served in glycerin. Both were infectious for monkeys in the amounts used experimentally. The animals were inoculated under anesthesia, the rats and guinea pigs with 0.1 to 0.2 cc. intracerebrally and 1.0 cc. intraperitoneally, the mice with 0.05 cc. intracerebrally and 0.5 cc. intraperitoneally. Subinoculations were made in the same manner, brain and cord serving as the source of the subinoculation material.

The purified virus was carried through 6 transfers in rats and 4 in mice, the crude virus preparation through 6 rat and 3 mouse passages. The crude virus was also inoculated into several adult guinea pigs and passed through 3 transfers in young guinea pigs. All of the transfers were made at 3-day intervals. Two or 3 animals were used at each stage, one being sacrificed for subinoculation material; the others were allowed to live for continued observation. The latter animals were killed and examined several weeks after inoculation or whenever intercurrent disease necessitated termination of the experiment.

In none of the animals were there symptoms suggestive of poliomyelitis as it is seen in man or monkey, and histological examination of the cord and brain tissue failed to show any changes referable to the disease. An acute inflammatory reaction was noted both grossly and microscopically in the meninges of one mouse. This was shown to be due to *Bacterium enteritidis*.

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Fibrinolytic Activity of Hemolytic Streptococci from Scarlet Fever.

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Tillett and Garner[1] have demonstrated an extracellular substance freely excreted by growing cells of beta hemolytic streptococci which has the property of dissolving solid human fibrin. They[2] have shown also that patients convalescing from acute hemolytic streptococcus infections develop a relative resistance to this fibrinolytic action. Their studies included 60 normal individuals and 11 patients with hemolytic streptococcus infections, 3 of whom had scarlet fever.

[1] Tillett, W. S., and Garner, R. L., *J. Exp. Med.*, 1933, **58**, 485.

[2] Tillett, W. S., Edwards, L. B., and Garner, R. L., *J. Clin. Invest.*, 1934, **13**, 47.

With the thought that there might be some correlation between the fibrinolytic activity of hemolytic streptococci in human infections and the clinical severity of the disease, we have studied 303 cases of scarlet fever occurring during the winter of 1934-35, and cared for at the Municipal Contagious Disease Hospital, Chicago. In 52 of these cases we have studied (1) the action of the patient's throat strain against a standard plasma-clot, (2) the reaction of the patient's plasma-clot to a standard strain, and (3) the action of the patient's strain on his own plasma-clot. In 47 of these cases 2 or more plasma specimens and corresponding cultures were tested, the interval between the taking of the first and second specimens varying from 10 to 39 days. In the remaining 251 cases only the fibrinolytic activity of the patient's strains was studied. Twenty-five of these represent cultures obtained from suppurative mastoids at the time of mastoidectomy, the others are throat cultures. In 70 of the latter group a second culture was taken about 2 weeks following the first.

The selection of patients in this study was made without regard for the clinical condition, except that in most instances only patients in the early stages of the disease, who had definite scarlatiniform rash at the time of the first culture, were chosen. First specimens were taken usually in the hospital receiving room or during the first or second day of hospitalization.

Clinical data on this series of patients were assembled after completion of the laboratory studies and about 3 weeks following admission of the last patient of the series to the hospital. Therefore, a small number of these patients are still under hospitalization because of complications and the mortality statistics might ultimately be slightly modified. Also in a few instances it is likely that patients listed as being uncomplicated at the time of discharge developed complications at home. Our clinical report is based only on hospital data.

The technic described by Tillett and Garner[1] was followed, using the whole plasma-clot rather than purified fibrin. A "standard" strain was selected which we found consistently dissolved the fibrin clot of the "standard" plasma in about 15 minutes. For the latter we used the freshly drawn blood of 2 normal subjects. This was found to remain very constant in reaction when repeatedly tested against the standard strain. During the course of the experiments a slight modification of procedure was made. In the first 99 cases we selected only a single hemolytic streptococcus colony from each of the blood agar plate cultures of patients' throats; in the remainder

as many as 5 to 10 well isolated colonies were picked to the same tube of broth. Although in repeated tests in which 2 or more colonies were transferred to separate broth tubes the several strains gave identical results, we felt that a more representative test culture would be obtained by pooling several colonies.

