

INFECTION IN THE PUERPERIUM, WITH ANALYSIS
OF 8000 CASES*

BY FRED L. ADAIR, M.D., MINNEAPOLIS, MINN.,
AND L. J. TIBER, M.D., ST. PAUL, MINN.

WE ALL realize that puerperal infection remains one of the great problems for the obstetricians to solve. It is true that it is recognized as being a preventable infection, but this is not absolutely true and it still remains one of the two great causes of maternal mortality and of a morbidity the extent of which cannot be calculated. It is generally considered to be an infection which is introduced from without at or near the time of delivery. This is doubtless true in most instances. Yet, there seem to be a few cases where virulent organisms are harbored within the genital tract of the individual and still others, rare perhaps, where the offending organism is deported from some more remote tissue to lodge in or around the recently traumatized and weakened genitalia.

Granting the impossibility of not unintentionally and occasionally exposing the mother to these infectious agents by either the exogenous or endogenous route, we have still failed to solve the problem in its entirety. Results indicate that it is not possible to infallibly protect groups of mothers from the danger of infections which at times become serious and too often fatal. There are obviously other factors at work. It happens too frequently to be accidental that one woman with a normal uncomplicated delivery becomes infected while another, confined at nearly the same time, in almost the same environment, but delivered operatively, remains free from infection. Why should one woman without operative manipulation die from a rapidly fatal infection while another acquires a slight infection or one which runs a mild course to recovery? Is this all to be attributed to a difference in the virulence of the infecting organism and to variations in aseptic technic, or is it in part due to the resistance and immunity of the woman? Undoubtedly both factors are of enormous importance, but greater consideration has been given to a study of the various bacteria which infect these mothers and to the development of aseptic care than has been manifested in the other side of the picture.

It is well known that there are many racial and individual immunities to different diseases. These are of course both natural and acquired. It is useless and unnecessary to go into the details of this

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general problem at this time, but it may be interesting to note some peculiarities in relation to certain diseases with which the streptococcus is definitely recognized as being associated. One of the diseases is scarlatina, which is usually quite definitely recognized and ordinarily remembered by the patient. This disease generally confers immunity against a subsequent attack. Why might it not confer more or less immunity to a later occurrence of a puerperal infection with streptococcus, which is the most frequent and dangerous agent of this disease, as well as to other streptococcal infections?

Hofbauer¹ has been studying the local defense mechanism and your President, Dr. Palmer Findley,² called attention to this field of endeavor two years ago in his presentation "The Biologic Defense in Puerperal Infection." Dr. Arthur L. Bloomfield³ has been studying "The Association of Susceptibility to Scarlet Fever and Acute Tonsillitis" and draws the conclusion that certain people possess a natural or at least unexplained resistance to hemolytic streptococcal infection of the lymphadenoid tissue of the throat. There is a significant positive association between susceptibility to two types of infection of this sort, acute follicular tonsillitis, and scarlet fever.

Geller,⁴ in his study of the bactericidal power of the blood in pregnancy and the puerperium, found a decided rise in the bactericidal index during the twenty-four hours following delivery. He regards this of special significance because it occurs at a time when the antibodies and the cellular defense, or so-called granulation wall, have not yet developed. He recognizes that other factors may play an even more important rôle.

In a study of streptococcal diseases and their prevalence in Illinois⁵ during the past seventy-five years, one is struck by an apparent relationship between the incidence of a group of diseases known or suspected of being due to infections with the streptococcal group of organisms. The diseases considered in this analysis are erysipelas, scarlet fever, septicemia, and rheumatism. In early days these diseases were very prevalent and in many instances they assumed epidemic proportion in various communities with higher fatality rates than at the present day. One of the significant improvements in the last half century is the lessened prevalence and lowered virulence of most members of this group. The Illinois death rates from scarlet fever have declined from 98.7 per 100,000 of population in 1860 to 11.5 in 1890, and those of Chicago from a rate of 114.7 to 16.1 for the corresponding years. The rate for the years⁶ 1919 to 1925 was 3.0 for Illinois and that for Chicago was the same.

In Minnesota⁶ the mortality rate for 100,000 inhabitants for scarlet fever was 6.0. This covers a period of seven years, from 1919 to 1925. The rate in Minneapolis for the years 1925 and 1926 was five and six respectively.

It is commonly said that there has been no decrease in the mortality rate from puerperal fever. This may be correct for the past twenty or twenty-five years, but it is not true if a longer period is covered as it shows a downward trend corresponding to other streptococcic diseases.

