31. Does the weather affect your chest ? Yes/No
31a. (If no, check " not even fog or cold ? ") Yes/No
35. Does it make you wheeze ? Yes/No
38. Does it make you breathless ? Yes/No

Apart from colds, do you usually have a stuffy nose or catarrh at the back of your nose;

41. (*a*) in the winter ? Yes/No
42. (*b*) in the summer ? Yes/No
43. During the last three years have you had a chest illness which has kept you in bed, off work, or indoors ? Yes/No
43a. (If no, check " not even 'flu ? ") Yes/No

If yes to 43 or 43a:

44. (*a*) did you have increased cough with the illness(es) ? Yes/No
45. (*b*) did you have increased phlegm with the illness(es) ? Yes/No
46. (*c*) did you have only one such illness ? ☐
47. (*d*) did you have more than one such illness ? ☐
48. (*e*) estimated average duration .....
62. Do you smoke ? Yes/No
63. (If no) Have you ever smoked ? Yes/No
(Record " No " if less than 1 a day for a year)

(If yes):
Cigarettes a week .....
Ounces of tobacco/week (hand-rolled) .....
Ounces of tobacco/week (pipe) .....

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Retirement is largely a twentieth-century problem, the size of which can be gauged by the estimate that there will be about 10 million people of pensionable age in this country by 1970. A study group appointed in 1955 by the National Old People's Welfare Council has recently issued an outline of the ways in which people can prepare themselves to meet the psychological and practical difficulties they will be faced with in their old age (*Preparation for Retirement or Adjustment to Ageing*, National Council for Social Service, price 1s. 6d.).

SECRETION OF BLOOD-GROUP SUBSTANCES IN RHEUMATIC FEVER

A GENETIC REQUIREMENT FOR SUSCEPTIBILITY ?

BY

A. A. GLYNN, M.B., M.R.C.P.

L. E. GLYNN, M.D., M.R.C.P.

AND

E. J. HOLBOROW, M.D.

Rheumatism Research Unit (Medical Research Council), Canadian Red Cross Memorial Hospital, Taplow, Maidenhead, Berkshire, England

In a previous study of rheumatic fever subjects we reported an unduly high incidence of non-secretors of ABH blood-group substances (Glynn *et al.*, 1956). This result was based mainly on findings with a single test in which the readily precipitable Le^a substance present in the saliva of most ABH non-secretors was detected by means of rabbit anti-Le^a precipitating serum. This test gave results in close agreement with red-cell Lewis phenotypes and was positive with most A, B, or AB salivas giving negative agglutination inhibition tests for A and B substances.

In the present work we have used this test and also the " ulex " test for secretion of ABH substances to estimate the frequencies of both ABH non-secretors and Le^a non-secretors in normal schoolchildren. In addition, a number of rheumatic fever cases have been added to the series, including 79 salivas from rheumatic fever cases in New York State, kindly made available for test by Dr. Harrison Wood, Medical Director, Irvington House, Irvington-on-Hudson, N.Y.

Many rheumatic fever salivas previously tested only for Le^a precipitation have now been retested for inhibition of ulex extract (see below).

Materials and Methods

1. Fresh specimens of saliva were obtained from approximately equal numbers of schoolchildren of each sex in the area of Slough, Bucks, whose ages were evenly distributed between 5 and 15 years. Specimens were collected, boiled for 10 minutes within two hours of taking, and stored at 4° C. until tested.

2. *Tests for ABH and Le^a Substances in Saliva.*—(*a*) ABH secretors were detected by testing saliva for its ability to inhibit the natural agglutinins (lectins) for human group O cells present in extracts of gorse seed (*Ulex europaeus*). The method is described by Boyd and Shapleigh (1954). (*b*) Le^a substance in the saliva was detected, using rabbit anti-Le^a precipitating serum as previously described. Positive results were obtained only with salivas negative in the gorse-extract test.

