Their experiments have been repeated, but no differences between the control and treated animals, as described by these authors, could be demonstrated.

This work was done during the tenure of a Medical Research Fellowship of the American College of Physicians.

I wish to express my thanks to the Medical Research Council for allowing me the privilege of carrying out these experiments in the laboratory of Sir Henry Dale.

REFERENCES

- Neuburger, F., and Scholl, R. (1937a). *Arch. exp. Path. Pharmac.*, **186**, 492.
 — (1937b). *Ibid.*, **188**, 64.

GLASGOW EXPERIENCE OF INCREASED DYSENTERY PREVALENCE

BY

E. BLOCH, M.A., M.B., Ch.B., D.P.H.

Public Health Department, Glasgow

During the past three years the annual number of dysentery cases registered in Glasgow has been increasing and has become relatively high. During the second half of 1937, too, the city, with 203 cases, shared in the reported country-wide increase in prevalence. I attempt here a brief review of some aspects of the prevalence of dysentery during these years and on previous occasions of raised incidence.

Annual Incidence

Dysentery became notifiable in 1919, when 117 cases were registered. During the nine years thereafter the annual number of notifications was small, often being less than twenty. In more recent years the number has been increasing, and has exceeded a hundred again on five occasions—namely, 1929, 119; 1932, 136; 1935, 135; 1936, 239; 1937, 272. The annual average over the whole period 1919-37 was 81.4.

OTHER DIARRHOEAL DISEASES

There has not been any apparent regular association between increased prevalence of dysentery and that of other diarrhoeal diseases. It is true that in 1919 and 1932 an increased number of deaths from diarrhoea were registered, that in 1935 enteric and paratyphoid fevers were more prevalent than usual, and that 1936 was a high year both for paratyphoid cases and for deaths from diarrhoea. On the other hand, deaths from diarrhoea were more numerous than usual in 1920, 1921, and 1926; also, the incidence of enteric fever was relatively high in 1920, and that of paratyphoid B fever in 1927, 1930, and 1933.

Seasonal Incidence

Reports from various sources regarding the seasonal incidence of dysentery differ widely. The years under special review here might be regarded as revealing some resemblance between the seasonal incidence of dysentery and that of the other diarrhoeal diseases. Deaths from diarrhoea and enteritis are highest in either the third or the fourth quarter of the year. Enteric infections are most frequent in the third quarter. Paratyphoid infections are less regular in this respect than typhoid; and, indeed, a large outbreak of paratyphoid B comprising 159 cases in Glasgow and forty-one other cases in neighbour-

ing county areas occurred in the spring of 1936. The total seasonal incidence of dysentery during the past three years was as follows:

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Home Infections ..	41	65	136	106	348
Institutional Infections..	116	13	59	110	298
Total	157	78	195	216	646

If it is held that the true seasonal tendency of the disease is obscured in the figures with respect to institutional cases by reason of special opportunities for spread, then dysenteric infections would appear to be most frequent in the third quarter, as suggested by the figures regarding cases infected at home. From the following list it will also be noted that of fifteen outbreaks of dysentery the numbers commencing in each quarter of the year were respectively 4, 0, 8, and 3. Of twelve institutional outbreaks included in the list the quarterly distribution of the onset was 4, 0, 5, and 3.

Outbreaks

The outbreaks recorded up to the end of 1936 and those now falling to be recorded for 1937 were as follows:

Date	Outbreak
1928: Aug.-Sept. ..	7 fatal institutional cases among infants. 2 positive Sonne. Reported by Hay (1930)
1929: Aug.-Nov. ..	51 cases and carriers in group of overcrowded tenements. 35 positive Flexner, including 9 symptomless persons. No common source detected. 93 other cases of enteritis investigated
1930	5 of 10 institutional cases positive Sonne
1933: January ..	Small Flexner Z institutional outbreak
Aug.-Sept. ..	Small Sonne institutional outbreak affecting children
August ..	7 children positive Sonne of 12 cases which sickened 1-3 days after consumption of suspected ice-cream
1934: March-April ..	5 of 13 institutional cases positive Sonne
1936: January only ..	60 positive Flexner (X or Z) of 104 cases in large Poor Law institution, including 20 positive food workers. Total inmates, excluding staff, 1,343. 23 patients sickened in first 5 days after eating suspected meat pies on January 1; then 29, 27, and 24 in successive weeks. 10 aged patients died
September ..	9 positive Sonne cases associated with ice-cream—2 in family of vendor and 7 cases sickening 1 to 2 days after consumption
Sept.-Nov. ..	13 positive Sonne and 2 Flexner in children's institution
1937: Jan.-March.	23 young children and 2 nurses notified from large general hospital; Sonne and Flexner W, X, and Z. Again:
Aug.-Sept. ..	23 young children and 2 adults notified from this institution, Sonne and Flexner W, X, and Y. Total cases notified in 1937 from this institution, 60, mainly Flexner; several of the foci untraced
September ..	9 men notified as cases of Flexner dysentery from ward in large general hospital, which later housed the big outbreak described below
Oct. 21-Nov. 4	Fever hospital staff outbreak affecting one doctor and 34 nurses, with 14 positive Sonne. Cases sickening on successive days—1, 2, 2, 2, 3, 5, 5, 3, 4, 1, 2, 1, 0, 2. Possibly due to fresh fruit eaten October 20. Controlled by removing cases from nurses' home to special ward
Nov.-Jan., 1938	5 positive Sonne of 11 cases among staff and female patients in large mental institution. First case, missed, inmate of old standing. Good isolation accommodation. Notifications in 1938 figures
Nov.-Jan., 1938	94 cases and 12 carriers in large general institution with 86 positive, of whom 78 were positive Sonne. Described below. 42 cases included in 1937 figures. 386 other persons investigated, including 114 with loose motions. Total persons examined, 492

True Incidence of Dysentery

The above list sheds light on some factors in the frequently discussed disparity between the notified cases of dysentery and its true incidence. Of 121 positive findings in two outbreaks twenty-one were made regarding persons free from symptoms; and of 349 persons comprised in nine outbreaks only 219 yielded positive specimens. It therefore seems probable that despite the increased attention recently paid to dysentery many mild and many bacteriologically negative cases remain unnotified. Moreover, suspicion of dysentery may not be raised when cases do not occur in groups; and it is also known that investigation and notification are withheld in some cases that do incur suspicion. Other considerations tend to limit the extent of disparity between true and apparent prevalence. In connexion with two outbreaks regarded as comprising 157 persons, 207 contacts with loose motions were investigated with negative result. Also, in connexion with one outbreak regarded as comprising 106 persons, 386 contacts were examined with negative result.

Food-borne Infection

It will be noted that food has been incriminated or suspected as the vehicle of infection in respect of both types of bacillus and both in institutional and in non-institutional environments. Besides the two listed Glasgow outbreaks of Sonne dysentery attributed to ice-cream, a small county Flexner outbreak traced to ice-cream was investigated in the city laboratory in 1931. In 1926, too, a county outbreak of eighty cases of Sonne dysentery associated with a milk supply had been investigated in the city laboratory, as reported by Wiseman (1927) in the first record of the appearance of Sonne dysentery in epidemic form in the West of Scotland.

Institutional Infections

Institutional infections form a substantial and increasing proportion of the total number of cases, as will be seen from the following list:

Year	Institutional Infections	Home Infections	Total Cases Registered
1935	42	93	135
1936	111	128	239
1937	145	127	272

It will also be noted that the excess of total cases for 1937 over 1936 is accounted for by institutional cases.

Periods of high institutional incidence are of course not necessarily periods of high domestic incidence, because any one institutional focus may become enlarged owing to the special conditions existing in institutions. For example, in January, 1936, sixty-eight cases from institutions were registered, but only eight home cases were notified. Sometimes domestic registrations have been high without an associated increase in institutional cases. For instance, in the three years 1935-7 the following numbers of home and institutional cases were registered in September, the month with the highest total of home cases over that three-year period: 25 and 5, 28 and 6, and 23 and 16 respectively. In December, 1937, however, when the prevalence in other parts of the country was also notably high, there was a simultaneous notable rise in the number of home infections, which totalled twenty-eight, and of institutional infections, which totalled forty-four. On the whole some relation does probably exist between the

two classes of cases. The third quarter was the one giving the highest figures for domestic registrations during the past triennium, and also for the onset of various outbreaks recorded over several years. It is indeed reasonable to assume that infection will be more often introduced into institutions when its prevalence in the general community increases.

