STREPTOCOCCAL INFECTIONS AMONG CHILDREN IN A RESIDENTIAL HOME

III. SOME FACTORS INFLUENCING SUSCEPTIBILITY TO INFECTION

By MARGARET C. HOLMES* and R. E. O. WILLIAMS

Streptococcus Reference Laboratory, Public Health Laboratory Service, Colindale, N.W. 9

WITH THE COLLABORATION OF

C. V. BLOOM, *Dr Barnardo's Homes, Barkingside, Essex*

and ANN HIRCH, and LERMIT and EILEEN WOODS

Streptococcus Reference Laboratory

In our studies of streptococcal infections among the 300–500 children living in a residential home (see Holmes & Williams, 1958*a*, *b*) we accumulated records on a variety of factors that might affect susceptibility to infection. Some of these were discussed in the first paper. Thus, the incidence of streptococcal infection varied little with age in the children of 2 years and older, and there was no difference between the attack rates in boys and girls, but the children in the *reception* group who were mostly newly arrived in the home had a consistently higher incidence than those in the group of *permanent* residents. In the present paper we discuss principally the effect of two further factors: tonsillectomy and previous experience of streptococcal infection.

METHODS

There are two alternative methods available for determining the personal characteristics that predispose a child to, or protect him from, some infection: we can compare the general incidence of infection on subgroups of the population having different characteristics, or we can compare the effect, in different persons, of known exposures to infection.

For the first method to be useful the subgroups must have equality of exposure to the risk of infection; in our material such equality can reasonably be assumed for the two sexes, because sex was not one of the characteristics that determined the sort of cottage in which a child was placed or, therefore, the infections to which he was exposed. The *reception* and *permanent* groups, on the other hand, certainly had a different exposure to risk. The higher attack rate for the children in the *reception* cottages compared with those in the *permanent* cottages might result from the differences in their exposure, from a difference in susceptibility of children with differing experience in the community, or, since a greater proportion of the *permanent* children had had their tonsils removed, from a difference in their average tonsillectomy rate. In fact all three factors almost certainly played a part.

* Present address: Fairfield Hospital, Melbourne, N. 20, Victoria, Australia. Requests for reprints of this paper should be sent to Dr Williams at Colindale.

The analysis of known exposures to infection overcomes some of the difficulties of the first method in that equality of exposure is ensured; it has, however, its own difficulty in that we can usefully study only the response to undoubted exposures. We can only be certain that a child was exposed to an effective disperser of streptococci if we know that infection was being spread in his cottage or class in school at the material time. We have therefore required that, for a child in a cottage to be regarded as certainly exposed to infection with a particular type of streptococcus, there should be at least two cases of clinical illness due to that type in the cottage within a period of 14 days, or one case of illness with collateral evidence that the infection was actually acquired in the cottage. To be exposed, a child had to be resident in the cottage for at least 8 consecutive days of the 14-day period centred on the day on which the qualifying case (the second of two cases, or the single case infected in the cottage) became ill. The same rules were adopted for school exposures.

These close definitions mean that the children who introduce infection into their cottage or class are excluded from the analysis, and as will be shown in a later paper (Holmes & Williams, 1958*c*), there is some evidence that they are a selected group. Moreover, the exposures that we analyse are all rather heavy and it may be that susceptibility to a lighter exposure is influenced differently.

For each child exposure, we recorded the outcome of the exposure—whether clinical illness or latent infection—and the child's previous experience of streptococcal infection while under observation in the home. Included under the heading of previous experience are the 'doubtful' exposures that were occasioned by a single case of infection in the child's cottage. Bacteriological examinations of the healthy children in the cottage were only made at the time of some of the exposures, usually those of the larger cottage outbreaks, in which the attack rate may have been higher than average. Children were considered 'well-swabbed' if at least two throat swabs were examined at about 2-week intervals, one during and one shortly after the end of the exposure period.