These results are common experiences as are seen from Table I, which gives some data relative to scarlet fever and erysipelas. It is interesting to note, however, that there has not been in recent years the same downward trend with reference to puerperal septicemia as is noticed in the other two diseases. A similar condition is shown in Table II, in which the rates for scarlet fever and puerperal septicemia are compared. In Table IV a similar situation is revealed, and in addition a comparison is made between the rates of scarlet fever and puerperal infection for the colored and white population.

There seems to be a definite difference in the susceptibility of the white and colored races to scarlet fever and puerperal septicemia. This is shown in Tables I and IV. The mortality among the colored

TABLE I. MORTALITY RATES FROM SCARLET FEVER, ERYSIPELAS, AND PUERPERAL SEPTICEMIA PER 100,000 ESTIMATED POPULATION FOR WHITE AND COLORED PERSONS, U. S. DEATH REGISTRATION AREA, 1910-1925 (8)

YEAR	SCARLET FEVER			ERYSIPELAS			PUERPERAL SEPTICEMIA		
	TOTAL	WHITE	COLORED	TOTAL	WHITE	COLORED	TOTAL	WHITE	COLORED
1910	11.6	12.0	3.4	4.5	4.6	4.0	7.2	7.0	13.1
1911	8.9	9.2	1.5	4.2	4.3	2.9	7.4	7.1	13.3
1912	6.7	6.9	1.6	3.8	3.9	2.5	6.5	6.2	12.4
1913	8.7	9.0	2.9	4.0	4.1	2.3	7.2	7.0	11.4
1914	6.6	6.9	1.5	3.8	3.9	2.0	7.1	6.8	13.1
1915	3.6	3.7	1.2	3.5	3.6	2.1	6.3	6.0	10.7
1916	3.3	3.5	1.1	3.8	3.9	1.8	6.7	6.4	10.8
1917	4.2	4.5	0.8	3.8	4.0	2.0	6.9	6.6	11.9
1918	3.0	3.3	0.4	3.2	3.3	1.7	6.5	6.0	11.7
1919	2.8	3.0	0.5	2.6	2.7	1.2	5.8	5.4	10.5
1920	4.6	4.9	0.8	3.1	3.2	1.7	6.6	6.2	11.7
1921	5.3	5.7	1.1	2.8	2.9	1.5	6.8	6.3	11.5
1922	3.5	3.8	0.7	2.5	2.6	1.0	5.7	5.2	10.4
1923	3.5	3.8	0.9	2.7	2.8	1.1	5.8	5.4	10.4
1924	3.1	3.4	0.6	2.5	2.6	1.3	5.8	5.2	11.1
1925	2.7	2.9	0.7	2.4	2.5	1.3	5.5		

people is definitely less than among the white people for both scarlet fever and erysipelas. This is especially noticeable in the former disease. It seems to be generally recognized among those who come in contact with the colored race that they are less susceptible to infection with scarlet fever than are the whites.

Doull,⁷ in discussing the incidence of measles, scarlet fever, diphtheria, and so forth, in Brazil notes marked variations in the mortality from scarlet fever in the northern and southern states of the United States. It is definitely greater in the northern than in the southern states, which is possibly due to the large number of negroes in the latter. The situation is reversed when one compares the mortality of the two races from puerperal septicemia, the mortality among the

negroes from this disease being almost twice as great as among the whites. One might argue that this is due to greater exposure to infection on account of poorer obstetric care among the negroes. The experience of those conducting clinics where both whites and blacks are admitted seems to indicate that the latter are more susceptible to puerperal sepsis. It is interesting also to note the trend of these diseases during recent years. In the past fifteen years the general mortality rate from scarlet fever has been markedly reduced for both whites and blacks in the Death Registration Area as shown in Table I. That this reduction is almost world-wide is shown in Table II. The same prog-

TABLE II. COMPARATIVE DEATH RATES FROM PUERPERAL SEPTICEMIA AND SCARLET FEVER IN VARIOUS COUNTRIES (9-10)

