Para “	“	“	“	“	S.	Tr.	0	0

As will be seen from Table VIII *Micrococcus florens* does not autolyze as readily as the normal and para meningococcus, while *Micrococcus flavus* 3 autolyzes still less than *Micrococcus florens*.

¹³ These tests were kindly made by Dr. Wilson G. Smillie of The Rockefeller Institute for Medical Research.

TABLE VIII.

Organism.	Degree of autolysis.	
	4 hrs.	6 hrs.
Normal meningococcus (Rockefeller Institute)	+++	Almost complete.
Para " " "	++	+++
<i>M. florens</i>	+-	+
<i>M. flavus</i> 3.....	-	-

Pathogenicity Tests.

Mice.—(a) and (b). The pathogenicity of *M. florens* for mice was tested on two animals. 1.0 cc. of a saline emulsion containing one-tenth of a living 24 hour agar slant of this organism when injected into the peritoneums of two white mice produced death in 11 to 18 hours in each instance.

Films made of the milky peritoneal exudate and stained with Hiss' capsular stain¹⁰ failed to show any capsules. *M. florens* was recovered in cultures, made at the autopsies, of the heart's blood and of the peritoneal exudate.

Rabbits.—The pathogenicity of *Micrococcus florens* for rabbits was tested on four animals.

(a) 1.5 cc. of a saline emulsion containing one-sixth of a living 24 hour agar slant of the organism injected into the lumbar cord¹⁴ of Rabbit 1 failed to cause any symptoms for 15 days. On the 15th day 1.75 cc. of a saline emulsion containing one-fifth of a living 24 hour agar slant of the organism were again injected into the lumbar cord. This injection produced death within 12 hours.

The autopsy showed slight thickening of the meninges, enlargement of the spleen, and marked injection of the blood vessels of the intestine and mesentery. Histological sections of the brain and spinal cord showed the presence of meningitis. Cultures of the spinal cord and the heart's blood, made at autopsy, showed the presence of *M. florens*.

Table IX shows the result of agglutination tests made with serum from this rabbit, obtained immediately before its first inoculation, and on the 15th day, immediately before the second inoculation. The production of agglutinins for *Micrococcus florens* is demonstrated.

(b) 0.5 cc. of a saline emulsion containing one-twentieth of a living 24 hour agar slant of *M. florens* was injected intracerebrally (left frontal lobe) into Rabbit 2. No symptoms were noted for 10 days. At the end of that time, 0.5 cc. of a

¹⁴ The technique for lumbar puncture for rabbits is that employed by C. R. Austrian (*Bull. Johns Hopkins Hosp.*, 1916, xxvii, 237).

saline emulsion containing one-fifth of a living 24 hour agar slant of *M. florens* was again injected intracerebrally.

A culture of the heart's blood, made by aseptic cardiopuncture 24 hours after the last inoculation, showed a growth of *M. florens*. A progressive weakness and general malaise were noted for the next 10 days, at the end of which death occurred.

M. florens was recovered from cultures made at autopsy from the brain and spinal cord. Histological sections of the brain and spinal cord showed evidence of a chronic meningitis.

(c) and (d). 1.0 cc. of a saline emulsion containing one-fourth of a living 24 hour agar slant of *M. florens* was injected into the lower lumbar cords of Rabbits 3 and 4. No. 3 died in 8 to 14 hours. No. 4 died in 12 to 18 hours.

M. florens was recovered from cultures made at autopsy of the heart's blood and the spinal cord of each rabbit. The rabbits' sera before inoculation and after death did not agglutinate *M. florens*. Microscopic sections of the spinal cords showed the presence of an acute purulent meningitis in each animal.

TABLE IX.

Serum.	Organism.	Dilutions of serum.				Control.
		1:25	1:50	1:125	1:250	
Rabbit 1 (1st day) before first inoculation.....	<i>M. florens</i> .	0	0	0	0	0
" 1 (15th ") " second "	<i>M. " "</i>	T.	Tr.	0	0	0

Monkeys.—(a) 0.5 cc. of saline emulsion containing one-fifth of a living 24 hour agar slant of *M. florens* was inoculated into the left frontal lobe of a monkey. This monkey, a *Macacus rhesus*, was obviously suffering from miliary tuberculosis at the time. For the next 15 hours no symptoms of meningitis could be noted. Cultures of the heart's blood, obtained by cardiopuncture, at the end of this time revealed a growth of *M. florens*.