Unless otherwise stated the words 'sickness' or 'illness' are used to denote streptococcal infections of the upper respiratory tract or middle ear, as defined in the first paper of this series (Holmes & Williams, 1958*a*). In some of the tables a few children who developed clinically typical illness in a cottage outbreak of streptococcal infection are included as cases of 'sickness' although they were not examined bacteriologically.

MATERIAL

The attack rates in Table 1 are based on the children from the *permanent* group so as to minimize effects due to varying exposure and length of stay in the Village. For some analyses (e.g. Table 2) concerning children undergoing tonsillectomy we have included children from the nearby Woodford home. For the analyses of exposures to infection we have used records of all children in both *reception* and *permanent* groups over a 42-month period (November 1950–April 1954), that is, 12 months longer than the main study on which all the other analyses in these papers are based.

Many of the children in the community had had their tonsils removed before they arrived in the home. Once there, the indication for tonsillectomy was, in general, the occurrence of repeated sore throats in a period of a year or so. Enlargement of the tonsils was not, by itself, an indication for their removal. The tonsillectomy rate in the population was, however, high, as is implicit in the population figures of Table 1.

In analysing individual children's response to exposure to infection, we used data from the analysis of cottage 'outbreaks' of infection, which are presented in greater detail in the succeeding paper in this series.

RESULTS

Effect of tonsillectomy

General incidence of infection

In the *permanent* group at Barkingside, those children who had been tonsillectomized had a lower incidence of febrile respiratory tract illness than children of the same age who retained their tonsils, as shown in Table 1; all the rates were lower among the tonsillectomized children except two, namely, those for otitis in the 5 and 6 and 7–10 year groups. For gastro-intestinal illnesses requiring hospital admission, which were taken for comparison, the tonsillectomized children had the lower rate only in the 3 and 4 year age group.

In the group of children providing the figures for Table 1 there were thirty-five who underwent tonsillectomy at some time during our 30 months' survey. For the 199 child-months of exposure before tonsillectomy the incidence of streptococcal sore throat was 9·0 per 100 child-months; in the 416 child-months afterwards it was 0·7. The corresponding rates for non-streptococcal sore throat were 4·5 and 0·5; for other non-streptococcal respiratory infections they were 1·0 and 1·7. These children, therefore, showed the same difference in incidence of sore throat as noted in Table 1, but they did not have an unduly high incidence of total respiratory tract infection before the operation, nor did the operation affect it. When children whose tonsils had been removed before the start of our survey were compared with those who retained their tonsils throughout, a much smaller difference was noted, the rates for streptococcal sore throat being 2·1 and 1·3. The high rate of 9·0 for the first group clearly reflects the fact that a history of repeated sore throats constituted the indication for tonsillectomy.

These facts are further emphasized when the rates are broken down by the periods before and after operation (Table 2). The incidence of streptococcal sore throat fell to a low level immediately after operation and did not alter in the subsequent 12 months. As in the previous analysis, based on fewer children, there was a smaller reduction in the incidence of otitis, but this reduction seems greater than would be expected simply from the increased age of the children. There was no evidence for any effect on other respiratory illness.

There were only eighteen children who were observed for the whole of 12 months both before and after tonsillectomy. They suffered altogether forty-four upper respiratory illnesses before operation and only six afterwards; only one of the post-

Table 1. *Comparative attack rates on children with and without tonsils*

			Attack rates per 100 child-months					
			Febrile respiratory tract disease					
			Sore throats					
Age group (years)	Tonsils	No. of child-months of observation	Streptococcal	Non-streptococcal	Acute otitis	Other	Total	Acute gastro-intestinal illness
3 and 4	In	1161	2·0	3·4	4·0	4·3	13·7	2·6
	Out	111	1·8	0·9	1·8	1·8	6·3	0·9
5 and 6	In	1191	2·3	1·8	2·9	1·9	8·9	1·0
	Out	395	1·8	1·0	4·0	1·3	8·1	1·0
7–10	In	1429	2·5	0·8	1·8	1·5	6·6	0·2
	Out	1020	1·4	0·8	2·0	1·0	5·2	0·2
More than 10	In	1041	2·6	1·2	1·2	1·5	6·5	0
	Out	1064	0·8	0·4	1·2	0·9	3·3	0·4
All	In	4822	2·4	1·7	2·5	2·3	8·9	0·9
	Out	2590	1·2	0·7	2·0	1·0	4·9	0·4