COUNTRY	DEATHS FROM PUERPERAL SEPTICEMIA PER 10,000 LIVE BIRTHS					DEATH RATE FROM SCARLET FEVER PER 100,000 POPULATION		
	1921	1922	1923	1924	1925	1901-1905	1911-1915	1921-1925
Australia	15	14	17	20	17	7	3	3
Belgium	24	21	29	31	28	42	46	14
Canada (birth reg. area)	11	11	18	17	17	41	19	16 (Ont.)
Chile	24	22	19	13	15	5	3	3
Czechoslovakia	—	12	15	12	14			
Denmark	13	9	10	9	9			
England and Wales	14	14	13	14	16	39	21	11
Germany	28	28	30	29	26	62	38	7
Hungary	13	13	13	15	14	189	162	70
Irish Free State	—	—	19	16	17			
Northern Ireland	—	19	16	15	16	15	29	9 (Ireland)
Japan	13	12	13	13	10			
The Netherlands*	7	7	6	7	9	8	7	3
New Zealand	17	18	19	19	15	16	5	3
Norway	8	7	7	6	—	14	11	1
Salvador	10	11	10	8	9			
Scotland	20	20	19	17	16	27	43	27
Spain	32	32	28	27	—	34	24	16
Sweden	13	11	—	—	—	28	16	9
Switzerland	31	25	22	16	20	17	8	3
Uruguay	19	16	17	16	15	28	2	1
U. S. birth registra- tion area	27	24	25	24	24		8.9—3.6	5.3—2.7

*Prior to 1924 live-born infants who died before registration of birth (within three days of birth) are omitted in calculating the maternal mortality rate.

ress toward prevention is to be noticed with reference to erysipelas as applied to both whites and negroes. This trend downward is doubtless due to better quarantine regulations and other means of prevention. This same improvement is not noticeable with reference to puerperal septicemia. There is some downward trend shown in Table I, but this is a rate per 100,000 population and is in part at least accounted for by a diminution in the birth rate. The same improvement is not noticeable in tables based on the rate for living births for either the United States or other countries (Tables II and III).

One cannot but wonder why there should be no material reduction in the mortality from puerperal sepsis along with the general improve-

ment in health conditions and the lessened mortality from other streptococcal diseases. Is it because there has been no general improvement in obstetric care? Can it be possible that such infection has been reduced to the lowest possible level? Are there perhaps some factors which are being overlooked?

It seems to be true that the negroes have a relatively high natural immunity to scarlet fever and erysipelas as compared with the whites. This does not seem to be true with reference to puerperal sepsis. Do

TABLE III. DEATH RATE FROM PUERPERAL CAUSES PER 1,000 LIVE BIRTHS, WHITE AND COLORED, BY STATES AND YEARS (8)

	PUERPERAL SEPTICEMIA						OTHER PUERPERAL CAUSES					
	1919	1920	1921	1922	1923	1924	1919	1920	1921	1922	1923	1924
Kentucky												
White	3.2	2.5	2.6	2.4	2.2	2.5	3.8	3.5	3.0	3.0	3.3	3.2
Colored	6.0	7.0	7.0	9.4	7.7	7.1	6.4	6.0	7.7	9.1	7.7	6.0
Maryland												
White	2.4	1.8	2.0	1.6	2.0	2.5	5.3	4.8	3.9	3.7	3.4	3.1
Colored	4.0	5.0	3.7	3.6	2.9	5.5	7.5	6.8	5.9	4.8	5.4	4.6
Mississippi												
White	-	-	2.2	1.8	2.1	1.8	-	-	4.9	4.6	4.4	4.7
Colored	-	-	4.0	3.6	3.8	4.0	-	-	8.0	6.5	7.1	8.5
N. Carolina												
White	1.5	1.7	1.4	1.6	1.4	1.6	6.7	6.9	4.7	5.5	5.3	5.0
Colored	2.9	3.1	3.0	2.8	2.6	2.8	8.9	10.1	7.2	7.2	8.1	7.6
S. Carolina												
White	1.8	1.8	1.7	1.8	1.4	2.0	6.0	7.1	6.0	6.8	6.0	5.6
Colored	4.5	3.7	3.4	4.5	2.9	3.2	9.9	11.7	8.4	8.3	9.3	10.9
Virginia												
White	1.5	1.9	1.8	1.6	2.0	1.9	5.1	5.6	3.9	4.3	4.0	3.1
Colored	3.3	3.1	3.5	3.6	3.1	3.1	8.6	8.0	6.4	6.5	7.7	6.9

fewer blacks acquire immunity to streptococcal disease which may be inoculated as in puerperal sepsis or is there a difference in the infecting organism? Perhaps there are a multiplicity of factors which are difficult to determine.