At the end of 24 hours 0.5 cc. of a saline emulsion containing one-fifth of a living 24 hour culture of *M. florens* was again injected intracerebrally, into the left frontal lobe. At the end of 12 hours the monkey was decidedly ill and very irritable, lying on the bottom of his cage, refusing food. No opisthotonus could be noted although the monkey evidenced pain when his neck was bent. Symptoms became more marked and death followed in 60 hours after the second inoculation.

The autopsy showed miliary tuberculosis involving the mediastinal and mesenteric glands, the great omentum, the kidneys, the spleen, and the body of the tenth thoracic vertebra. No tuberculous processes were noted in the central nervous system. Films of the brain and spinal cord showed large numbers of polymorphonuclear leukocytes and Gram-negative diplococci. There were ad-

hesions between the frontal and temporal lobes. Histological sections of the brain and spinal cord gave obvious evidence of acute purulent meningitis. Cultures made of the heart's blood, brain, and spinal cord showed growths of *M. florens*.

Table X shows the results of agglutination tests made with this monkey's serum before the first inoculation and at autopsy.

(b) 1.5 cc. of a saline emulsion containing one-quarter of the growth from one 24 hour agar slant culture of *M. florens* were injected into the lower lumbar

TABLE X.

Serum.	Organism.	Dilutions of serum.				Control.
		1:25	1:50	1:125	1:250	
Monkey 1, before first inoculation.....	<i>M. florens</i> .	0	0	0	0	0
“ 1, at autopsy (4 days later).....	<i>M. “</i>	T.	T.	T.	T.	0

TABLE XI.

Serum.	Organism.	Dilutions of serum.				Control.
		1:25	1:50	1:125	1:250	
Monkey 2, before first inoculation.....	<i>M. florens</i> .	0	0	0	0	0
“ 2, “ third “ (22 days later)....	<i>M. “</i>	T.	T.	T.	T.	0
“ 2, at autopsy (24th day).....	<i>M. “</i>	“	“	“	“	0

cord of a healthy *Macacus rhesus* (Monkey 2). No symptoms were noted for the next 3 days. At the end of this time 1.5 cc. of a saline emulsion containing one-half of the growth from a 24 hour agar slant culture were injected into the lower lumbar cord. No symptoms occurred for the next 19 days. At the end of this time 1.75 cc. of a saline emulsion containing all the growth from one 24 hour agar slant of *M. florens* were again injected into the lower lumbar cord. Death resulted in 8 to 18 hours.

M. florens was recovered in cultures made at autopsy from the heart's blood, brain, and spinal cord. Histological sections of the brain and spinal cord showed evidence of acute purulent meningitis. No other lesions could be found.

Table XI shows the results of agglutination tests made with this monkey's serum before the first inoculation, before the third inoculation (22 days after the first and 19 days after the second inoculation), and after death.

CONCLUSIONS.

These virulence tests lead us to believe that *Micrococcus florens* is pathogenic for mice, rabbits, and monkeys (*Macacus rhesus*), producing septicemia, and that it will also cause purulent meningitis in the two latter animals.

The combined results of the biological reactions and of the agglutination tests lead us to believe that we are dealing with an organism which, though morphologically similar to the meningococcus, yet is entirely distinct.

A review of the literature fails to reveal any description of a Gram-negative micrococcus which grows luxuriantly on all media tested, forms no pigment, and ferments arabinose, dextrose, and galactose.

We wish to express our thanks to Dr. Anna Williams and to Dr. Stanhope Bayne-Jones for their valuable suggestions and assistance.

EXPLANATION OF PLATE 61.

FIGS. 1 and 2. These photographs were taken 3 days before death, showing the child in different positions. The opisthotonus was extreme.

FIG. 1.

FIG. 2.

(Davison, Davison, and Miller: Meningitis due to *Micrococcus florens*.)