(For 33 child-months the tonsil state was not known.)

Table 2. *Attack rates for respiratory tract disease during* 12 *months before and after tonsillectomy*

Period of observation in months	No. of child-months of observation	Attack rates per 100 child-months: Sore throats: Streptococcal	Sore throats: Non-streptococcal	Acute otitis	Other febrile respiratory infections	Total
Before operation						
12–7	323	5·0	6·2	3·1	2·5	16·8
6–4	279	9·3	7·2	3·9	1·1	21·5
3–0	439	11·0	5·5	3·2	1·4	21·1
After operation						
0–3	447	1·1	0·7	2·2	1·1	5·1
4–6	304	0·7	1·6	1·3	4·0	7·6
7–12	418	1·0	0·2	1·0	1·7	3·9
Total						
Before operation	1041	8·7	6·1	3·4	1·6	19·8
After operation	1169	0·9	0·8	1·5	2·1	5·3

operative illnesses was associated with streptococcal infection, compared with twenty-two of the pre-operative.

There is thus an indication that the tonsillectomized children suffered fewer sore throats and perhaps also fewer attacks of otitis after the operation than before. It is, however, possible that without the operation these children would have ceased to have sore throats at about the same time. It would have been desirable to select paired controls for the children of Table 2 to check this point, but this was not practicable. There were, however, 224 children over 5 years of age who were observed for the whole of 2 consecutive years and who did not have their tonsils excised during this period; their records were examined to discover what relation there was between experience of streptococcal illness in the 2 successive years. Among the children with tonsils, there were forty-nine who had one or more such illnesses in the first year; 40·8 % of these had one or more streptococcal illnesses in the second, compared with 24·6 % of the 126 children with no illness in the first year. There was therefore an indication that the children who were ill in one year were the more likely to fall ill again in the subsequent year. These figures may underestimate the magnitude of the difference because some children who had repeated sore throats had their tonsils removed before the second year of observation was completed, and so are not included in this analysis.

Outcome of exposure to infection

We had records of 628 occasions on which children of 5 years and over, with tonsils present, were exposed to infection in their cottage and 339 when they were exposed to infection in school. The corresponding figures for the tonsillectomized children were 295 and 107 (Table 3). School exposures resulted in illness less often than cottage exposures, and with both cottage and school exposure the total

Table 3. *Effect of tonsillectomy on results of cottage and school exposures of school-age children*

Length of stay in Village prior to exposure (months)	Cottage exposures				School exposures			
	Tonsils present		Tonsils removed		Tonsils present		Tonsils removed	
	No.	% sick*	No.	% sick	No.	% sick	No.	% sick
0–1	137	26·3			41	14·6	6	(0)
2–3	96	22·9			56	10·7	24	4·2
4–6	121	22·3 } 23·8	157	10·2	58	8·6 } 10·6	10	0 } 1·8
7–12	90	23·4			63	9·5	17	0
13–24	81	17·3			42	4·8	8	(25·0)
25–36	25	12·0 } 16·0	74	16·2	44	4·5 } 4·7	17	17·7 } 20·0
37–48	38	13·2			19	15·8	12	0
49–	40	7·5 } 10·3	64	14·1	16	0 } 8·6	13	7·7 } 4·0
All	628	20·9	295	12·5	339	8·8	107	6·5