That there is a definite difference between the mortality rates of the two diseases for whites and blacks is shown in Tables I and III, where the rates are compared for puerperal sepsis and scarlet fever among the two races. It is readily seen that the mortality rate from puerperal sepsis is quite uniformly greater in each state for the negroes than for the whites. The reverse is true for scarlet fever, which has a constantly lower mortality rate in every state for the colored than for the white race. In order to bring out a little more clearly some points, Table IV was compiled to show comparative rates for some other acute infectious diseases. The mortality rate of typhoid fever is definitely greater for the negroes than the whites. This is probably due to the greater incidence of this disease from poorer sanitation though the difference in the care and treatment might be a contributory factor. It is further possible that the white race might have a greater natural immunity to this disease. Measles present a varied picture and show

no constant difference in the rates, indicating probably that there is no racial immunity to this disease. The comparison of measles and scarlet fever is important because it points to the fact that the exanthemas are not overlooked in the colored race. At least measles are quite definitely diagnosed as a cause of death among negroes in as great frequency as in the whites. It is unlikely that erysipelas as a cause of death would be frequently overlooked and yet the mortality rate is definitely lower for the negroes than for the whites, as is shown in Table I. It seems to be true that statistically at least the colored race has a greater resistance to two of the streptococcic diseases than the white race of the United States.

TABLE IV. CRUDE MORTALITY RATES FROM TYPHOID, MEASLES, SCARLET FEVER, PUERPERAL SEPTICEMIA, AND OTHER PUERPERAL CAUSES (8)

YEAR	CRUDE RATES PER 100,000 POPULATION						CRUDE RATES PER 100,000 FEMALE POPULATION			
	TYPHOID		MEASLES		SCARLET FEVER		PUERPERAL SEPTICEMIA		OTHER PUERPERAL CAUSES	
	WHITE	COLORED	WHITE	COLORED	WHITE	COLORED	WHITE	COLORED	WHITE	COLORED
	1920	6.6	19.7	9.3	4.1	5.0	0.8	12.4	23.0	23.6
1921	7.7	22.6	4.3	3.4	5.8	1.1	12.8	23.3	18.7	37.0
1922	5.7	20.2	4.7	3.0	3.9	0.8	10.5	20.7	18.4	35.9
1923	5.4	17.9	10.5	15.7	3.8	1.0	10.9	20.9	17.7	38.0
1924	4.9	21.8	7.1	14.7	3.4	0.7	10.5	22.5	17.1	42.5
1925	6.0	25.8	2.4	1.9	2.9	0.8	9.9	22.5	16.4	41.9

The greater incidence and higher rate for puerperal septicemia among the blacks are equally apparent and are accompanied by a disproportionately, even higher mortality rate from other puerperal causes. This of course indicates that they have a higher percentage incidence of obstetric complications or that they receive poorer care, both of which are probably true. It is unlikely that deaths among the colored would be more completely and accurately reported than those among the whites. Table V shows practically the same data as Table IV, except that the actual number of deaths is given as well as the rate per 100,000 females.

In a recent discussion of puerperal infection before the American Gynecological Society, Dr. C. Jeff Miller was of the opinion that the pure black was a better surgical risk and withstood infection better than the whites, but that the mulatto was a poorer risk. Dr. J. W. Williams reported some recent work from the Johns Hopkins Clinic indicating that puerperal infection is about twice as frequent in the negroes as in the whites. They have also made the observation that the whites are more susceptible to the hemolytic streptococcus and less to the anaerobic nonhemolytic to which the negro seems much more susceptible. If correct, this could explain the greater resistance of the blacks to scarlet fever and their increased susceptibility to puerperal infection with the anaerobic nonhemolytic streptococcus, with which variety they seem to be more frequently infected.

