

the present century, largely as a result of the physiological investigations of the American school, and the pioneer work of Fortescue Fox in England. The term "physiotherapy" includes: heat; general and local massage; exercises, active and passive; electrotherapy; the judicious use of rest; and actinotherapy.

**Heat.**—Heat applied to the body produces diaphoresis, rise in the pulse rate, an effect on the blood pressure, hyperpnoea, increase in basal metabolic rate and protein metabolism, increase in the relative alkalinity of the blood and body tissues, hyperaemia of the skin, "relaxation" in the muscular tissues, and a general sedative effect. These effects are more noticeable when heat is applied generally; they are also observed to a large extent when only local applications are used. It will be seen that heat may be harmful if applied in unselected cases. The commoner devices for applying heat systematically are the radiant heat cabinet, the hot-air chamber (dry heat), hot baths of various types, the vapour bath, and the mud bath (wet heat). Locally it may be applied by means of electric lamps (radiant heat), infra-red apparatus, the high-frequency current (diathermy), local hot-air baths, mud packs, and douches.

**Massage.**—Massage is used to increase the blood flow through the affected tissues, to open out the smaller capillary beds, to improve the general or local metabolism of skin or muscle, and to delay or prevent the atrophy of muscle which is so often present, either as a primary condition or as a secondary result of disease due to pain or stiffness. Massage should generally be preceded by general or local application of heat.

**Exercise.**—Active and passive movement should generally be preceded by massage, and, if the movement of the joint is limited by adhesions, great caution is needed, since inadvertent fracture of the neighbouring rarefied bone may then occur very easily. Carried out in the deep pool or reclining bath such movements are among the most important and most successful operations in hydrotherapy, the warmth allaying muscular spasm, and the weight of the water supporting the limb and protecting it from sudden movement, thus engendering confidence in the patient's mind. Most forms of electrotherapy, such as faradism and galvanism, may also be classed as methods of inducing passive muscular movement. The arthritic of moderate grade should be encouraged to follow any sport that is within his powers, otherwise he may become a chronic invalid and his joints may stiffen rapidly.

**Rest.**—Local rest for an acutely inflamed joint is provided by nature owing to the pain produced by movement. Systemic rest provides a more difficult problem. From a study of the "prodromal" symptoms of twenty-five patients at St. Mary's Hospital who ultimately developed arthritis, I found that in nineteen fatigue or lassitude was the major initial subjective symptom. This may be attributed either to the increased physical difficulty of "carrying on" under a slowly progressive disability, or to the patient's psychological strain as he visualizes the apparently inevitable approach of complete crippledom. Such a state of affairs suggests the need for great caution in applying exhausting remedies until the patient has accumulated some "reserve" to fall back on. Pemberton aptly parallels the progress of an athlete in "training" to the correct course to be followed in the treatment of these patients: Bromides appear to be useful during this stage of the disease.

**Actinotherapy.**—Ultra-violet light, in combination with other methods of treatment, may help to produce a satisfactory end-result. It is particularly useful to bed-ridden patients with a certain degree of anaemia and malnutrition, and in conjunction with massage is said to raise their blood count in a remarkable manner.

#### CONCLUSION.

It will be realized that the range of therapeutic agents in the rheumatic group of diseases is unusually extensive. It will, I hope, also be realized that the multiplicity of these agents does not in this case indicate failure to find a suitable remedy, since it appears to be more and more obvious that the intelligent combination of remedies is the keystone of success, the danger lying in the adoption of any one method of treatment, to the exclusion of the rest.

## EPIDEMIC CATARRHAL JAUNDICE.

AN OUTBREAK IN YORKSHIRE.

BY

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No apology is needed for an account of an outbreak of catarrhal jaundice in Wensleydale in the North Riding of Yorkshire when it is stated that more than 250 cases have occurred among a population of only 5,700, living in a part of the valley less than twenty miles long. This paper, it is believed, will help to show the definite spread from case to case rather than from some common source, will confirm the estimation of an incubation period arrived at by Dr. Booth,<sup>1</sup> and will describe unusual points in the clinical characteristics of the disease.

Wensleydale has apparently not been immune from epidemics of this nature in the past; an epidemic of a less serious character in 1910 is remembered. As a recently qualified assistant, jaundice in epidemic form, a zymotic disease unmentioned in my medical curriculum, caused me the greatest perplexity, but my principal assured me that epidemics had frequently occurred in his thirty years of practice. Soon after the date of this epidemic Cockayne's<sup>2</sup> article appeared, distinguishing the disease from the more serious Weil's disease, and suggesting the name "epidemic catarrhal jaundice."