* 'Sick' means ill with sore throat, otitis or other respiratory tract infection due to the exposing type of streptococcus and occurring within 7 days of the last day of the exposure period. In this and the subsequent tables a few children who developed respiratory tract infection but were not swabbed are included as 'sick'.

sickness rate was lower in the tonsillectomized children. However, the latter difference seemed, with the cottage exposures particularly, to be confined to exposures occurring within the first 12 months of a child's stay in the Village. There are various possible explanations for this. It might reflect simply the fact that children who have many sore throats in their first year in the Village are likely then to have their tonsils excised and that this reduces their liability to infection. Or, it might be that the children with tonsils, and not those without, are able to develop a degree of immunity from their earlier infections sufficient to reduce their susceptibility to roughly the same extent as does tonsillectomy. The effect does not appear to be due simply to increase in age, since the children aged less than 5 years, in the nursery cottages, actually had a lower rate than the older children. Their rates were 17·0% (377 exposures) in the first 12 months; 14·9% (188) in the second, and 21·4% (14) in the third 12-month period. Nor is it simply an effect of increased length of stay in the Village, as will be shown when the figures of Table 5 are discussed.

Table 4. *Effect of tonsillectomy on clinical and bacteriological attack rate in school-age children following cottage exposure*

Length of stay in Village prior to exposure (months)	Tonsil state	No. exposed	No. sick	No. well swabbed	Healthy carriers as % of no. well swabbed	Total infected estimated % of no. exposed	Proportion sick as % of total infected
0–12	In	309	78	158	29·8	47·5	53·2
13–36	In	70	14	45	24·9	41·5	48·3
37–	In	58	6	42	33·4	40·2	25·8
All	In	437	98	245	29·8	45·5	49·2
0–12	Out	115	15	64	34·4	42·9	30·4
13–36	Out	46	8	31	22·6	36·1	48·2
37–	Out	49	8	29	27·6	39·4	41·5
All	Out	210	31	124	29·8	40·1	36·8

In Table 4 are set out the bacteriological results from the cottages in which reasonably satisfactory carrier surveys were made on at least two occasions after an exposure. Tonsillectomy seemed to have less effect in protecting children against infection by the streptococci than it had in preventing clinical illness. In the children with tonsils the bacteriological attack rate, and the proportion of infected children who became ill, decreased slightly according to their length of stay in the Village. No consistent effect was seen among the children who had had their tonsils removed.

A slightly different approach is possible by relating the tonsil state of all the children present in a cottage during a cottage outbreak of infection (discussed more fully in Holmes & Williams 1958*c*) to their experience during the outbreak. This approach is less precise than the one adopted above, since not all the children were present in the cottage for the same period of time, but it is at the same time

more comprehensive in that it does not omit the first child to be infected. The results were very similar to those of the earlier analysis; 28·1% of the children with tonsils became ill compared with 18·7% of the tonsillectomized children. The ratio of these two percentages is 1·5:1·0; the corresponding ratio from Table 3 is 1·7:1·0. The total bacteriological attack rates were 60·7 and 53·2%, respectively.

Effect of previous experience of streptococcal infection

For each exposure we recorded the child's experience of streptococcal infection during the period of observation before the exposure. For the analysis we took out (1) those exposures in children who had previously been ill with the type of streptococcus to which they were now exposed; then from the remainder we took out (2) exposures in children who had been infected with the homologous type of streptococcus but not ill with it—an incomplete group since some children must have carried the streptococcus at times when they were not examined. Partly for this reason we next extracted (3) the exposures in children not recognized as carriers but who had been exposed, in a cottage outbreak, to the same type. The next two groups of exposures were those in children who did not fall into categories 1, 2 or 3, but who had previously been (4) sick with a heterologous type, or (5) exposed to a heterologous type outbreak. The remaining exposures (6) were in children who had either been exposed to a single case of streptococcal infection of a known type or were not known ever to have been exposed, and there seems no justification for separating these groups. The exposures in each of the six categories were divided up according to the interval since the last previous illness or exposure and attack rates calculated (Table 5).