One might conclude from a consideration of Tables I to V that there has been a downward trend of some diseases which may be considered as due to infection with the streptococcus. This is quite definitely shown statistically in Table I for scarlet fever and erysipelas. In Table I there is an apparent decrease in the mortality from puerperal septicemia per 100,000 population, which also appears in Table IV per 100,000 female population. This decrease is not so apparent in Tables II and III where the rate is based on live births. One reason for this would be that the number of births has been rather rapidly decreasing. In any case the decrease in mortality from puerperal septicemia has been very slight as compared with erysipelas and scarlet fever, especially the latter. One is struck by certain racial differences when comparing the mortality rates of the whites and blacks from certain diseases. This appears very definitely in Table I. It is interesting to note the striking differences in scarlet fever; the rate has steadily decreased for both races but has retained about the same ratio, always being much less for the negro. The same is true with reference to erysipelas, though the difference in the rates is not so striking. The exact opposite holds true with reference to puerperal septicemia, which has a constantly and more or less uniformly higher rate among the blacks than the whites. There has been a slight proportional decrease in this rate for both races. One might ask if this were due to a difference in the resistance of the two races or to greater exposure to infection of the negroes, from either poorer care or more frequent complications. In Tables III and IV it is easily seen that the mortality rate is much higher among the negroes from other puerperal causes, which of course includes some other infections than puerperal septicemia. This points probably to more complications and poorer obstetric care. In Table III one sees in all the states uniformly higher rates for the blacks than the whites, indicating that it is not a local or accidental condition. In Table IV certain other diseases are compared and indicate racial susceptibility or the existence of conditions more favorable to infection. In Table II an attempt is made to ascertain whether or not there is any association between a high rate for puerperal septicemia and one for scarlet fever. In comparing these mortality rates for different countries there seems to be no constant relationship. Belgium, Germany, and Spain show rather high rates for both puerperal septicemia and scarlet fever. On the other hand, The Netherlands and Norway show low rates for both diseases. Australia and Chile show low rates for scarlatina and a moderately low one for puerperal septicemia. There does not seem to be the same tendency in the white race to have a low mortality rate for scarlet fever associated with a high rate for puerperal septicemia. In Table V the same comparative points are brought out with reference to puerperal deaths among the white and

colored races, and in addition the actual number of deaths is given so that one may obtain some idea of the number of persons involved.

It is desirable to secure if possible more definite information as to whether or not a resistance may be built up against puerperal septicemia of streptococcic origin. Scarlet fever, inasmuch as it seems to be a streptococcic disease which establishes immunity to subsequent attacks, might build up such a resistance.

It seemed of some importance to analyze a large group of puerperal cases with reference to the incidence of scarlet fever and the relationship to febrile puerperia and to fatal cases of puerperal septicemia. We have analyzed two such groups of cases, one consisting of over 6000 cases from the Minneapolis General Hospital and the other from private practice, made up of 2000 cases. This makes a combined series of over 8000 cases. In the Minneapolis General Hospital group of 6060 cases, there were 723 cases with a history of scarlet fever, or a percentage incidence of 11.9. In the private series of 2000 this disease occurred in 380 instances, or 19 per cent. This totals 1103 cases, or 13.6 per cent, for the entire series. The general incidence of scarlet fever seems to be between 11 and 12 per cent. The figures and percentages for those not having scarlet fever represent the difference and appear in Table VI. This table also shows an analysis of the febrile and afebrile cases in both those with and without a history of scarlatina. A temperature of 100.4° F. or more on two or more days during the puerperium was taken as the standard of a febrile puerperium. Percentages and rates were computed for each group and subgroup on the basis of the total number of cases and also of those in each subgroup. It is interesting to note that a very much higher percentage of cases without scarlet fever had a febrile puerperium than of those who had a history of this disease. This is marked in both groups of cases as well as in the entire series. In this same table the cases are also divided into afebrile and febrile groups and each of these is subdivided into those with and without a history of scarlet fever. The percentages were figured on the same basis as has been described. We find a higher percentage incidence of febrile puerperia among those without scarlet fever than corresponds to the general incidence of this disease. In the Minneapolis General Hospital group 88 per cent had no history of scarlet fever but over 90 per cent of the febrile cases fall in this group. The same is true in the private series of cases, but more marked, as the relative percentages were 81 and 92. For the entire series, then, the percentage incidence of cases without scarlet fever was 86.3 and the percentage of febrile cases in this whole group was 90.7. The reverse is true for those who had scarlet fever. This seems to indicate that a greater percentage of cases have a febrile puerperium in those who have not had scarlatina than in those who have had the disease.

