gave an inverted curve. The figures were 87, 75, 73, 73,* and 64 mg. per 100 c.cm. Five units of insulin given to the fasting patient resulted in the following figures at half-hourly intervals: 71, 53, 51, 56, and 62 mg. per 100 c.cm. A glucose tolerance test repeated on two subsequent occasions again gave inverted curves, but on removing blood every five minutes for half an hour an early peak reaching 123 mg. per 100 c.cm. was obtained. A rapid fall to below the fasting level then occurred within the thirty minutes.

The glycogen reserves in the liver appeared to be satisfactory, as 7 minims of adrenaline to the fasting patient gave the following curve, blood being removed at half-hourly intervals: 76, 102, 94, 92, and 85 mg. per 100 c.cm. On one occasion, before lunch, the blood sugar was found to be 42 mg. per 100 c.cm. The patient felt weak and experienced hunger pains, but there were no definite symptoms. On several other occasions when the blood was tested the level varied from 57 to 97 mg. per 100 c.cm.

Discussion

The general appearance, emaciation, low basal metabolic rate, amenorrhoea, low blood pressure, slow pulse, abnormal carbohydrate metabolism, and increased sensitivity to insulin in the first case justified the diagnosis of Simmond's disease with a resulting hypofunction of the adrenals, thyroid, and gonads. The hypoglycaemic tendency follows naturally from a relative overaction of insulin due to a lack of antagonism from the adrenals, thyroid, and pituitary. The hysterical attacks were shown to be due to a state of hypoglycaemia, and a typical attack was produced when the blood sugar was lowered by giving insulin.

In the second case the patient was predisposed to hypoglycaemia because of the abnormal excretion of sugar resulting from the low renal threshold. It is probable that the diabetes treated thirty years ago was in fact a renal diabetes, and that only within the last year or two had a tendency to hyperglycaemia been added. There can be no doubt as to the presence now in this patient of a condition of diabetes mellitus, but any use of insulin must be controlled by the sugar level of the blood and not of the urine. A diabetic whose blood sugar has for some time been at a high level may show hypoglycaemic symptoms when this level is reduced to what would normally be an ordinary figure. This, together with the continued presence of sugar in the urine, led to the attacks being considered functional rather than hypoglycaemic. Probably two factors contributed to the state of hypoglycaemia in this case—the excessive loss of sugar resulting from the low renal threshold, and also the excessive use of insulin.

The third case is more difficult to understand, as no apparent cause can be found to explain the tendency to hypoglycaemia, and physically the patient appeared to be in good condition. Gammon and Tenery⁸ describe a state of alimentary hypoglycaemia in which the fall in blood sugar, after the ingestion of food, has been sufficiently marked to cause slight symptoms of hypoglycaemia. In this case there appears to be an excessive insulin response to the ingestion of glucose, and in the absence of endocrine, hepatic, or renal abnormality one must consider the possibility of a simple hyperplasia of the islets of Langerhans. It is highly probable that several attacks, originally due to hypoglycaemia, especially if they occur outside, will predispose to future attacks of anxiety. The patient came to dread going outside alone, fearing the occurrence of his extreme weakness. As already remarked, the initial hypoglycaemic symptoms are largely sympathetic in nature, and the distinction between such a condition and an anxiety state is very difficult to make.

In the second case the patient was on a strict diabetic diet, while in the first and third the patients, who were under observation for a prolonged period, were on the ordinary hospital diet.

The blood sugars were measured by the Hagedorn-Jensen method.

Summary

Three cases of hypoglycaemia are presented, and the aetiology is distinct in each case. The difficulty of distinguishing between such cases and functional nervous disorders which they may closely resemble is discussed.

I wish to thank Professor D. K. Henderson, medical superintendent, Royal Edinburgh Hospital for Mental and Nervous Disorders, for permission to publish these cases, and also Dr. Henry Tod, biochemist to the Royal Edinburgh Hospital for Mental and Nervous Disorders, for the help he has given me in investigating their biochemistry.