Five (9·3%) of the fifty-four exposures in children who had previously been ill with the homologous type resulted in sickness; in all cases the illness developed within 3 months of the first attack and in three the child had been treated with penicillin in the first attack.

The attack rate for sickness among the children who had no previous sickness or exposure, or had been exposed to single cases of infection, was 24·9 for those with tonsils and 13·9 for those without.

Subclinical infection seemed to afford as good protection against a subsequent homologous type exposure as actual illness; the apparent protection shown by the third group (previous exposure to the same type) presumably derived from unrecognized subclinical infection in some of the children exposed.

Among the children with tonsils, but not significantly in those without, the attack rates in groups 4 and 5 (heterologous type illness or exposure) were substantially lower than in the unexposed group (6), but there is a suggestion that this non-type-specific protection was stronger in the first 3 months after exposure than subsequently.

There was no indication of a decreasing attack rate in the group without previous exposure with increasing duration of observation, suggesting that the decrease observed with increasing stay in the Village among the children with tonsils (Table 3) resulted from clinical and subclinical infections rather than simply from increasing age or length of stay.

Table 5. *Attack rate in school-age and nursery-age children exposed in their cottage at various intervals after previous illness, exposure in outbreak or (for those not ill or exposed) arrival in the Village*

		Interval (months) since previous illness, exposure, etc.									
		Less than 3		4–12		13 and more		Not known		Total	
Tonsils	Previous experience	No. of exposures	% sick	No. of exposures	% sick	No. of exposures	% sick	No. of exposures	% sick	No. of exposures	% sick
In	1. Sick with exposing type	27	11·1*	11	0	3	(0)	0	—	41	7·3
	2. Not sick, infected with exposing type	18	11·1	13	7·7	5	(0)	5	(20·0)	41	9·8
	3. Not sick, in outbreak of exposing type, not known to be infected	117	14·5	27	18·5	3	(33·3)	0	—	147	15·7
	4. Sick with another type	54	9·3	72	19·5	31	16·1	0	—	167	14·4
	5. Not sick, in outbreak of another type	99	11·1	103	12·6	37	12·9	0	—	239	12·1
	6. Not previously sick or exposed	317	25·2	193	22·8	78	28·2	0	—	588	24·9
Out	1. Sick with exposing type	8	(25·0)*	4	(0)	1	(0)	0	—	13	15·4
	2. Not sick, infected with exposing type	6	(0)	10	0	2	(0)	1	(0)	19	0
	3. Not sick, in outbreak of exposing type, not known to be infected	31	9·7	8	12·5	5	(0)	0	—	44	9·1
	4. Sick with another type	9	(0)	23	13·0	10	30·0	0	—	42	14·3
	5. Not sick, in outbreak of another type	26	11·5	25	16·0	5	(0)	0	—	56	12·5
	6. Not previously sick or exposed	80	15·0	38	7·9	48	16·7	0	—	166	13·9

* All three of the children with tonsils, but neither of the two without, had been treated with penicillin in their first attack.
Percentages in brackets are based on less than ten exposures.

Some of the children whose records are included in Table 5 had only been observed for a short time, so that our knowledge of their previous experience was not complete. A further analysis was therefore made on children observed for a full 6 months. The results were very similar. Exposures in children with tonsils previously ill with, or carrying, the homologous type had an attack rate of 4·7 %; for those in children previously sick with, or exposed to, another type the rate was 12·3 %, and for those not previously ill or exposed in an outbreak it was 20·4 %. The corresponding percentages for tonsillectomized children were 7·1, 9·2 and 12·1.

