house, this would suggest that in the smaller type of house girls are more liable to infection than boys, while the reverse is the case in the larger houses.

TABLE V.—Size of House and Sex Incidence in Children

	No. of Rooms		I	II	III	IV	Over IV
			Percentage	Percentage	Percentage	Percentage	Percentage
boys	number of		7.8	53.3	20.1	8.0	10.8
girls	number of		8.5	57.2	18.0	7.8	8.5

VARIATION OF INCIDENCE WITH SEX AND AGE

TABLE VI.—Sex and Age Incidence

Ages		0 to 11 months	1 year to 1 yr. 11 mos.	2 years to 2 yrs. 11 mos.	3 years to 3 yrs. 11 mos.	4 years to 4 yrs. 11 mos.	5 years to 5 yrs. 11 mos.	6 years to 6 yrs. 11 mos.	7 years to 7 yrs. 11 mos.	8 years to 8 yrs. 11 mos.	9 years to 9 yrs. 11 mos.	10 years to 10 yrs. 11 mos.	11 years to 11 yrs. 11 mos.	12 years to 12 yrs. 11 mos.	13 years to 13 yrs. 11 mos.	14 yrs. and over	Totals
M.	8	38	72	110	130	145	129	117	83	69	83	44	46	39	186	1,303	
F.	17	40	67	114	139	157	163	138	119	111	86	63	64	59	284	1,621	

With the exception of the age group 2 years to 2 years 11 months, there is seen to be an excess of female cases throughout. This shows a true increase in susceptibility, because in the general population of this area there is an excess of males over females at all ages under 20, and also in the general population above that. The fact that a larger proportion of girls than boys come from houses with few apartments, and that the age incidence is earlier in these houses, would suggest that the age incidence in girls should be earlier than in boys. Such is not the case, however, as is seen from Table VI, where 56.6 per cent. of the boys are under 7 years, and only 52.1 per cent. of the girls. Also, in the case of boys the age of maximum incidence is in the fifth year, whereas in girls it is in the sixth year. The excess of female cases and the maximum age incidence at 5 to 6 years are the commonly accepted findings.

SUMMARY

1. The periodicity of scarlet fever in this area appears to be one of about five years.
2. Adults have an annual variation in incidence separate from that of children, and following that of children at about one year's interval.
3. While the maximum seasonal incidence in children is in October, with a smaller increase in January and February, the maximum in adults is in December and January, with a following increase in March.
4. The fewer the number of apartments in the house the higher the incidence of fever among children, but the lower among adults.
5. The smaller the house the earlier the average age of infection among children. This does not appear to be due to overcrowding *per se*.
6. Females are more liable to infection with scarlet fever than males, but girls are not affected until a later age than boys, though a larger proportion of their cases come from small apartment houses.
7. The maximum age of incidence for boys is 5 years, and for girls 6 years.

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THE AETIOLOGY OF HEART DISEASE

BY

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An analysis of the cases of organic heart disease seen by the late Dr. Carey Coombs in the wards of the Bristol General Hospital during the years 1918 to 1929 showed that acute rheumatism was the aetiological factor in over 55 per cent. Further, a three-year survey of the incidence of acute rheumatic heart disease in Bristol and the surrounding counties¹ provided strong evidence that the incidence of this disease was very much higher in the city than in the counties. For these reasons it appeared desirable to Dr. Coombs that an attempt should be made to assess the part played by rheumatism in the causation of heart disease in other parts of Great Britain. The trustees of the R. L. St. J. Harmsworth Fund interested themselves in this investigation, and by their help it has been possible to obtain the figures of the cardiac cases admitted to various hospitals of Great Britain for the year 1932. Information has been received from the following: Royal Infirmary, Aberdeen; Royal Victoria Hospital, Belfast; General Hospital, Birmingham; General Hospital, Bristol; Royal Infirmary, Bristol; Royal Infirmary, Cardiff; Western Infirmary, Glasgow; National Hospital for Diseases of the Heart, London; Royal Infirmary, Liverpool; Middlesex Hospital; Royal Victoria Infirmary, Newcastle; Norfolk and Norwich Hospital, Norwich; and Royal Hospital, Sheffield.

