was, however, able to make an estimate of "goodness of cure" which had a significant relationship to administration of sulphatriad.

It is felt that the routine administration of sulphonamides to patients with acute tonsillitis cannot be supported by the results of this experiment.

We wish to thank Professor Bradford Hill and Dr. D. D. Reid for their help and advice. We also are grateful to Messrs. May and Baker Ltd. for their kindness in providing both sulphatriad and control tablets for these experiments, and particular thanks are due to Mr. E. J. Baines, of the New Products Division. We are indebted to the Director-General of Medical Services, R.A.F., for permission to publish.

REFERENCE

Anderson, T. (1949). *British Medical Journal*, 2, 860.

"SORE THROAT" IN GENERAL PRACTICE

BY

J. B. LANDSMAN, M.B., Ch.B., F.R.F.P.S.*

N. R. GRIST, M.B., Ch.B., B.Sc., M.R.C.P.Ed.*

R. BLACK, M.B., Ch.B.

D. McFARLANE, M.B., Ch.B.

W. BLAIR, M.B., Ch.B., D.P.H.

AND

T. ANDERSON, M.D., F.R.F.P.S., F.R.C.P.Ed.

(From the University and Knightswood Hospital, Glasgow)

Acute tonsillitis, especially as it occurs in general practice, has received little study in recent years from the point of view of either epidemiology or treatment. The Commission on Acute Respiratory Diseases (1944) made an intensive study of the problem in American troops during the recent war, but, valuable as this investigation undoubtedly is, its findings are applicable only to young healthy adults, and, indeed, to young adults living in artificial surroundings which would tend to encourage infectious "in-breeding." No excuse is needed, therefore, for presenting some information on the epidemiology of "sore throat" as it is seen in ordinary urban practice. But if there is a need to know what clinical material is comprised in this general descriptive title, there is an equal need to study what is the best method of treatment. Criticisms, based largely on clinical impressions, were made in the correspondence columns of the *British Medical Journal* following a statement that the sulphonamides had little value as a method of treatment in such conditions (Anderson, 1949). A study was therefore conducted to secure some factual information. The present paper is based upon the records of the first 100 cases.

Material and Methods

The patients studied were encountered in the general practice of three of us (R. B., D. McF., and W. B.); they consisted of all those who complained of "sore throat" as the leading symptom. It was arranged that throat swabs would be submitted from such patients, who would subsequently be visited by one of the epidemiological team, if possible within the following 24 hours. At this visit a second swab of the throat and a swab of the post-nasal space (taken through the nose) were

obtained. Two special cards were drawn out, one of which was to be used by the general practitioner so that uniform records of the duration of signs and symptoms could be kept; the other was used to record the main epidemiological data. The experiment was begun in January, 1950, and still continues.

Quantities of tablets were prepared by May and Baker Ltd. which, though differing in composition, were similar in appearance. One set contained 0.5 g. of sulphanilamide, another 0.5 g. of "sulphatriad," and a third 0.5 g. of lactose. Each lot of tablets was referred to by the letters A, B, or C, the proper constituents being known only to the hospital dispenser. The practitioners have stated that they were unaware which tablet was which, except on one occasion when a patient developed a sulphonamide rash, whereupon the lettering was changed.

During January and early February each doctor was supplied with a particular tablet which he was to use for those patients who came into the trial, the intention being that the doctors were to employ a different medicament each month. This method, which was chosen for its obvious simplicity, was open to criticism on epidemiological grounds, for it was possible that the type of tonsillitis seen in one month might be different from that seen in another. Accordingly, during the remainder of the period each practitioner carried a supply of all three tablets, and the method of treatment was thereafter dictated by the use of a set of random numbers which were written on the cards supplied to the practitioner.

During the preliminary period (January–February) the practitioner who had been given the lactose tablets saw the greatest number of sore throats. Accordingly when the whole series is summated there is some inequality in the treatment groups. Thus there were 26 cases in the sulphanilamide group, 26 in the sulphatriad group, and 43 in the lactose group. It is felt that, since the method of treatment was at no time selected by the doctor, no serious harm arises from analysing all of the patients in this preliminary report. In four cases the practitioner's card was lost, so that the method of treatment was not known, and in one case, in error, the allocated method of treatment was not adhered to. It is perhaps worth commenting that prior to the trial one practitioner was firmly convinced of the value of sulphonamides in such cases, the second used them with fair frequency, whereas the third seldom prescribed them.