Results

Secretor and Lewis Gene Frequencies in Normal Schoolchildren

Table I shows the results of testing 669 healthy children's salivas with ulex extract and with rabbit-anti-Le^a serum. Le^a substance was detected by precipitation in 21% of these, and H substance by

TABLE I.—*Saliva Phenotypes in 669 Healthy Schoolchildren*

Reagent	Substance Detected	Positive	
		No.	%
Ulex extract	H	516	77·1
Rabbit anti-Le^a (precipitation) serum	Le^a*	139	20·8
Both H and Le^a absent		14	2·1

* Detected in non-secretors of H only.

inhibition in 77%, these two categories being mutually exclusive. In 2% neither test was positive.

The ulex results give the frequency of H non-secretors as 153/669=0.2287. These are individuals homozygous for the recessive secretor gene *se*, and the frequencies of the secretor alleles may therefore be calculated:

$$se=\sqrt{0.2287}=0.4783 \quad Se=1-0.4783=0.5217 \quad \text{S.E.}=0.019$$

The genotype frequencies, therefore, are:

SeSe=0.2722	Secretors (0.7712)
Sese=0.4990	
sese=0.2287	Non-secretors
Total 0.9999	

Table I also gives information about the Lewis gene frequencies. Thus among the total of 153 (ulex-negative) non-secretors 14 showed no precipitable Le^a substance in their salivas. It has previously been shown (Glynn *et al.*, 1956 ; Brown *et al.*, 1959) that when Le^a substance is present in non-secretors' saliva it is always in precipitable form. We may therefore assume that Le^a substance is absent from the salivas of these 14 non-secretors. Since, according to Ceppelini (1955), the Lewis (*L,l*) genes and the secretor genes segregate independently, the proportion 14/153 obtained from observation of the non-secretors provides an estimate of the frequency of the genotype *ll* in the whole population. The Lewis gene frequencies are thus obtainable:

$$ll=14/153=0.0915 \quad l=\sqrt{0.0915}=0.3025 \quad L=1-0.3025=0.6975 \quad \text{S.E.}=0.037$$

The genotype frequencies are:

ll=0.0915	
Ll=0.4220	
LL=0.4865	
Total 1.0000	

From these results we have calculated the frequencies of the various combined Lewis and secretor genotypes, which are set out in Table II.

TABLE II.—*Frequencies of Lewis and Secretor (ABH) Genotypes and Phenotypes in 669 Slough Schoolchildren. (Based on Ulex and Le^a Precipitation Results Only)*

Frequency	Genotype	Saliva Phenotype			Red Cell Phenotype
		H	Le^a	Le^b	
0·1319	*SeSe LL*	+	(+)	+	Le(a−b+) 0·6996
0·1144	*SeSe Ll*	+	(+)	+	
0·2428	*Sese LL*	+	(+)	+	
0·2105	*Sese Ll*	+	(+)	+	
0·1113	*sese LL*	0	+	0	Le(a+b−) 0·2078
0·0965	*sese Ll*	0	+	0	
0·0248	*SeSe ll*	+	0	0	Le(a−b−) 0·0931
0·0456	*Sese ll*	+	0	0	
0·0227	*sese ll*	0	0	0	

Se=Secretor gene for ABH substance. *se*=Non-secretor gene for ABH substance. *Ll*=Allelomorphic genes for Le^a substance in saliva. +=Present 0=Absent. (+)=Not detectable with anti-Le^a (precipitation), but only by agglutination-inhibition.

Secretor Frequency in Rheumatic Fever

The present study adds 174 British and 79 American rheumatic fever cases to the 450 cases already reported by us. The majority of these have now been tested by both ulex and precipitation tests, but in 73 cases it has not been possible to do both tests, and in 11 the secretor status was determined exclusively by inhibition of anti-A and/or anti-B grouping sera. The methods of testing and results of the whole series are set out in Table III.