The classification adopted was as follows:

1. Congenital heart disease.
2. Rheumatic heart disease. In this group were included not only cases of heart disease with a history of rheumatism, chorea, tonsillitis, or scarlet fever, but also cases without any such history, yet conforming in type to the rheumatic pattern—namely, cases of (a) ventricular enlargement with mitral incompetence under the age of 40; (b) mitral stenosis with or without incompetence; (c) aortic incompetence with or without stenosis under the age of 30; and (d) acute fibrinous pericarditis. The inclusion of such cases in this group was, of course, conditional on the absence of any alternative aetiology.
3. Ulcerative endocarditis. In this group were placed all cases of infective lesions of the endocardium not already included under rheumatic or syphilitic; thus it included all cases of acute, subacute, and chronic bacterial endocarditis, endocarditis lenta, etc.
4. Cardiac syphilis. This group comprised cases of aortic incompetence, aneurysm, aortitis, and angina with a history of syphilis, positive Wassermann reaction, or the presence of signs of other syphilitic lesions such as tabes dorsalis.
5. Thyrotoxic heart disease. In this group were placed all cases with physical signs or symptoms of heart disease with evidence of past or present thyrotoxicosis.
6. Hyperpiesis. Systolic blood pressures of 200 mm. Hg and over, even if only reported on one occasion, qualified for admission to this group, whether the patient also exhibited signs of arterial degeneration or not.
7. Senile cardiosclerosis. This term covered all cases of arteriosclerotic or "senile" heart disease, even though the "senility" was premature. The word "decreased" was considered, but rejected for various reasons. This group, of course, included the majority of cases of coronary thrombosis.
8. Functional. All cases of heart disease with no ascertainable organic basis were placed in this group, which included such diseases as "D.A.H.," paroxysmal tachycardia without organic lesion, sino-auricular block, etc.

9. Various. This group comprised cases with a definite organic change yet of a kind which did not fit in with the other groups. Such conditions as auricular fibrillation, congestive failure and heart-block with no ascertainable aetiology, heart failure secondary to chronic pulmonary disease, diphtheritic myocarditis, and terminal pericarditis were included.

The results of the investigation are given in the table. It must be borne in mind that these figures deal only with patients of the hospital class in Great Britain, and further that, with the exception of those from Liverpool, they refer only to patients admitted to hospital.

might be expected in the case of a not very common disease. The average incidence for the whole group is 2.3 per cent. of all heart cases. If it is assumed that in a general hospital one in five of the medical admissions is suffering from some form of heart disease (a fair average), this incidence approximates closely to Horder's estimate³—that bacterial endocarditis is found once in every 200 medical admissions. It is interesting to note that the hospital with the highest incidence of rheumatic heart disease (Cardiff Royal Infirmary) also showed the highest percentage of cases of ulcerative endocarditis; but the correlation between the two diseases holds no further than this.

	Aberdeen	Percentage	Belfast	Percentage	Birmingham	Percentage	Bristol General Hospital	Percentage	Bristol Royal Infirmary	Percentage	Cardiff	Percentage	Glasgow	Percentage	Heart Hospital	Percentage	Middlesex Hospital	Percentage	Newcastle	Percentage	Norwich	Percentage	Sheffield	Percentage	Liverpool	Percentage	Total for All Centres ¹	Percentage
Congenital	0	0	0	0	8	3.4	2	0.9	2	1.9	3	6.8	1	0.2	2	0.6	1	0.5	3	1.2	2	1.7	1	0.8	6	3.5	31	1.1
Rheumatic heart disease ...	47	39.2	100	28.2	72	30.6	86	42.5	45	42.8	22	0.0	195	43.5	160	47.6	33	16.5	95	40.9	41	36.1	53	41.1	71	41.6	1,020	38.4
Ulcerative endocarditis ...	1	0.8	9	2.5	6	2.5	8	3.9	6	5.6	3	6.8	3	0.6	7	2.0	3	1.5	8	3.4	2	1.7	4	3.3	2	1.1	62	2.3
Syphilitic	15	12.5	26	7.6	20	8.5	10	4.9	6	5.6	5	11.3	40	8.8	21	6.3	3	1.5	27	11.6	3	2.5	5	4.1	3	1.75	184	6.5
Thyrotoxic	7	5.8	54	15.2	14	5.9	32	15.8	15	14.2	1	2.2	23	6.2	16	4.7	68	34.0	6	2.5	32	27.6	12	10.0	2	1.1	287	10.7
Hyperpietis	13	10.8	43	12.1	35	14.8	18	8.9	7	6.6	2	4.5	58	12.9	38	11.3	64	32.0	8	3.4	12	10.3	35	29.2	10	5.9	343	12.7
Senile cardiosclerosis ...	31	25.8	108	30.5	52	22.1	31	15.3	14	13.2	4	9.1	101	22.4	42	12.5	8	4.0	71	31.0	5	4.2	8	6.6	37	22.0	512	19.1
Functional	4	3.8	3	0.8	17	7.2	5	2.4	4	3.8	2	4.5	6	1.3	22	6.5	2	1.0	6	2.5	4	3.4	—	—	29	17.2	104	3.8
Various	2	1.6	11	3.1	11	4.6	10	4.9	6	5.7	2	4.5	16	3.5	28	8.3	18	9.0	8	3.4	15	12.8	2	1.6	8	4.7	137	5.1
Total number of cases ...	120		354		235		202		105		44		448		336		200		232		116		120		168		2,680	
Hyperpietis and senile cardiosclerosis	44	36.6	151	42.6	87	36.9	49	24.4	21	19.8	6	13.6	159	35.3	80	23.8	72	36.0	79	34.4	17	14.5	43	35.8	47	27.9	855	31.8