The throat and post-nasal swabs were treated in the following way. A Löffler's slope, and blood-agar and gentian-violet blood-agar plates were inoculated, care being taken to ensure that the whole swab was rubbed on the surface of the plates. A direct film was also examined for the presence of Vincent's organisms. Cultures were examined at the end of 18–24 hours' incubation. Particular attention was paid to the presence of β -haemolytic streptococci (H.S.), and when these were present the following notation was used: + = up to 5 colonies; ++ = up to 50% of the growth; +++ = more than 50% of the growth. The predominance of any other organism was noted and an attempt made to type any pneumococci isolated. Under the conditions of the experiment it was not possible to carry out serological tests which might have had the value of defining more completely the streptococcal aetiology.

As the study has two aspects—namely, epidemiological and therapeutic—the results will be described under these subheadings.

*These workers are in receipt of a grant from the Medical Research Council.

Epidemiological Data

Table I shows the cases arranged according to the week of onset and in four broad categories according to the result of the initial throat swab. It will be seen that

TABLE I.—Distribution of Cases by Week of Onset and Result of Swab

Week No.	Total Cases	β -haemolytic Streptococci			Normal Flora
		+	++	+++	
52	1	1	0	0	0
1	3	0	0	0	3
2	17	1	0	7	9
3	6	1	0	1	4
4	8	3	1	2	2
5	8	2	0	6	0
6	4	1	1	2	0
7	7	0	1	4	2
8	5	1	2	1	1
9	5	2	2	1	0
10	12	2	2	1	7
11	7	3	1	2	1
12	10	5	3	1	1
13	4	0	1	2	1
14	1	0	0	0	1
15	2	0	0	2	0
Total ..	100	22	14	32	32

No culture revealed the presence of *Corynebacterium diphtheriae*. Smears for Vincent's organisms were all negative.

the cases occurred fairly evenly throughout the period, apart from the second week of the year, which showed the highest total of 17. The totals for the four-weekly periods are 27, 27, 29, and 17.

The results of the throat swabs show that in approximately one-third of the cases the flora was that commonly associated with a normal throat; in a similar proportion a profuse growth of H.S. was obtained; in 22% a few colonies were found; and in 14% there was a moderate growth of H.S. The exact significance to be attached to these subdivisions cannot be stated dogmatically, but it is interesting to record that the epidemiological team has investigated similar swabs taken from a random sample of healthy persons living in the district from which the present patients were drawn. Few streptococcal carriers have in fact been encountered, and in those detected the plate has with few exceptions been read as "one plus." It is obvious, however, that from some individuals one might expect to isolate odd colonies of streptococci, including haemolytic non-pathogenic varieties, so that it would be unwise to regard their presence as evidence of streptococcal infection. Further, the errors inherent in chance sampling would suggest that the subdivision between those whose culture produced a normal flora and those who showed a few colonies of H.S. was not clear-cut. In subsequent tables, therefore, it is proposed to use three groupings only: Group 1, comprising those whose culture was read as a "one plus H.S."; Group 2, those whose H.S. was read as "two plus" and "three plus"; and Group 3, those who showed a "normal flora." It is felt that Group 2 may be regarded as a fair representation of the cases of true streptococcal tonsillitis. (It may be noted that the American workers already referred to found a strong correlation between the predominance of H.S. in the throat swab and the occurrence

of a rise in antistreptolysin titre.) Group 1 comprises cases in which a streptococcal aetiology may be regarded as very doubtful; Group 3 consists of cases which must be regarded at present as of unknown aetiology.

On this basis, therefore, it is apparent that less than one-half of the cases (46%) can be regarded as streptococcal in origin—an observation of some interest and importance, since it is a common misapprehension that acute tonsillitis almost always implies a streptococcal aetiology.

Table II and the accompanying Chart draw attention to the mode of onset, the assessment of severity, and the main symptoms. (It should be noted that the clinical records of some of the earlier cases were incomplete.)