The simplest analysis of these figures is into secretor and non-secretor frequencies, including as secretors all

TABLE III.—*Salivary Tests in 703 Rheumatic Fever Cases*

Le^a Precipitin Test	Secretion Test	No.	Secretor Status
		British Cases	
Le^a−	H+	385	*Secretors* (ABH present in saliva) Mostly *secretors*, but includes one or two non-secretors of genotype *ll*
Le^a−	A,B+	5	
Le^a n.d.	H+	8	
Le^a−	H n.d.	44	
Le^a+	H−	146	*Non-secretors* (Precipitable Le^a present and/or ABH not detected)
Le^a+	A,B, −	6	
Le^a+	H n.d.	16	
Le^a n.d.	H−	5	
Le^a−	H−	9	
		American Cases	
Le^a−	H+	56	Secretor
Le^a+	H−	22	Non-secretor
Le^a−	H−	1	Non-secretor
	Total	703	

Le^a+=Precipitable Lewis^a in saliva. Le^a−=No precipitable Lewis^a in saliva. H+=H detected by ulex test. H−=H not detected by ulex test A,B+=A, B, or AB detected by agglutination inhibition test. A,B−=A, B, or AB *not* detected by agglutination inhibition test. n.d.=Test not done.

TABLE IV.—*Comparison of Rheumatic Fever Cases and Normal Schoolchildren. Saliva Tested with Ulex Extract*

Saliva	H+	H−	Total	% H−
Rheumatic fever	393	160	553	28·9
Healthy schoolchildren	516	153	669	22·9

$\chi^2=5.9$. n=1. P=<0·02.

TABLE V.—*Comparison of Rheumatic Fever Cases and Normal Schoolchildren. Saliva Tested with anti-Le^a (Precipitation)*

Saliva	Le^a−	Le^a+	Total	%Le^a+
Rheumatic fever	443	168	611	27·5
Healthy schoolchildren	890	239	1,129	21·2

$\chi^2=8.8$. n=1. P=<0·01.

of the 44 Le^a precipitin-negative subjects not tested for H. The whole series, British and American, gives 205 non-secretors, out of a grand total of 703 cases. This is a percentage of 29.16.

For the purposes of strict comparison with normal children, the results to be compared are those in which the same test has been carried out in both control and rheumatic fever cases. Considering the results of ulex testing, for example, we have a total of 553 British rheumatic children tested in this way and 669 normal children. The comparison of results in the two groups is set out in Table IV. The percentage of non-secretors in the rheumatic fever group is 28.9%, compared with 22.9% in the control group. This difference is significant at the 2% level ($\chi^2=5.9$; n=1 ; P=0.02–0.01).

A second comparison with an independent test—Le^a precipitation—is shown in Table V. Here the total number in the control group is much larger, and is composed of the 460 children originally tested and the

669 children reported above (total 1,129 normal children). The comparison of this large control group with the 611 British rheumatic fever cases which we have now tested with the anti-Le^a precipitating serum shows a highly significant difference ($\chi^2=8.8$; $n=1$; $P<0.01$). The American cases have not been included in either of these comparisons, as no normal control cases were available, but it is of interest that by both tests they give results closely similar to the British cases.

Discussion

In view of Ceppelini's (1955) demonstration that there is no correlation between the presence of Le^a substance and ABH substances in the saliva, the use of our Le^a precipitin test as an indicator of ABH secretor status may appear questionable. We have already shown, however (Glynn *et al.*, 1956), that the saliva precipitation test with rabbit anti-Le^a serum detects, under standard conditions, only Le^a secretors who are also non-secretors of ABH substances, and in the present work the good negative correlation with the ulex test confirms this. In the majority of Le^a secretors—that is, those who are also ABH secretors—Le^a substance is secreted in the saliva in a form detectable by agglutination inhibition tests, as used by Ceppelini, but not by precipitation. Although we have recently shown (Brown *et al.*, 1959) that the Le^a substance in the saliva of ABH secretors differs qualitatively (as well as quantitatively) from that of ABH non-secretors, it nevertheless remains true that if, as Ceppelini claims, Le^a and ABH secretion segregate independently, there should be the same proportion of Le^a non-secretors among ABH secretors as among ABH non-secretors. It is on this basis that the Lewis genotype frequencies have been calculated in Table II.