For studying the bacteriological outcome of exposure (Table 6) we have tabulated all exposures in both school-age and nursery children occurring in cottages in which bacteriological surveys were made. A previous illness due to, or previous carriage of, the homologous type generated substantial immunity to re-infection. There was little evidence that previous sickness with, or exposure to, a different type protected against infection, though both protected against sickness, at least in children with tonsils.

Many analyses were made to test the relationship of the different types of streptococci to the outcome of exposure, but no consistent differences between types could be detected. With all but one of the types the attack rate was higher among the children with no previous exposure or illness than among those with such a history, and in the former of these two groups the attack rate on tonsillectomized children for all types was lower than that on children with tonsils. Types which commonly produced high attack rates had a higher ratio of children sick to those infected than types producing low attack rates. In so far as it was possible to judge from the small numbers available, types known to produce easily recognized M antigens (*1*, *2*, *5*, *6*, and *12*) did not differ in their ability to induce type-specific immunity from those producing poor M antigens (*4*, *9*, *22*, *Corby*).

DISCUSSION

It is not proposed to enter into an extended discussion of the literature on the effect of tonsillectomy on a child's liability to contract illness because most of the studies lack any reference to bacteriological diagnosis of the illness. Without doubt a really precise assessment of the value of the operation could only be obtained by a prospective and properly controlled trial, in which children considered suitable for tonsillectomy were allocated to operation and no-operation groups at random and were all observed equally thoroughly for the same length of time. Equally certainly, if such a trial were really practicable, it would have been carried out already.

Our data concern the experience of children who had or had had their tonsils removed on an individual clinical assessment, and we could only contrast them with children in whom the operation was never thought necessary. Nevertheless, it seems to us difficult to escape the conclusion that the children at Barkingside who had their tonsils removed during our study benefited from the operation, in that they subsequently had fewer streptococcal sore throats. This conclusion is not

Table 6. *Effect of previous experience of infection on clinical and subclinical infections in school and nursery following cottage exposure*

Tonsils	Previous experience	No. exposed	No. swabbed	Healthy carriers as % of no. swabbed		Sick (%)		Total infected, estimated % of no. exposed		Sick as % of total infected	
In	1. Sick with exposing type	33	20	10·0	10·8	9·1	8·7	18·2	18·6	50·0	46·8
	2. Not sick, infected with exposing type	36	17	11·8		8·3		19·1		43·5	
	3. Not sick, in outbreak of exposing type, not known to be infected	118	49	24·5		16·1		36·6		44·0	
	4. Sick with another type	119	75	37·4		16·0		46·5		33·7	
	5. Not sick, in outbreak of another type	191	124	42·0		14·7		50·4		29·0	
	6. Not previously sick or exposed	375	177	35·6		28·6		53·9		53·0	
Out	1. Sick with exposing type	8	2	(50·0)	15·4	(12·5)	4·4	(56·3)	19·0	(22·2)	22·8
	2. Not sick, infected with exposing type	15	11	9·1		0		9·1		0	
	3. Not sick, in outbreak of exposing type, not known to be infected	26	12	33·3		11·5		41·0		28·1	
	4. Sick with another type	31	17	35·3		16·1		45·7		35·3	
	5. Not sick, in outbreak of another type	47	30	23·4		12·8		33·1		38·6	
	6. Not previously sick or exposed	123	72	33·3		17·1		44·7		38·2	

Percentages in brackets are based on less than ten exposures.

based on a diagnostic difference in the children with and without tonsils, because there was no compensating increase in non-streptococcal illness. It does not seem reasonable to argue that the children who came to tonsillectomy were about to cease suffering from sore throats because, in a sample of children who were studied for 2 years and not operated on, those who had a high attack rate in the first year continued to have a high incidence in the second. Although there was a marked decline in the total incidence of respiratory tract illness as the children grew older, and this probably accounts for the post-tonsillectomy decrease in 'other respiratory illness' recorded in some of our analyses, there was no comparable decline in the incidence of streptococcal sore throat.