Table II shows that a rough distinction may be made between the cases in Group 2 and those in Groups 1 and 3. If the latter cases are combined to make a simple comparison we find that the percentages are (Group 2 percentages given first): sudden onset, 66% against 38%; mildly ill, 30% against 59%; moderately ill, 55% against 39%; and severely ill 15% against 2%. In the

TABLE II.—Mode of Onset and Clinical Severity of "Acute Tonsillitis"

	β -haemolytic Streptococci		Normal Flora (Group 3)	Total
	+	++ and +++		
	(Group 1)	(Group 2)		
Sudden ..	7 (37%)	22 (66%)	7 (39%)	36
Gradual ..	12 (63%)	11 (33%)	11 (61%)	34
Total ..	19	33	18	70
Mild ..	14 (64%)	14 (30%)	18 (56%)	46
Moderate ..	7 (32%)	25 (55%)	14 (44%)	46
Severe ..	1 (4%)	7 (15%)	0	8
Total ..	22	46	32	100

Malaise.

Sneezing.

Stuffy nose.

Rhinorrhoea.

Cough.

Headache.

Anorexia.

Vomiting.

Sweating.

Chills + Rigors.

Pain in glands.

□ Cases whose throat culture showed a heavy growth of haemolytic streptococcus (Beta).
 ■ Cases whose throat culture showed a normal flora or a 1+ haemolytic streptococcal growth (Beta).

Chart showing initial symptoms in cases of "sore throat."

chart a similar combination of the cases shows that in Group 2 (presumed streptococcal cases) headache, anorexia, vomiting, sweating, and chills and rigors predominated; whereas in those cases which were probably not streptococcal infections (Groups 1 and 3) there was a predominance of symptoms more clearly referable to the respiratory tract, such as sneezing, stuffy nose, rhinorrhoea, or cough.

The age distribution of the cases is shown in Table III. (Sex has been omitted, since the distribution in this respect is equivalent.) As in the previous tables, the distribution of the cases suggests some dissimilarity between the groups. Thus, in the under-5-years group there is an apparent excess of cases in which culture showed a normal flora, whereas those cases regarded as of streptococcal origin show an excess in the age group 25 years and over. We are in no doubt of the necessity to collect

TABLE III.—*Distribution of Cases of Tonsillitis by Age*

Age Group (Years)	β -haemolytic Streptococci		Normal Flora (Group 3)	Total
	+	++ and +++		
(Group 1)	(Group 2)			
0-4 ..	1	4	10	15
5-9 ..	2	11	3	16
10-14 ..	3	6	8	17
15-19 ..	2	1	4	7
20-24 ..	2	3	2	7
25 and over ..	11	20	5	36
Total ..	21*	45*	32	98

* In one case in each group the age was not recorded.

a much larger series for analysis before drawing definite conclusions. Nevertheless the cumulative evidence suggests that there is a rather mild form of acute tonsillitis, possibly commoner in childhood, which is not streptococcal in origin and which produces a symptomatology showing some distinctions from that of streptococcal tonsillitis.

A simple notation was used to describe the appearance of the throat. This permitted four subdivisions: (a) no exudate present; (b) soft follicular spots of exudate; (c) continuous small "flecks" of exudate; and (d) confluent pseudomembrane. Table IV shows the effect of correlating these findings with the result of the initial throat swab.

TABLE IV.—*Appearance of Throat and Result of Throat Swab*

	β -haemolytic Streptococci		Normal Flora (Group 3)	Groups 1 and 3 Combined
	+	++ and +++		
(Group 1)	(Group 2)			
No exudate ..	9	12	14	23
Follicular spots ..	9	23	13	22
Exudate ..	3	6	4	7
Membrane ..	0	4	1	1
Total ..	21*	45*	32	53

* One case in each group not recorded.

It has already been noted (Table II) that Groups 1 and 3 contained a relative excess of mild cases, and it may therefore be natural that a higher proportion in these groups showed no exudate on the throat. Nevertheless it may be observed that about a quarter of the streptococcal cases were not exudative.

Results of Treatment

As the present report is of a preliminary nature, detailed comparisons of the three treatment groups in regard to such factors as age, severity, and duration of illness prior to treatment are not given. The distribution of the cases in respect of the presumed aetiology and method of treatment is shown in Table V, which suggests that there is no gross dissimilarity.