Our findings, then, may be discussed under two headings: the distribution of Lewis and secretor genotypes among normal children, and the deviation from this distribution found in a series of rheumatic fever cases.

Lewis and Secretor Genotypes in Normal Children

In using results of Le^a precipitin tests on saliva to estimate ABH non-secretor frequencies allowance must be made for ABH non-secretors who are also non-secretors of Le^a substance. Our previous series (Glynn *et al.*, 1956) contained 25 A, B, or AB non-secretors (whose saliva had been tested for inhibition of anti-A and anti-B agglutinating sera) ; of these, 23 gave positive Le^a precipitation tests, so that 2 out of 25 were non-secretors of precipitable Le^a substance. This figure was combined with those reported by Grubb and Morgan (1949) and by Race *et al.* (1949)—totalling 3 out of 108—to give 5 out of 133 (3.75%) as an estimate of the frequency of Le^a non-secretors among ABH non-secretors. That this was an underestimate is suggested both by Ceppelini's work in Italy, which revealed an incidence of non-secretors of Le^a substance of nearly 12%, and by our own figure of 9%, reported above, for British children.

Lewis and Secretor Genotypes in Rheumatic Fever

In view of the large number of cases and controls in this study, the results leave little doubt that a significant difference exists between the incidence of non-secretion of ABH substances in patients with rheumatic fever and in a corresponding group of normal subjects. Although significant, the observed difference of 6 to 7% would not appear at first sight to be of aetiological importance. However, from the calculated frequency of the secretor genes *Se* and *se* in the normal population it may be seen that if the gene *se* were essential for the development of rheumatic fever the expected incidence of non-secretors in a population with rheumatic fever would be 31.4%, which is not significantly different on these numbers from the observed figure of 29.1%. Thus if the gene *se* is essential for the development of rheumatic fever, then subjects with this disease must be either *Sese* or *sese*, and the frequency of non-secretors—that is, individuals of genotype *sese* in such a population—would be:

$$\frac{sese}{Sese+sese} = \frac{0.2287}{0.4990+0.2287} = 0.314 = 31.4\%$$

We therefore provisionally advance the hypothesis that rheumatic fever can develop only in individuals of genetic constitution *Sese* or *sese*. Since it is at present impossible to distinguish homozygous secretors, *SeSe*, from heterozygous secretors, *Sese*, confirmation of this hypothesis is obtainable only from some form of family study. If, for example, families are chosen in which one parent has rheumatic fever and is a secretor whilst the spouse is a non-secretor, then evidence of the genetic constitution (presumptive heterozygote) of the propositus with regard to secretion may be obtained from a study of the secretor status of the offspring. Thus the incidence of non-secretors amongst the children would be approximately 50% if the hypothesis were true and approximately 33% if false, since heterozygous secretors in the normal population are about twice as common as homozygous secretors (see Appendix I). Alternatively, the recognition of a few such families with eight or more children, all of whom were secretors, would go far to disprove the hypothesis.

If, as is postulated, all cases of rheumatic fever carry the non-secretor gene *se*, then compared with a normal population there will be an increased number of carriers of *se* in the parents and sibs of such cases. This increased frequency should be a measure of the increased liability, on purely hereditary grounds, of the parents and sibs to develop rheumatic fever.

The increased frequency of *se* carriers expected has been calculated (see Appendix II) to be 1.13/1 in the parents and 1.16/1 in the sibs of rheumatic fever patients.

The observed frequencies of rheumatic fever compared with a normal population are: parents 1.44/1, sibs 1.64/1. These figures are based on Taplow records. Similar ratios calculated from the literature vary from 4 (Read *et al.*, 1938) to 30 (Uchidà, 1953).

There are several possible explanations for the excess incidence of rheumatic fever found as compared with that expected, the most likely being that the excess is due to patients and their families both being exposed to environmental conditions favourable to the development of rheumatic fever. Indeed, it has been argued that environmental factors could account for the whole of the supposed familial tendencies of rheumatic fever (Griffith *et al.*, 1948).