The results of these studies may be summarized briefly:

Fibrinolytic Activity of Patients' Strains. There appears to be a definite statistical correlation between the activity of the patient's strain and the presence of complications (Tables I and II). All of the 25 strains cultured from suppurative mastoids were strongly fibrinolytic. Time for lysis of the standard plasma clot ranged from 15 minutes to more than 24 hours. In 45 of the 303 cases (15%) lysis did not occur within the 24-hour period of observation. This compares favorably with the 17% of 123 human strains of hemolytic streptococci which were found inactive by Madison.[3] (For purposes of statistical analysis we have considered these strains as lysing within 36 hours.)

TABLE I.
Fibrinolytic Activity of Cultures of Hemolytic Streptococci Isolated from Scarlet Fever Patients.

Complications	Lysis time in hr.									
	0-½	½-1	1-2	2-3	3-4.5	4.5-6	6-9	9-12	12-24	24 plus
0	12	23	26	26	18	6	2	2	9	34
+	3	5	11	8	6	2	2			4
++	5	4	8	2	7	2			1	6
+++	2	1	7	1	4					
++++	7	5	4	1					1	1
Fatal	5	2	1	1					1	
Mastoid	8	9	4	4						

Complications:
0 = none.
\+ = rhinitis or moderate cervical adenitis.
++ = persistent rhinitis and cervical adenitis.
+++ = suppurative cervical adenitis, suppurative otitis media, catarrhal mastoiditis, persistent albuminuria.
++++ = suppurative mastoiditis, septicemia, multiple abscesses, acute hemorrhagic nephritis.

TABLE II.
Summary of Table I.

Complications	Total cases	Average lysis time hr.	Median hr.	Mode hr.
0	158	10.5	2.69	24 plus
+	41	5.8	2.19	1-2
++	35	8.4	2.25	1-2
+++	15	2.1	1.64	1-2
++++	19	3.7	0.75	0-½
Fatal	10	2.6	0.50	0-½
Mastoid	25	1.1	0.75	½-1

[3] Madison, R. R., PROC. SOC. EXP. BIOL. AND MED., 1934, **31**, 1018.

A comparison of second cultures with first cultures in 70 cases reveals an increase of activity in 29 instances, a decrease in 20, and no change in 21. These differences may represent true changes in the strains, or cross infection in the hospital, or perhaps both factors may play a part.

Resistance of Patients' Plasma-Clot to Fibrinolysis. In the small series of 52 cases studied there was no consistent correlation of the reaction of the plasma with the presence of complications (Table III). In general the plasma of these patients, even early in the

TABLE III.
Analysis of 52 Cases with Complete Data on Cultures and Plasmas.

Complications	No. of cases	Average time required for lysis, expressed in hours: Patients' first strain vs. standard plasma*	Patients' first plasma vs. standard strain*	Patients' first plasma vs. patients' strain
0	32	11.52	12.17	14.45
+	13	2.5	10.25	15.25
++	2	0.75	36.0	19.0
+++	2	1.12	1.12	4.75
++++	3	0.9	15.2	15.2
Fatal	2	0.37	4.75	4.75

(The 2 fatal cases are included in the ++++ group.)
*Control tests using standard plasma against standard strain gave a constant value of 0.25.

course of the disease, appeared relatively resistant to lysis, as compared with figures given by others[2, 4] for the plasma of normal individuals. Our studies suggest that the plasma of children under 5 years of age is highly susceptible to lysis, but the number of cases (6) is too small to warrant a conclusion. Of 47 instances where a second plasma was examined there was an increase in resistance to fibrinolysis in 13, including 5 complicated cases with one death. In 13 cases, including 3 with complications, resistance to fibrinolysis was diminished. In the remaining 21 there was no change.

The reaction of the patient's plasma to his own strain did not seem to be correlated with the presence of complications.

Regarding an interpretation of the reaction of the patients' plasma, it should be stated that most of the more severely ill patients were given human convalescent scarlet fever serum intravenously early in the course of the disease; many of those critically ill were transfused, some of them repeatedly. We have no data bearing on the effect of these procedures on the patients' plasma.

Conclusion. In general, strains of hemolytic streptococci from complicated cases of scarlet fever are more actively fibrinolytic than strains from uncomplicated cases.

4 Hadfield, G., Magee, V., and Perry, C. B., *Lancet*, 1934, **226**, 834.