The clinical data which had been entered on the practitioner's card made it possible to state the duration, in days, of certain signs and symptoms. After consideration, attention was confined to three of these—namely,

TABLE V.—*Distribution of Cases by Aetiological Group and Method of Treatment*

Method of Treatment	β -haemolytic Streptococci		Normal Flora (Group 3)	Total
	+	++ and +++		
(Group 1)	(Group 2)			
Sulphanilamide ..	9	7	10	26
Sulphatriad ..	3	15	8	26
Lactose ..	8	21	14	43
Total ..	20	43	32	95*

* In four cases the treatment was not known; in one case treatment was changed.

the duration of fever, oedema, and pain. Each of these factors had different merits in that the first was an entirely objective finding, the second was a clinical observation by the physician, and the third was a subjective record of the patient's main complaint. The data in respect of these criteria are recorded in Table VI

TABLE VI.—*Results of Treatment*

	Days									Total
	0	1	2	3	4	5	6	7	8	
1. <i>Duration of Fever</i>										
Sulphanilamide	4	17	3	1	1	0	0	0	0	26
Sulphatriad ..	7	16	3	0	0	0	0	0	0	26
Lactose	17	16	6	1	1	1	1	0	0	43
Means (days): sulphanilamide, 1.15; sulphatriad, 0.85; lactose, 1.07.										
2. <i>Duration of Oedema</i>										
Sulphanilamide	0	6	0	13	3	1	1	1	1	26
Sulphatriad ..	1	6	3	10	5	1	0	0	0	26
Lactose	2	7	1	23	3	1	4	1	1	43
Means (days): sulphanilamide, 3.19; sulphatriad, 2.58; lactose, 3.12.										
3. <i>Duration of Pain</i>										
Sulphanilamide	0	17	2	4	2	0	1	0	0	26
Sulphatriad ..	1	13	5	4	2	1	0	0	0	26
Lactose	0	26	4	6	5	0	2	0	0	43
Means (days): sulphanilamide, 1.81; sulphatriad, 1.85; lactose, 1.95.										

according to the method of treatment which the patient received. The table shows that there is little difference between the average duration of each factor. The application of statistical tests of variance also indicates that no significance can be attached to any of the differences. The figures give no grounds for the belief that either of the sulphonamide tablets was appreciably superior to the lactose tablet, which presumably was therapeutically inert.

The complications encountered are shown in Table VII.

TABLE VII.—*Complications Encountered in 100 Cases of "Tonsillitis"*

Group 1 (H.S. +)	Group 2 (Streptococcal)	Group 3 (Normal Flora)
Quinsy (1) (L)	Relapse (1) (St) Quinsy (1) (L) Sinusitis (1) (St) Erythema nodosum (1) (L)	Pneumonia (1) (L) Bronchitis (1) (St) Sinusitis (1) (St) Epistaxis (1) (Sa) Exacerbation of chronic myalgia (1) (L)

Sa = Treated with sulphanilamide. St = Treated with sulphatriad.
L = Treated with lactose.

It will be noted that none of the cases developed otitis media. The other complications encountered were not of individual importance apart from their effect in prolonging the illness. In view of the differences already noted between Groups 2 and 3 the slightly different character of the complications in these groups deserves attention. It may be finally noted that 4 of the 43

patients who received lactose, 4 of the 26 patients who received sulphatriad, and 1 of the 26 who received sulphanilamide developed complications. There is obviously little difference between the effects of the treatments in this respect.

Discussion

We do not propose to enlarge upon the epidemiological aspects in the present report. This study must be regarded as a "pilot" one undertaken in an endeavour to prospect the possibilities of such a form of investigation. Nevertheless it is interesting that our results show certain similarities to those obtained by the Commission on Respiratory Diseases. It must be remembered that their clinical material was all adult and confined to cases in which the temperature exceeded 100° F. (37.8° C.) and which thus qualified for admission to hospital. From the results of throat swabs and the demonstration of a rise in serum antibodies they concluded that roughly half of their cases were streptococcal. They also found some dissimilarity between the clinical pattern of the streptococcal and non-streptococcal cases in that chills, headache, and malaise were commoner in the former, whereas cough, nasal obstruction, and hoarseness were commoner in the latter.