REFERENCES

- ¹ Harris, S.: *International Clinics*, 1932, Forty-second Series, i, 9.
- ² Hoxie and Lisherness: *Hypoglycaemia*, p. 220.
- ³ Finney, J. M. T., and Finney, J. M. T., jun.: *Ann. of Surg.*, 1928, lxxviii, 584.
- ⁴ Cammidge, P. J.: *British Medical Journal*, 1930, i, 818.
- ⁵ Wauchope, G. M.: *Quart. Journ. Med.*, 1933, xxvi, 117.
- ⁶ Roth: *Med. Klinik*, 1930, p. 1777.
- ⁷ Cannon, W. B.: *Amer. Journ. Physiol.*, 1924, lxix, 46.
- ⁸ Gammon, G. D., and Tenery, W. C.: *Arch. Int. Med.*, 1931, xlvii, 829.

THE INCIDENCE OF ERYSIPELAS

BY

JOHN RIDDELL, M.D., D.P.H.

ASSISTANT MEDICAL OFFICER FOR STIRLINGSHIRE

In the literature of erysipelas there are many varied statements concerning the aetiology. While agreeing that the causal organism is a streptococcus, writers on the subject differ widely in their other views. Whether it is a specific organism or merely a variant of the streptococcus of scarlet or puerperal fever remains undecided.

The factors increasing susceptibility to infection are very vaguely stated. Beyond the necessity for a lesion of the epithelium most writers refuse to commit themselves, and take refuge in various possibilities such as alcoholism, poverty, overcrowding, and unhealthy conditions of life. That age plays an important part all are agreed, but very often wide limits are given. That sex plays an equally important part is also agreed, but apparently sex incidence varies from place to place. The season of maximum incidence is another moot point. Lord Horder¹ favours the spring, but in Ker's textbook *Infectious Diseases* the autumn is definitely stated. Similarly with other factors.

The subject, therefore, is well worthy of further investigation, and this article, which deals with the 686 cases of erysipelas notified in the landward area of Stirlingshire between July 1st, 1919, and June 30th, 1934, inclusive, is written in the belief that it is only by the pooling of many such local researches that a true knowledge of the disease may be gained.

Annual Incidence

In view of the close relation with the streptococcus of scarlet fever, it might be expected that the annual variation of erysipelas would show some relation with that of scarlet fever. Table I gives the number of cases of erysipelas and of scarlet fever in the yearly periods from July to the following June.

The only possible connexion which might be deduced is that there is an increased incidence of erysipelas in the year following a scarlet fever epidemic—an occurrence that might be expected theoretically as the result of the increased number of virulent streptococcal carriers present in the community during this period. The figures show no periodic increase and decrease in the incidence of erysipelas such as is found with scarlet fever. That the disease is practically stationary as regards total incidence is shown by the fact that in the three quinquennial periods the total number of cases is respectively 233, 229, and 224.

TABLE I

Year	1919-20	1920-1	1921-2	1922-3	1923-4	1924-5	1925-6	1926-7	1927-8	1928-9	1929-30	1930-1	1931-2	1932-3	1933-4	Totals
Erysipelas ...	42	44	51	46	43	44	44	50	38	53	42	40	34	58	50	686
Scarlet fever ...	354	561	190	149	207	331	449	429	217	260	252	190	419	479	1,020	5,553

Seasonal Incidence

Seasonal incidence of erysipelas is given in Table II, where the maximum incidence is shown to be in October, November, December, and January. This is especially so in the case of males, among whom there is also a markedly increased incidence in April.

TABLE II

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Totals
Male ...	13	13	16	19	34	38	23	20	20	31	21	16	279
Female ...	19	31	35	42	41	43	39	35	37	30	33	16	407
Total ..	32	44	51	61	75	81	62	55	57	61	54	32	686

This maximum in the latter part of the year agrees with the findings of Rundle.² Several American workers, such as Erdman,³ the Seegals,⁴ and Boston and Blackburn,⁵ have found the maximum incidence to occur in the first four months of the year, and it has been pointed out that the same contrast has been found in the incidence of rheumatic fever in Britain and the United States of America. The autumnal increase occurs with all ages.

Age Incidence

This is shown in Table III. The maximum incidence for both males and females occurs in the decennium 45 to 54, but there is also a slight increase, especially for males, in the period 30 to 34 years, and in the first year of life. Rundle gives the age of maximum occurrence as between 40 and 50 years. Boston and Blackburn, on the other hand, dealing with facial erysipelas, found the maximum incidence in the third decade.