Institutional cases appear to fall into two categories. In one a definite cause can be recognized—for example, contamination of food or secondary spread from a previous case. In the other are those institutional patients who sicken sporadically in the manner of cases ordinarily arising in non-institutional communities; and more than one type of endemic dysentery organism may thus participate in the prevalence. In respect of the relative frequency of institutional cases in this category dysentery differs from the enteric infections, institutional outbreaks of which usually are traceable to a definite source—a difference doubtless due to the greater general severity of enteric infections and to the longer duration of the ensuing carrier state.

Sex Incidence

The gross figures for all cases of dysentery without subdivision according to type of bacillus revealed no special feature with regard to sex incidence. For the years 1935-7 the sex distribution of the registered cases was as follows:

	Males	Females
Home Infections	187	161
Institutional Infections	140	158
Total	327	319

Age Incidence

The figures with respect to the age of incidence of both institutional and non-institutional cases confirmed the recognized high incidence of dysentery under the age of 15 and especially between the ages of 1 and 15. True dysentery does occur under 1 year of age, but with relative infrequency. Although a large proportion of cases of summer diarrhoea in America appear to be due to dysentery, Blacklock, Guthrie, and Macpherson (1937), working in Glasgow, state that in common with other British investigators they have rarely isolated dysentery bacilli in cases of infantile diarrhoea, apart from cases of frank dysenteric ileocolitis. The total figures for the years 1935-7 were as follows:

Age:	-1	-5	-15	-55	55+	Total
Home Infections	6	85	86	139	32	348
Institutional Infections	17	94	18	71	98	298
Total	23	179	104	210	130	646

Thus 306 cases occurred below the age of 15 and 340 cases above; home cases under 15 years of age actually outnumbered those aged over 15.

Fatality

Deaths certified as due to dysentery remain few. The age distribution of the sixteen persons who died in 1936 and of the nine who died in 1937 of dysentery was as follows:

Age:	-1	-5	-15	-55	55+	Total
Cases	14	132	76	169	120	511
Deaths	3	4	1	2	15	25

The disease therefore appears to be more serious among infants and among the elderly. The number of deaths during 1935 was five. Thus, during the three years of increased prevalence there were thirty deaths among 646 cases. During the years 1927-34 there had been thirty-two deaths among 619 registered cases: the case mortality rate has therefore not risen with the incidence. Dysentery, of course, also plays a part in deaths not included in such figures—that is, when it forms a terminal event in cases where death is certified as primarily due to pre-existing illness.

Organisms

A majority of the cases of bacillary dysentery are probably still due to the Flexner type of organism. The presence of Sonne dysentery in Glasgow was first recorded in 1928, when the outbreak reported by Hay and a few other isolated cases occurred. During the years 1929-36 positive specimens from Glasgow, according to the city bacteriologist, have numbered 413 Flexner and 278 Sonne. Positive Sonne specimens have exceeded positive Flexner specimens in the central city laboratory only in 1930, 1933, and 1936; and in 1936 a large institutional outbreak with sixty positive Flexner cases was investigated in a hospital laboratory. It is also of interest to note that, in 1936, of fifty positive specimens submitted from a town near Glasgow thirty were Sonne and twenty Flexner. Carter (1937) reported the results of his examination of eighty-eight Flexner strains isolated from Glasgow cases during 1936 and 1937. The staff of Dr. F. E. Reynolds, Stobhill Hospital, also recently examined ninety-five Flexner strains derived from the hospital. The results were as follows:

	V	W	X	Y	Z	WX	XYZ	Total
Carter	—	16	8	3	60	1	—	88
Reynolds	—	28	23	29	14	—	1	95

Although one type of organism usually predominates in any group, it is not uncommon to find different types and strains of these endemic dysentery organisms associated in a multiple focus. Examples of this association are included in the list of outbreaks given above. In 1934, too, four persons in a family were found positive for Flexner and two others positive for Sonne. In the autumn of 1932 four positive findings of paratyphoid B and three of Sonne dysentery had been made regarding seven persons living in an insanitary tenement. Also, in the large Sonne epidemic described below, a man unusually ill with positive Sonne dysentery was found to be a chronic urinary carrier of *B. typhosus*.

A Large Outbreak of Sonne Dysentery

The first large Glasgow outbreak of Sonne dysentery occurred in a big general municipal institution towards the end of November, 1937, and continued till the end of January, 1938. It therefore appeared at a time of exceptionally high country-wide prevalence of dysentery. In December forty-two cases were registered from this focus and only two from other Glasgow institutions. Home infections numbering twenty-eight were also registered in Glasgow in December. The seventy-two December cases thus constituted over a quarter of the year's 272 cases. Although the possible sources of introduction of dysentery into the institution were therefore more numerous than usual, it is to be remarked that of the ten Glasgow home infections registered in November and of the twenty-eight registered in December only one and four respec-

tively occurred in the city division containing the institution. Moreover, apart from a few households whence patients were admitted suffering from frank dysentery, no infections were reported from the homes of infected patients, a large proportion of whose visitors would be derived from these homes. Also, no dysentery cases were registered from the homes of the infected staff members.