It may be noted that Bloomfield & Felty (1923) produced bacteriological evidence for protection against streptococcal infection by tonsillectomy, and that Rantz, Spink & Boisvert (1945) reported tonsillectomy to protect against infection in a food-borne streptococcal outbreak.

We think that part of the confusion in the literature on the effects of tonsillectomy results from lack of bacteriological diagnosis: tonsillectomy probably has some effect on streptococcal sore throat but less on non-streptococcal sore throat and perhaps none on other respiratory tract illnesses. And since non-streptococcal illnesses are generally the more frequent, analyses of total illness are not really adequate to measure the effect of the operation.

The fact that only some respiratory tract illnesses appear to be affected by tonsillectomy is by itself an argument against tonsillectomy as an operation to alleviate repeated respiratory tract illness, unless this has been shown to be streptococcal. Moreover, even with streptococcal infection the benefit conferred by tonsillectomy may not be very great and may not be very long-lasting; it has to be set against the risks of the operation itself and the risk that the tonsillectomized child may be more liable to bulbar involvement if he contracts poliomyelitis (*Report*, 1955). Tonsillectomy as a method of treating dangerous carriers of streptococci seems unjustifiable in view of the satisfactory antibiotics now available. In any case it is probably useless: the dangerous carriers are those who harbour streptococci in the nose and we have already shown (Holmes & Williams, 1958*a*) that in convalescence from acute infection tonsillectomized children tend to be nasal carriers more often than children with tonsils.

So far as experience of streptococcal infection is concerned, our results confirm the general experience that there is a type-specific immunity. It is noteworthy that in three of five cases of a second infection, the child had been treated with penicillin for the first, and it has been shown elsewhere that penicillin inhibits the formation of bactericidal antibodies (Denny, Perry & Wannamaker, 1957). Moreover, four of the re-infections were within 1 month of the first attack; apart from the difficulty of truly distinguishing a re-infection from a relapse after such a short interval, Denny *et al.* (1957) showed that bactericidal antibodies take 6 or more weeks to become detectable. Subclinical as well as clinical infection induced some immunity to re-infection; and there was also a strong indication of some 'non-type-specific immunity'. The doctrine of type-specific immunity with *Streptococcus pyogenes* is derived largely from Lancefield's work on immunity in mice (e.g. Todd

& Lancefield, 1928), though it was also implied by Griffith (see *Report*, 1938) in his work on streptococcal epidemics in schools and by Wannamaker (1954) in the U.S. Air Force. However, the work of Evans (e.g. 1946) and more recently of Fleck (1956) suggests that even in mice examples of non-type-specific immunity can be detected; and the same was claimed by Rantz *et al.* (1945) in their study of a food-borne streptococcal outbreak. It seems important to seek further opportunities for examining this problem in human populations.

Even with records of a home with an average population of over 400 children studied for a period of $3\frac{1}{2}$ years, many of our conclusions are equivocal. Among these equivocal points the most interesting certainly seems to be the suggestion that tonsillectomy may reduce the child's ability to develop this non-type-specific immunity, whereas it appeared that children who retain their tonsils had some, possibly transient, degree of immunity of this sort.

SUMMARY

Children in a residential home whose tonsils had been removed had lower attack rates for streptococcal sore throat than tonsillectomized children. Tonsillectomy did not have a consistent effect on respiratory tract illness.

Tonsillectomy has a similar effect on the outcome of individual exposures to streptococcal infection; the difference was more marked for illness than for simple colonization.

The apparent benefit from tonsillectomy could not be attributed to the ageing of the child, and was considered real. Its magnitude did not seem, however, great enough to justify a policy of extensive tonsillectomy, particularly in view of the possible risks to the child.

A child who had been ill with infection due to one streptococcal type rarely became ill when re-exposed to the same type. In addition there was some evidence in children with tonsils of an immunity, perhaps short lived, which was clearly not type-specific.

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