TABLE VI. ANALYSIS OF CASES SHOWING RELATION OF FEBRILE PUERPERIUM TO INCIDENCE OF SCARLET FEVER

	WITH SCARLET FEVER						WITHOUT SCARLET FEVER					
	AFEBRILE		FEBRILE		TOTAL		AFEBRILE		FEBRILE		TOTAL	
	NO.	RATE ¹	NO.	RATE	NO.	RATE	NO.	RATE	NO.	RATE	NO.	RATE
M.G.H. ² 6060	651	10.8 90.0	72	1.1 10.0	723	11.9 100.0	4668	77.0 87.5	669	11.0 12.5	5337	88.0 100.0
Private 2000	363	18.15 95.5	17	0.85 4.5	380	19.0 100.0	1422	71.1 87.8	198	9.9 12.2	1620	81.0 100.0
Combined 8060	1014	12.5 91.9	89	1.14 8.1	1103	13.6 100.0	6090	75.5 87.5	867	10.7 12.5	6957	86.3 100.0
	AFEBRILE						FEBRILE					
	WITH SCARLET		WITHOUT SCARLET		TOTAL		WITH SCARLET		WITHOUT SCARLET		TOTAL	
	NO.	RATE	NO.	RATE	NO.	RATE	NO.	RATE	NO.	RATE	NO.	RATE
M.G.H. 6060	651	10.8 12.2	4668	77.0 87.8	5319	87.7	72	1.2 9.7	669	11.0 90.3	741	12.2
Private 2000	363	18.15 20.3	1422	71.1 79.7	1785	89.2	17	0.85 8.0	198	9.9 92.0	215	10.7
Combined 8060	1014	12.5 14.3	6090	75.5 85.7	7104	88.1	89	1.1 9.3	867	10.7 90.7	956	11.8

¹Rate per 100 cases. Upper figure is rate for total cases, lower figure for group cases.²Minneapolis General Hospital.

In Table VII a study is made of both the febrile and the fatal cases. It is apparent that the rate for febrile cases is definitely higher in those cases who give no history of scarlet fever than in those who have had it. The number and rates are given with reference to fatal cases. All cases who died of any infection in connection with labor or the puerperium are included. Two cases are also incorporated from whom no history was obtainable, as they entered the hospital in a critical condition and died before a complete history could be obtained. Abstracts of the fatal cases are appended so that their character may be better appreciated.

There were 23 in all, of which two are eliminated from the group statistics because of the absence of a history. This leaves 21 cases for closer analysis. Of these cases, two gave a history of scarlet fever, Cases 5 and 22. The former had a pyelitis and probably a puerperal sepsis. The records of bacteriologic study are incomplete and no autopsy was permitted. The other case was a preeclamptic who had evidence of a respiratory tract infection at the time of delivery and died later of a lobar pneumonia. Of the ten cases with known streptococcic infections, not one gave a history of having had scarlet fever. It would appear, then, that scarlet fever might confer some immunity to subsequent infection with streptococcus during the puerperium. In considering the prevention of puerperal septicemia the various antiseptic and aseptic technics have been used with success in limiting puerperal infections. Bacteriologic studies have been made to determine the various organisms responsible for this condition. There still remains a residuum of cases which become infected and die from puerperal sepsis. Perhaps we can improve our morbidity and mortality rates by more extensive investigation of the factors in the resistance to disease. As pointed out earlier in this paper, such investigation has recently been carried out and is still being conducted. Scheyer¹¹ has carried out experiments to determine the part played by the reticulo-endothelial system in combating streptococcic infections. He believes that the cells of this system show that certain individuals have no reaction against streptococcic infections, that others react but have their resistance soon overcome, and lastly, others who perhaps as a result of previous streptococcic infection are immune or very resistant to it. Burt-White¹² has recently reported some work on the skin test for sensitiveness to streptococcic toxin. He reports 100 tested cases, of which twenty-seven were toxin-sensitive and seventy-three were not. Eight, or 30 per cent, of the twenty-seven women had a morbid puerperium. Only two of the seventy-three women exhibited morbid puerperia. He concludes, "women who react positively to intradermal inoculation of scarlatinal toxin are more liable to develop puerperal sepsis than nonreactors."

Hackett made some skin tests on some of our patients at the Minne-

TABLE VII. INCIDENCE OF FEBRILE AND FATAL CASES OF INFECTION WITH AND WITHOUT A HISTORY OF SCARLET FEVER

CASES	FEBRILE CASES							FATAL CASES						
	WITHOUT SCARLET FEVER			WITH SCARLET FEVER			TOTAL		WITHOUT SCARLET FEVER		WITH SCARLET FEVER		TOTAL	
	NO.	FEBRILE	RATE ¹	NO.	FEBRILE	RATE	NO.	RATE	NO.	RATE	NO.	RATE	NO.	RATE
M.G.H. 6060	5337	669	11.0 12.53	723	72	1.2 9.95	741	12.2	16	0.29 2.38	1	0.14 1.4	19 17(2)	0.31 2.29
Private 2000	1620	198	9.9 12.22	380	17	0.85 4.5	215	10.7	3	0.18 1.51	1	0.27 5.8	4	0.2 1.86
Combined 8060	6957	867	10.7 12.5	1103	89	1.1 8.1	956	11.8	19	0.27 2.19	2	0.18 2.25	23 21(2)	0.21 2.2