CONSIDERATION OF THE VARIOUS AETIOLOGICAL GROUPS

Congenital.—The figures in this group undoubtedly give no true indication as to the incidence of congenital cardiac defects. In the first place, many of the patients with severe malformations die in early infancy, and admission to hospital is rarely considered. In the second, many of the cases of less severe forms of congenital heart disease—for example, patent ductus arteriosus—present few or no symptoms, and in the absence of any engrafted infection or intercurrent disease would not need in-patient hospital treatment.

Rheumatic Heart Disease.—This was responsible for over 35 per cent. of the cardiac cases admitted to ten of the thirteen hospitals concerned. The maximum incidence recorded was 50 per cent. of the total heart cases at Cardiff Royal Infirmary, and the minimum—16.5 per cent.—at the Middlesex Hospital. This latter figure is rather surprising and difficult to explain, since the corresponding figure for the National Hospital for Diseases of the Heart, London, was 47.6 per cent.—one of the highest in the series. It may be related in some way to the very high incidence of thyrotoxic and hyperpietic heart disease at the Middlesex Hospital, due to the fact that special investigations were being made on these two types of heart disease. Another factor which may influence the figures is that very few heart cases are admitted to the children's wards, and Dr. Keele suggests that this may be in part due to the proximity of the Middlesex Hospital to the children's hospital in Great Ormond Street. The large part played by rheumatism in the causation of heart disease is shown forcibly by the fact that 38.4 per cent. of the cases in the whole series fell into this category. It is noteworthy also that the incidence of rheumatism at the different centres varied less than any other single aetiological group, with the exception of the Middlesex Hospital, which has already been discussed.

Ulcerative Endocarditis.—The figures for this disease vary quite considerably (from 0.6 to 5.6 per cent.), as

Cardiovascular Syphilis.—The variations in the incidence of this type of heart disease found at the various centres are most surprising and difficult to explain. It would appear likely that the incidence of syphilis must be roughly the same in all large cities, and yet we find the incidence of heart lesions varying from 1.75 per cent. of all heart cases in Liverpool to 12.6 per cent. in Aberdeen.

Thyrotoxic Heart Disease.—From the well-recognized influence of geographical conditions on diseases of the thyroid gland, the large variations in the incidence of heart disease from this cause might have been expected. However, there appears to be no very close geographical relation between the places with a high incidence or between those where the incidence is low. Part of the wide variation may be due to the fact that in some hospitals such cases are admitted to medical wards and in others to surgical ones.

Hyperpietic Heart Disease and Senile Cardiosclerosis.—There are wide variations in both of these groups. It is possible, however, that there may have been some confusion in the sorting of these two types of heart disease. If the two groups be added together there is much less variation in the incidence of the combined groups, although even then the figures by no means show an even incidence.

Functional Heart Disease.—The incidence of functional heart disease was high at Liverpool, where such cases formed rather a high percentage of the whole (17.2 per cent.). This is almost certainly due to the fact that the figures from all the other centres dealt only with hospital in-patients, whereas for Liverpool all patients attending Professor John Hay's clinic were included.

It might be argued that the marked variations noted in the different types of the disease merely served to show that such a study as this was worthless and the information gained unreliable. However, against this must be set the figures obtained from the two Bristol hospitals, where the cases are seen and diagnosed by two

quite distinct groups of physicians; these show a very marked parallelism.

The most obvious fact that emerges from this study is the strikingly constant and high incidence of rheumatic heart disease among hospital patients. It thus serves to show, if any further evidence is needed, the urgent necessity for further study into the aetiology of acute rheumatism and into methods for its prevention and relief. In view of the variations in the incidence of other types of heart disease, which are evident in this investigation, it would appear very desirable that such inquiries should be continued at different centres throughout Great Britain along similar lines for a longer period of time, so that it may be ascertained whether such variations are constant, and what local features are responsible for them.