Secondly, there may be a further hereditary mechanism so far undiscovered. In view of the complicated interaction of secretor and Lewis genes already known, the possibility of further modifying genes cannot be excluded.

From the calculations in Appendix II the increased incidence of rheumatic fever expected in the parents of

patients with this disease would, on this hypothesis, be only some 13% and in the sibs some 16%. In view of the undoubted importance of environmental factors such small genetic factors would be almost entirely obscured except in impracticably large series. Failure, therefore, to establish a significant role for genetic factors in any ordinary series of cases in no way invalidates the present hypothesis.

Although it has been postulated that rheumatic fever is related to the presence of the non-secretor gene, one would not expect a parallel variation in different populations. The incidence of rheumatic fever varies enormously with local factors, particularly with those affecting the spread of streptococci. For instance, 38% of North American Negroes are non-secretors (Mourant, 1954), the gene frequency of *se* being 0.62, but the incidence of rheumatic fever is variously reported as equal to or higher or lower than that in the white population (Friedberg, 1950). Non-secretors are extremely rare among North American Indians, forming only 1.5% of the Navajos (Boyd and Boyd, 1949). Even fewer have been reported in other tribes: 0/79 in the Utes (Matson and Piper, 1947) and 1/210 in the Blood Indians (Chown and Lewis, 1953). Even so, this means that in the Navajos, for example, the gene frequency of *se* is 12%, and that 22% of the population carry the *se* gene in double or single dose.

Moreover, a study of hospital admission rates (Navajos) (Salsbury, 1937), comparative mortality rates (Navajos) (Smith, 1957), and rejections (all tribes) on cardiovascular grounds by selective service boards (McGibony, 1942) suggests that rheumatic heart disease may be less common among Indians than among the rest of the U.S. population. However, in Indians, as in others, environment is the overriding factor, and Paul and Dixon (1937), in a survey of Indian schoolchildren in three different areas, give the incidence of rheumatic heart disease as 4.5% in the north (Crows, Shoshones, and Arapahoes), 1.9% in the middle (Navajos), and 0.5% in the south (Pimas and Papagos). The 4.5%, which is unusually high for any population, is explained by the long Montana winters coupled with a degree of overcrowding not usually reached even in the slums of New York. (Three generations per room is usual.)

Finally, it is very dangerous to compare two groups so different in genetic make-up and in environment as Southern English schoolchildren and North American Indians. What would be most useful would be to know the genotypes of individual Indians with undoubted rheumatic fever.

APPENDIX I

If the above hypothesis be true, then all the secretor rheumatic fever subjects are of genotype *Sese*, and if these were mated with non-secretor individuals of genotype *sese* the incidence of non-secretors amongst the offspring would be 50%.

If the hypothesis be false, then there is no reason to expect that the ratio of heterozygote to homozygote secretors in rheumatic fever would differ from that in the normal population—that is, approximately 2 to 1. In those families in which the propositus is homozygous (*SeSe*) and the spouse *sese* all the offspring would be secretors. In those families in which the propositus is heterozygous (*Sese*) and the spouse *sese* 50% of the offspring would be secretors and 50% non-secretors. Since this second type of family would be approximately twice as common as the former, the incidence of non-secretor children in a randomly chosen group of such families would be 33%.

APPENDIX II

Calculation of the Frequency of Carriers of *se* in the Families of Rheumatic Fever Patients

Phenotypes	*Genotypes*	*Genotype frequency* (based on Slough figures)	
Sec.	*SeSe*	0·2722	0·7712
	Sese	0·4990	
Non-sec.	*sese*	0·2287	

PARENTS

In a normal population there are three possible types of mating:

Phenotypes	*Frequencies*		
1. Sec. × sec.	$(0·7712)^2$	= 0·595	1·001
2. Sec. × non-sec.	$2(0·7712 \times 0·2287)$	= 0·354	
3. Non-sec. × non-sec. ..	$(0·2287)^2$	= 0·052	