As part of the American study the clinicians were asked to define the probable bacteriological cause before receiving the result of the throat swab, and it was found that the non-streptococcal cases were fairly accurately classified. There were, however, numerous errors among the cases finally proved to be streptococcal. Our own experience was that errors were frequent in both groups. Thus each of us saw patients in whom the clinical diagnosis of streptococcal tonsillitis appeared "obvious," but from whom a normal bacteriological flora was obtained from two throat swabs and a post-nasal swab; and others in whom a mildly inflamed throat produced almost a pure culture of haemolytic streptococci. The bacteriological examination of all such cases in general practice is not a practicable proposition; and yet precise differentiation of the cases without it is really impossible. Despite our observations, which suggest that a differentiation can be made between the different groups comprising the series, there seems to be no single clinical criterion which can be applied to diagnose "streptococcal" tonsillitis. In such circumstances it is obvious that the term must be used with considerable caution.

The results of the therapeutic trial do not support the thesis that sulphonamides exert a beneficial effect in the treatment of the "acute throat." Those who place more faith in the virtue of clinical impressions will no doubt be unconvinced by an array of "statistics." But it is well to remember that the average duration of fever and pain in those cases treated with lactose was exceedingly short—namely, 1.07 and 1.95 days respectively. In view of this, added to the fact that in about half of the cases a streptococcal aetiology is unlikely, it seems that to use drugs which have definite and known dangers is unnecessary, besides being expensive.

We are indebted to Dr. W. R. Thrower, of May and Baker Ltd., for supplying us with tablets of uniform size and appearance. Professor A. Bradford Hill and his colleagues undertook the statistical analysis and provided the random numbers, and to them we express our thanks.

REFERENCES

- Anderson, T. (1949). *British Medical Journal*, 2, 860.
Commission on Acute Respiratory Diseases (1944). *J. Amer. med. Ass.*, 125, 1163.

LEAD-POISONING IN CHILDREN

REPORT OF FIVE CASES, WITH SPECIAL REFERENCE TO PICA

BY

N. F. ELLIOTT BURROWS, M.A., B.M., D.C.H.
Senior Resident Medical Officer, Belgrave Hospital for Children

**JOHN RENDLE-SHORT, M.A., M.B., M.R.C.P.
D.C.H.**

Late House-physician, Hospital for Sick Children, Great Ormond Street

AND

**DENIS HANNA, M.B., M.R.C.P., M.R.A.C.P.
D.C.H.**

Late House-physician, Hospital for Sick Children, Great Ormond Street

Lead-poisoning in infancy and childhood is rare in Great Britain, although in other countries, notably Australia, America, and Japan, many cases have been described.

In a survey of the literature of this country for the past 60 years we have found only seven other reports of plumbism in infants and children. Stephenson (1898) reported poisoning in an infant from the use of white lead as toilet powder, and Cadman (1902) and Findlay (1935) each described a case due to lead nipple-shields. Rodgers, Peck, and Jupp (1934) described the case of a boy aged 2 years who had chewed toy soldiers, and Gartside (1948) reported two cases in a family from burning battery casings as fuel. Clark (1950) has reported a case in a breast-fed infant due to the lead contained in the family water supply.

We have recently seen three cases, and two others have been found in the records of the Hospital for Sick Children, Great Ormond Street. The five cases are reported below.

Sources of Lead

The source of the lead is broadly determined by the age of the patient. (1) In infancy there are dangers such as the application of powder containing lead to the breasts or to the infant's skin, and the use of lead nipple-shields. The use of lead powder by mothers was found to be the common cause of lead encephalopathy in Japanese infants. (2) In children up to about 5 years the ingestion of lead paint or metallic lead due to perverted appetite is the most likely cause, although peculiar circumstances have resulted in large outbreaks in Queensland, Australia. Climatic conditions there favoured the powdering of paint, which was readily transferred to the children's mouths (B.M.A. Queensland Branch Report, 1922). (3) In children of school age perverted appetite is not often a factor, but they may encounter a great diversity of hazards, as in adults. The majority of 40 cases due to burning battery casings as fuel were in older children (Williams *et al.*, 1933).

Pica.—Four of the five cases here described exhibited pica, or perverted appetite. All children pass through a temporary phase of putting objects in their mouths, but pica refers to a morbid craving, of longer duration, for such undesirable articles as earth, sand, coal, wall-paper, cloth, hair, paint, and even wood-lice. The condition may result from gastro-intestinal disturbances, but mental deficiency, neurosis, and simple habit are often