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B. PYOCYANEUS MENINGITIS WITH RECOVERY

BY

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The following case of *B. pyocyaneus* infection appears to be of sufficient general interest to warrant its publication, partly because it points a moral, and partly because the precise pathogenic status of *B. pyocyaneus* for the human adult is still somewhat doubtful. *B. pyocyaneus* has long been recognized as a secondary invading microbe in wounds and sinuses in man, but many authorities consider that it can only fill the role of a primary invader in infections of children and debilitated adults. Wilson¹ states, however, that the bacillus can produce in adults a generalized infection resembling typhoid fever, and that in the course of such an infection the bacillus may attack the meninges. He mentions that cases have been recorded of *B. pyocyaneus* meningitis resulting from the injection of contaminated cocaine solutions for anaesthetic purposes.

CASE REPORT

The patient, a married woman aged 34, was originally admitted to the surgical wards of the Queen's Hospital, Birmingham, under observation for presumptive attacks of gall-stone colic. This condition, however, bears no relation,

and she vomited several times. Her temperature, which was normal on admission, rose precipitately to 100° F., and her pulse rate increased from 65 to 80.

There is a hiatus in the clinical record for the next fifteen days, but apparently she returned home, where she was confined to her bed and was attended by her own doctor. She was admitted to the medical wards of the Queen's Hospital on September 6th, 1933, and on the following day the examination of a sample of her cerebro-spinal fluid established the bacteriological diagnosis. The fluid was frankly purulent, and contained large numbers of a small, extracellular, actively motile Gram-negative bacillus, which proved to be *B. pyocyaneus* on cultural investigation. Between September 7th and October 10th seven samples of cerebro-spinal fluid were examined bacteriologically and biochemically, and the laboratory findings on these fluids are tabulated below.

On admission the patient presented the picture of a subacute meningitis. She was febrile (102° F.), with a slow pulse (60), and was vomiting at frequent intervals; she had a severe left-sided headache, with a tendency to localization in the occipital region, a coarse nystagmus to the right, and a considerable degree of neck rigidity. Kernig's sign, however, was negative, and her fundi were clear. The clinical condition fluctuated considerably during the succeeding four weeks. On some days she had little or no headache, and the meningeal symptoms were inconspicuous; at other times she was prostrated by an intolerable headache, and the meningeal symptoms were obvious. For example, when she was examined by Dr. Neale on September 16th he was unable to detect

Date	Bacteriological			Biochemical				
	Cytology	Coagulum Formation	Presence of <i>B. pyocyaneus</i>	Sugar mg. %	Chlorides mg. %	Total Protein mg. %	Globulin	Colloidal Gold Curve
			M = microscopical C = cultural					
7.9.33	Frank pus. Exclusive polymorphonuclear reaction	Massive	M. +++ C. +++	21	668	175	Excessive	Luetic
8.9.33	1,230 cells per c.mm. Exclusively polymorphonuclear	Heavy	M. ++ C. +++	11	653	300	"	Meningitic
9.9.33	4,670 cells per c.mm. Chiefly polymorphonuclear	Heavy	M. + C. ++	32	674	150	"	Luetic
12.9.33	Purulent. Blood also present ...	—	M. 0 C. 0	Specimen not examined				
18.9.33	Purulent.* Polymorphonuclear cells predominate	Heavy	M. 0 C. 0	16	670	250	Excessive	Luetic
4.10.33	1,600 cells per c.mm. Polymorphonuclears = 70 per cent.	Present	M. 0 C. 0	27	655	200	"	Meningitic
10.10.33	1,070 cells per c.mm. Polymorphonuclears = 71 per cent.	Present	M. 0 C. 0	33	676	220	"	Luetic

other than an accidental one, to the meningeal infection; she had no symptoms or signs of meningitis at this time. Shortly after her admission to hospital, as part of the general surgical examination of her complaint an injection of 10 c.cm. of percaïne was given intrathecally, prior to a pelvic examination being carried out per vaginam. On the following day the patient complained of a very severe, generalized headache,

any appreciable abnormality in her condition, but two days later she had a severe recrudescence of headache and vomiting, and exhibited the signs of an acute meningitis. This recrudescence persisted, with slight fluctuations, until October 4th, from which date a rapid improvement set in, which progressed to a complete recovery without any further interruptions. The fluctuations in the clinical condition could