1. The sec. × sec. matings are of three kinds:

Genotypes	*Frequencies*		
a. *SeSe* × *SeSe*	$(0·2722)^2$	= 0·074	0·595
b. *SeSe* × *Sese*	$2(0·2722 \times 0·4990)$	= 0·272	
c. *Sese* × *Sese*	$(0·4990)^2$	= 0·249	

Type a can never produce children carrying *se*, and therefore, *ex hypothesi*, will not occur among the parents of rheumatic fever patients. Type b:—Only half of the children of this type of mating will carry *se*, so that in the parents of a large population selected for *se*—for example, rheumatic fever patients—one would expect only half the normal frequency of this type of mating=0.136. Type c:—Three-quarters of the children will carry *se*, and, similarly, one expects the frequency of this type of mating to be 3/4 (0.249)=0.187.

2. The secretor × non-secretor type of mating is of two kinds:

Genotypes	*Frequencies*		
d. *SeSe* × *sese* ..	$2(0·2722 \times 0·2287)$	= 0·125	0·354
e. *Sese* × *sese*	$2(0·4990 \times 0·2287)$	= 0·229	

All the children of both types will carry *se*, so that the expected frequencies of these matings are unchanged.

3. The non-secretor × non-secretor mating is of one type only, and all the children will be non-secretors. This mating also will have an unchanged frequency.

Mating Type	Frequency in Normal Population	Expected Frequency in Normal Population of Matings Genetically Capable of Yielding Offspring with *se*	Expected Frequency in Parents of R.F. Population
a. *SeSe* × *SeSe* ..	0·074	0·0	0
b. *SeSe* × *Sese* ..	0·272	0·136	0·187
c. *Sese* × *Sese* ..	0·249	0·187	0·257
d. *SeSe* × *sese* ..	0·125	0·125	0·171
e. *Sese* × *sese* ..	0·229	0·229	0·314
f. *sese* × *sese* ..	0·052	0·052	0·071
	1·001	0·729	1·000

For mating types c, e, and f, both parents carry *se*, so that the frequency of *se* carriers=frequency of mating type. In types b and d, only one parent carries *se*, so that the frequency of *se* carriers=half frequency of mating type. Hence frequency of *se* carriers in parent population=sum of mating frequencies c, e, and f + ½(b + d)/a+b+c+d+e +f=0.598/0.729=0.82.

In a normal population there are 0.728 *se* carriers, so that the relative increase in parents of rheumatic fever patients is 0.82/0.728=1.13.

SIBS

Mating Type	Frequency in Parents of R.F. Patients	Proportion of Children Carrying *se*	Expected Frequency of Children Carrying *se*
a. *SeSe* × *SeSe* ..	0	0	0
b. *SeSe* × *Sese* ..	0·187	0·5	0·093
c. *Sese* × *Sese* ..	0·257	0·75	0·192
d. *SeSe* × *sese* ..	0·171	1	0·171
e. *Sese* × *sese* ..	0·314	1	0·314
f. *sese* × *sese* ..	0·071	1	0·071

∴ increased frequency of *se* carriers compared with a normal population is 0·841/0·728=1·16. This assumes that all types of mating have the same average family size.

Summary

The presence of the ABH and Le^a blood-group substances in the saliva of healthy schoolchildren and of cases of rheumatic fever has been studied. By the ulex test 22.9% of 669 healthy schoolchildren were non-secretors; the comparable figure for 553 rheumatic fever cases was 28.9%. Positive results with a precipitation test on the saliva with a rabbit anti-Le^a serum were obtained in 21.2% of 1,129 healthy schoolchildren and in 27.5% of 611 cases of rheumatic fever. These two differences, significant at the 2% and 1% level respectively, would be expected if rheumatic fever could develop only in those individuals who are homozygous or heterozygous for the non-secretor gene. On the basis of this hypothesis we have shown that the incidence of rheumatic fever in the parents and sibs of patients with this disease should not, on hereditary grounds, be more than 13 and 16% greater respectively than in the general population.