The epidemic assumed the form of two successive waves of infection. The following number of acute cases, all positive for Sonne except one positive for unspecified dysentery, sickened in successive weeks from November 20: 1937, 2, 20, 5, 4, 0, 9; 1938, 15, 6, 1, 1, 2, 0; making a total of 65 positive acute cases of Sonne and unspecified dysentery. Other positive findings were:

Cases admitted with dysentery: Sonne 6, Flexner 1.

Acute institutional infections: Flexner 1, Flexner W 1.

Symptomless temporary carriers: Sonne 8, Flexner 1, Flexner X 2, unspecified 1.

Total positive findings: 86, including 78 Sonne.

Acute cases numbered sixty-seven as detailed. Only twenty other persons were regarded as clinical cases yet gave negative specimens. These were not notified, but they would raise the total of infected persons to 106. The detection of so large a proportion of positive cases was doubtless due to the facilities for relatively prompt bacteriological examination. Negative specimens were also obtained from 114 persons with loose motions or incontinence and from 272 persons free from suspicious symptoms. Six of the positive cases ended fatally during December and January. These persons were all elderly, and suffered, moreover, from pre-existing illnesses.

The patient admitted with Flexner dysentery and two patients admitted with Sonne dysentery produced no secondary cases. Of the six patients admitted to the hospital wards suffering from Sonne dysentery four were associated with only six other cases that could be regarded as possibly attributable to the admissions, even when among the secondary cases is included one sickening two and a half hours after the admission of a dysenteric patient to an adjacent bed in an otherwise uninfected ward. In one of these groups the interval between the removal of one secondary case and the sickening of another was eight days.

Since many of the cases were clinically extremely mild it is not surprising that eight persons were classified as symptomless Sonne carriers. None of the carriers could reasonably be regarded as chronic; and indeed it is generally accepted that symptomless chronic carriers of bacillary dysentery are rare. Five of nine staff members found positive were symptomless. Neither the carriers detected among the staff nor those detected among the patients were so situated as to account for all the otherwise untraced foci of infection in the outbreak. The acute infections among the staff occurred after the outbreak had begun.

There was no definite evidence of spread of infection by food, milk, or water, but it was thought important that the milk supplies should be scalded in the wards and attention devoted to the methods of cleansing food utensils, especially milk containers, passing through the central kitchen and dairy premises. It will be noted that no incidence of Sonne dysentery was detected in these departments, all the members of the staff of which were examined bacteriologically.

The most noteworthy feature of this outbreak was the apparently sporadic way in which some of the affected individuals sickened within the institutional community. The first cases in the institution were female inmates of old standing in the chronic sick block. The disease sub-

sequently appeared in other non-admitting blocks of the institution. Similarly, acute infection reappeared in wards which had been free from dysentery cases for two to four weeks and in which the presence of carriers had not meanwhile been demonstrable. The following list gives some details of incidence in all sections of the institution.

Female chronic sick wards:

9 of 17 wards affected between November 20 and January 27. Inmates 192. Positive findings: 41, including 1 nurse.

Male chronic sick wards:

6 of 18 wards affected between December 3 and January 29. 183 inmates. Positive findings: 13, including 1 nurse and 1 maid.

Male mental observation wards:

90 inmates. 3 positive acute cases on December 3.

Male mental wards:

159 inmates. 4 positive acute cases, January 6-11.

Female mental wards:

222 inmates. 3 positive acute cases, January 3, 3, and 31.

Female mental observation ward:

27 inmates. No cases.

Hospital wards:

8 of 19 wards affected from December 12 to January 16. Total inmates, 523. Positive findings: 17, including 1 doctor, 7 admissions, and 6 possibly secondary cases.

Staff:

Total 643, of whom 233 lived in and 410 lived out. 5 positive findings—namely, 3 nurses (not employed in any infected ward), a kitchenmaid (Flexner X carrier), and a food porter to chronic sick block (Flexner carrier). 2 nurses, 1 maid, and 1 doctor are mentioned above. Of the 5 nurses infected 3 were symptomless Sonne carriers, so that 5 of the 9 staff members found positive were symptomless.