¹Rate per 100 cases. Upper figure is rate for total cases, lower figure for group cases.

apolis General Hospital and found among 161 patients sixteen questionable, 102 negative, and forty-three positive reactions to streptococcic or scarlatinal toxin. Of the 145 cases reacting definitely, 29 per cent were toxin-sensitive. There was a positive history of scarlet fever in twenty-one of the 145 cases, or 14.5 per cent. Fifteen were in the nonreacting group, a percentage of 10.3 of the whole series and of 14.7 of the group. Six were toxin-sensitive, a percentage of 4.2 for the series and of 13.9 for the group. Among the sensitive cases there were six with a febrile puerperium, which is a percentage of 4.2 for the series and 13.9 for the group. In the nonreacting group, thirteen had a febrile puerperium, which makes 9 per cent of the total and 12.7 per cent for the group. There were no fatalities from infection in this series.

This is a small series and it is impossible to draw any conclusions, but a slightly smaller percentage of the nonreacting cases showed some evidence of infection in the puerperium. The incidence of scarlet fever is somewhat higher than in our larger series of cases. A percentage of 71 of those having had scarlet fever showed negative skin reaction and 29 per cent had a positive reaction.

SUMMARY

There has been a downward trend in the mortality of certain streptococcic diseases. This is not true of puerperal septicemia, which is most commonly due to the streptococcus. We should not regard this with equanimity and feel that the minimum has been reached. Bacteriologic studies have been made and the virulence of organisms studied. Various antiseptic and aseptic technics have been applied. Many operative procedures have been recommended and tried. There still remains a residuum of infection sometimes fatal, often unaccountable. We cannot always avoid the possibility of accidental and unknown inoculation of the patient with streptococci and other pathogenic organisms. It is unavoidable that the genital tract be injured and its resistance to infection thereby lowered during parturition. Is it possible perhaps to determine in a measure the resistance of the patient to the more frequent and serious streptococcic infections and perhaps in some manner raise the resistance of those who are sensitive and presumably nonresistant to this type of infection? Certain individuals and races seem to have greater resistance to streptococcic infections than others. This is shown by a comparison of the mortality rates for the negro and the white from certain streptococcic diseases. The fatalities among negroes are greater than for the whites in puerperal sepsis and other puerperal causes. This may be due to poorer care, more complications, or possibly a varying susceptibility to different types of organisms. In a study of a series of cases it appears to be true that those who have had a previous infection with the streptococcus, as in scarlet fever,

are less liable to a morbid puerperium. It also seems to be indicated that a large percentage of those who die from puerperal septicemia do not seem to have had a history of scarlet fever and thus have had no opportunity to increase their resistance. So far as the skin test with streptococccic toxin is concerned, the majority of persons seems to be nonreacting, some of whom have had scarlet fever. Those who are not sensitive may be less prone to streptococccic infection.

CONCLUSIONS

1. In our attempts to curtail and if possible eliminate puerperal septicemia we should gain a clearer idea of the factors producing susceptibility and resistance to infection, especially with the streptococcus.

2. The relationship between streptococccic diseases and puerperal sepsis should be more clearly understood.

3. Natural and acquired immunity should be studied with reference to puerperal infection.

4. It is possible that the streptococccic toxin may afford us an index of the susceptibility of the patient to streptococccic infection.

5. It is also likely that one could build up the patient's immunity to streptococccic infection when this seems to be indicated in susceptible persons.

6. The relatively low incidence of scarlet fever and high rate of puerperal sepsis among the negroes could also be explained by the supposition that at an early age they were resistant to scarlet fever and that later in life they lost this relative immunity and had acquired no group immunity to streptococccic infections from having had scarlet fever and therefore were more susceptible to inoculation with the streptococcus.

7. As an incidental observation it might be noted that while the negro seems more resistant to certain known streptococccic diseases than the white, he seems to have about the same susceptibility to measles. This might suggest the possibility that measles is not a streptococccic disease.

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