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The *Manual of Nutrition*, first published in 1945, was originally the work of Dr. Magnus Pyke, who was at that time a member of the Scientific Adviser's Division of the Ministry of Food. Since 1945 the rapid advance in nutritional knowledge has necessitated considerable revision of the text and tables, and the present edition, the fifth, has been prepared by present members of the Scientific Adviser's Division (Food) of the Ministry of Agriculture, Fisheries and Food in consultation with Dr. W. T. C. Berry of the Ministry of Health.

It differs substantially from the previous edition; Part I has been considerably amended to take into account the prevailing climate of opinion on the fundamental aspects of nutrition; the section on digestion in Part III has been rearranged so that the subject can be more easily explained; an expanded section has been included in Part IV on the effect of cooking on foods and nutrients, because the information is not readily available from textbooks in general use. . . . The *Manual* was originally designed to meet the needs of the caterer—for use in teaching the principles of nutrition to people already possessed of practical knowledge of cooking and catering; but its range of usefulness has been extended to teachers of domestic science and their students and pupils, and to all who are in any way concerned with public health. It has been found valuable by many of these, and by others who realize that an understanding of the scientific basis of good feeding should be part of the everyday knowledge of an educated community (*Manual of Nutrition*, H.M.S.O., 3s. net).

ANTERIOR TIBIAL SYNDROME DUE TO ARTERIAL EMBOLISM AND THROMBOSIS

ISCHAEMIC NECROSIS OF THE ANTERIOR CRURAL MUSCLES

BY

BERNARD J. FREEDMAN, M.B., M.R.C.P.
Consultant Physician, Dulwich Hospital, London,

AND

C. H. R. KNOWLES, M.D.
Consultant Pathologist, St. Richard's Hospital, Chichester

The anterior tibial syndrome comprises the following clinical features. There is sudden onset of severe pain in the muscles of the anterior tibial compartment. They become swollen, hard, acutely tender to pressure and to stretching, and paralysed, with resultant foot-drop. The tibialis anterior always undergoes ischaemic necrosis; the extensor hallucis longus and extensor digitorum longus usually do so. After some hours a reddish-purple discoloration, bearing some resemblance to a bruise, appears in the skin overlying the muscle bellies. The peronei, which lie outside the compartment, are not affected. Pulsation in the dorsalis pedis artery ceases for a few days or longer. A neuropathy, evidently ischaemic, of the anterior tibial nerve causes paralysis of the extensor digitorum brevis and cutaneous anaesthesia of the first interdigital cleft. During the ensuing 7 to 21 days pain and tenderness in the affected muscles subside. Movement may return to those muscle fibres in which paralysis is due to neuropathy, and to those necrotic fibres in which regeneration takes place. Paralysis may persist indefinitely; the muscles then remain indurated and undergo fibrous replacement. Histologically the affected muscle shows the changes of ischaemic necrosis (Griffiths, 1940). Much of the necrotic muscle is ingested by macrophages and undergoes replacement fibrosis.

Cases fall into three categories:

1. *Unaccustomed exertion involving the anterior tibial muscle group.*—The onset occurs a few hours later. Sixteen cases, all in healthy young men, have hitherto been reported in detail: Vogt (1943); Sirbu *et al.* (1944), one case with bilateral involvement; Horn (1945), two cases; Tillotson and Coventry (1950); and Freedman (1954)—all after marching; Phalen (1948), one case after a half-mile walk; Pearson *et al.* (1948), one case with bilateral involvement after long-jumping on a hard surface; Hughes (1948), two cases after playing football; and Carter *et al.* (1949), six cases after football and one case after marching.

2. *Local exogenous mechanical factors causing a rise in intracompartmental pressure.*—Sirbu *et al.* (1944) describe the occurrence of the syndrome after repair of a small muscle hernia. Carter *et al.* (1949) describe two cases apparently due to blood from a transfusion tracking extravenously into the compartment.

3. *Embolic or thrombotic occlusion of the anterior tibial artery or parent trunk.*—Hughes (1948) describes a case occurring in a young man with polyarteritis nodosa, and Watson (1955) two cases, the first (embolic) occurring in a woman aged 51, with mitral stenosis,