Total population of institution	1,629	} 2,039
Non-resident staff	410	
Persons examined bacteriologically, including those found positive	492	
Positive findings	86	

Summary

Dysentery registrations in Glasgow between 1919 and 1934 averaged 56.3 annually. Between 1935 and 1937 the annual total of institutional infections rose from 42 to 145 and the annual total of cases averaged 215.3. Some epidemiological aspects of these 646 registrations have been noted. Previous occasions of increased prevalence and sixteen outbreaks, including thirteen in institutions, recorded since the introduction of compulsory notification in 1919 have been adduced. Glasgow, with 203 cases, including seventy-two in December, shared in the widespread increased prevalence during the second half of 1937, and towards the end of that period experienced the onset of its first large outbreak of Sonne dysentery. Some details have been given of the incidence of the eighty-six positive findings (seventy-eight Sonne, including eight not associated with symptoms) made during this institutional outbreak. In the absence of case-to-case connexion between several foci within the outbreak it was considered important to devote attention to the methods of cleansing the ward food utensils handled by the uninfected staff of the central kitchen and dairy.

I am indebted to Dr. A. S. M. Macgregor for the suggestion to compile these notes, also for criticism and permission to publish.

BIBLIOGRAPHY

- Annual Medical and Sanitary Reports, Glasgow* (1919-36). Sections on Dysentery, reports of City Bacteriologist, etc.
Blacklock, J. W. S., Guthrie, K. J., and Macpherson, I. (1937). *J. Path. Bact.*, **44**, 321.
Carter, H. S. (1937). *Ibid.*, **45**, 447.
Hay, H. R. (1930). *J. Hyg., Camb.*, **30**, 25.
Wiseman, W. R. (1927). *Lancet*, **1**, 817.

CARCINOMA OF THE PALATE

HOW OFTEN DOES IT MASK MALIGNANT DISEASE IN THE MAXILLARY ANTRUM?

BY

JOHN R. NUTTALL, M.D., D.M.R.

National Radium Officer, Manchester Centre; Assistant Medical Officer, Christie Hospital and Holt Radium Institute

In the 1936-7 Statistical Report of the National Radium Commission the relatively low proportion of patients with carcinoma of the palate who have remained free from recurrence after treatment is commented upon. The report states that "the low proportion of patients with carcinoma of the palate who have remained free from recurrence is unexpected in view of the fact that the survival rate for this group approximates closely to that for the alveolus and that this group shows the highest proportion of patients free from glandular metastases when treatment was started. The figures given suggest that there is a tendency for tumours of the palate to spread further than can be easily recognized by clinical means, with the result that the tumour is often inadequately irradiated and thus tends to recur with greater frequency than tumours of the other sites." This particular problem was noticed some years ago at the Holt Radium Institute, and led to investigation with a view to finding, and remedying, the cause. Although at the time of the original investigation certain definite information was obtained, it was felt that the available cases were too few to justify publication of the inferences from their observation.

At the present time analysis of 167 cases of malignant palatal ulceration, and of 104 cases of antral carcinoma passing through a single clinic, is possible, and, in view of the comments in the Radium Commission Report, it would appear expedient that the conclusions to be drawn from that analysis should be placed on record. As a result of the investigation I suggest, and this article purports to demonstrate, that the tendency to recurrence after treatment of carcinoma of the palate is due to the fact that a large proportion of "palate growths" are really neoplasms of the antrum. It will be shown that, with certain limitations which will be discussed in their appropriate place, it is a wise generalization that every case of carcinoma of the palate must be considered and treated as an antral growth unless it has been proved not to be so. This generalization corresponds with those which nearly every medical student finds helpful with regard to malignant disease of the stomach, uterus, and rectum.

Material for Study

The material upon which this analysis is based is a group of 167 cases of palatal neoplasm and 104 cases of malignancy involving the maxillary antrum, partly included in the 167. Only those cases in which the palate was the site of major involvement have been considered. The patients were referred in part by general practitioners and in part by the surgical consultants on the out-patient staffs of the general hospitals in the area served by the Institute. In fairness it should be stated that failure to recognize the antral involvement of many of the palate tumours was not restricted to the former of these two groups.

The term "malignant disease involving the maxillary antrum" has been chosen to avoid any implication that it is considered that all, or even the majority, of the