TABLE III

Age	Under 1 month	2-11 months	1-4 yrs. 11 mos.	5-9 yrs. 11 mos.	10-14 yrs. 11 mos.	15-19 yrs. 11 mos.	20-24 yrs. 11 mos.	25-29 yrs. 11 mos.	30-34 yrs. 11 mos.	35-39 yrs. 11 mos.	40-44 yrs. 11 mos.	45-49 yrs. 11 mos.	50-54 yrs. 11 mos.	55-59 yrs. 11 mos.	60-64 yrs. 11 mos.	65-69 yrs. 11 mos.	70-74 yrs. 11 mos.	Others	Totals
Male ...	3	6	6	6	9	11	8	17	28	18	23	32	35	24	21	18	8	6	279
Female ...	1	6	7	8	15	27	23	30	34	31	33	52	50	30	18	16	17	9	407
Total ...	4	12	13	14	24	38	31	47	62	49	56	84	85	54	39	34	25	15	686

Sex Incidence

In the 686 cases, 407, or 59.3 per cent., are females. With 1,643 cases Rundle found 54.5 per cent. to be females, but he states that this apparent preponderance takes no account of erysipelas of the newborn, and is largely eradicated when the incidence is expressed as a rate on the population. While in the present investigation there is certainly an increased proportion of males under 1 year affected, the number of these early cases is not sufficient seriously to affect the sex relationship on the whole, and, when the proportions are expressed in terms of the population, the primary result is fortified because the population of the county of Stirling shows an excess of males over females. Again, in contrast, in America only 43 per cent. of cases were found to be among females.

Variation of Incidence with Size of House and Overcrowding

It has been frequently said that erysipelas is a poverty disease and that the majority of cases come from the lowest social class. Russell,⁶ referring to London and Glasgow, says "overcrowding and all that it connotes is closely correlated with the amount of erysipelas." In this inquiry, size of house and degree of overcrowding were noted. Table IV gives the absolute and percentage numbers of cases, together with the percentage of the general population living in each type of house.

TABLE IV

	One Apartment		Two Apartments		Three Apartments		Four Apartments		Over four Apartments	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cases * ...	47	7.0	312	46.4	181	26.9	52	7.7	81	12.0
General population		6.1		44.4		22.8		10.0		16.7

* 13 cases occurred in hospitals or institutions.

While there is a slight excess of cases from the houses with the smaller number of apartments, the greatest excess is in the three-apartment dwelling. Thus poverty would not appear to be a vital factor, as until the recent subsidized rehousing of slum dwellers the number of apartments in the house has been a good indication of the inhabitants' social or financial level.

In Table V is shown the number of persons per apartment (children under 14 years of age being reckoned as half units) in the case of the households in which the infection occurred, and of the general population.

TABLE V

	One Apartment	Two Apartments	Three Apartments	Four Apartments	Over four Apartments
Cases ...	2.8	2.2	1.6	1.3	1.0
General population	3.3	2.3	1.6	1.2	—

It is at once evident that the cases did not arise in the houses in which overcrowding was most severe, and that this cannot explain the greater proportional incidence in the smaller houses.

Summary

1. Present knowledge concerning the aetiology of erysipelas is very vague.

2. In this investigation it would appear that: (a) Erysipelas shows no epidemiological features closely allied to scarlet fever. (b) Maximum seasonal incidence occurs in the months of October to January, inclusive. (c) The majority of cases occur in persons between the ages of 45 and 54 years, but there is also an increased incidence among children in their first year of life. (d) In the first year of life males are more susceptible than females; thereafter females show a definite preponderance, almost 60 per cent. of all cases being of this sex. (e) Poverty, as judged by size of house occupied, plays very little, if any, part. (f) Overcrowding is not a cause of increased incidence.

3. It is only by pooling many investigations such as the foregoing that further knowledge of the disease may be gained.

REFERENCES

- 1 Horder: *Price's Textbook of the Practice of Medicine*, fourth edition, 1933.
- 2 Rundle, C.: *Ker's Infectious Diseases*, third edition, 1929.
- 3 Erdman, S.: *Journ. Amer. Med. Assoc.*, 1913, lxi, 2048.
- 4 Seegal, D., and Seegal, B. C.: *Ibid.*, 1929, xciii, No. 6.
- 5 Boston, L. N., and Blackburn, A. E.: *Ibid.*, 1907, xlix, 1520.
- 6 Russell, W. T.: *Journ. of Hyg.*, 1933, xxxiii, 421.