Lately, an account of an epidemic of jaundice in the Midlands has been recorded in a Ministry of Health publication by Morgan and Brown,<sup>3</sup> who sought to establish its leptospiral origin, but without success. A more recent publication by W. G. Booth<sup>1</sup> in *Public Health*, of an epidemic in Surrey, resembles in many ways the one here recorded.

Wensleydale is a broad valley, watered by the River Yore; the altitude of the villages, hamlets, and isolated farms, where these cases were seen, ranges from 600 to 1,000 feet. The water supplies are exceptionally good for a country district, and are separate for each village, the water being neutral in reaction. The district is tolerably prosperous, and there is an absence of poverty with concomitant dirt and ill-feeding. In common with most of rural England, the rat is much in evidence, but there is little likelihood of contamination of foodstuffs, as the standard of domestic cleanliness is traditionally exceedingly high. There is constant communication between the villages, which are united by ties of relationship and friendship, and there is no difficulty in accounting for the spread of an infection, although to trace the actual conveyance of this disease from case to case between the villages has been found difficult.

#### History of the Epidemic.

The epidemic began in the neighbourhood of Wensley, a village in the lower part of the Dale, in October, 1928. The disease attacked 18 out of 56 children in the Wensley school. No cases appeared in any other of the villages until January 29th, 1929, on which date the disease developed in two boys attending the Askrigg school, ten miles distant from Wensley. Then followed a remarkable spread in this school, 32 out of 81 being affected, the last on July 15th. Bainbridge, the sister village to Askrigg, remained immune until April 16th. The spread of the disease in this village is so significant that it is recorded in full, with dates of commencement of the cases, which appear in monthly crops.

	Illness commenced.
Harold P., school child ... ..	April 16th
John T., " " " " " " " " " "	May 14th
Harry B., " " " " " " " " " "	May 16th
Frank P., " " " " " " " " " "	May 19th
Mary M., " " " " " " " " " "	May 22nd
Leonard P., aged 15 " " " " " " " " " "	May 19th
Jas. M., school child ... ..	June 13th
Jas. P., " " " " " " " " " "	June 17th
Walter B., " " " " " " " " " "	July 8th
May L., " " " " " " " " " "	July 24th

S. P., aged 32, who began with jaundice on August 24th, and who sold sweets in the village shop, probably at this point preserved the link.

The next recorded cases are: Hilda M., September 25th; Richard S. and Annie S., October 25th; Peter L., November 17th.

The last case is most helpful in arriving at the incubation period, as, having developed measles on October 18th, he was not at school after October 17th or in contact with any cases of jaundice—that is, for a period of thirty-one days. During this period cases developed in all the villages in the area.

As stated previously, the spread between the villages was found difficult to trace; the following, however, is a clear record of such. According to my list, only five cases developed between September 25th and 30th, and the sole factor in common was that the patients attended a village fête at Thornton Rust on August 28th. After a prolonged search it was found that Dorothy A., an Aysgarth girl, who developed the disease on August 23rd, was also present. She was in the house of one of the victims, and spent most of the afternoon with another, a girl of 16, who developed the disease on September 30th; this latter girl served in a shop in West Burton, four miles away, and was the first case in this village. Other cases developed there subsequently on October 27th, November 4th, and November 5th (two cases), contact being proved with this girl in each instance.

*Method of Infection.*

The following is typical of the spread of the infection, and occurred in a family of young adults and among their friends.

Name.	Illness Commenced.	Remarks.
Jane ... ..	August 16th, 1929	Infection not traced.
James } Sarah }	September 14th, 1929	
William ... ..	October 11th, 1929	
G. S. ... ..	October 12th, 1929	A great friend of the family, often in the house.
Ann ... ..	November 7th, 1929	
Jennie U. ... ..	November 6th, 1929	A little girl, inseparable from the family.
W. M. ... ..	December 4th, 1929	Fiancé of Ann.
D. U. ... ..	December 2nd, 1929	Two-year-old sister of Jennie U.
Jno. U. ... ..	December 29th, 1929	Father of U. children.

The intervals here are 29, 27, 28, 27, 26, 27, 26, and 27 days.

An epidemic caused by contamination of water or food by the leptospira or other organism would appear simultaneously over an area corresponding to the distribution of these. This epidemic presents entirely different features, which can be best explained by assuming personal transference, probably by droplet infection.

*Period of Incubation.*

In families it was noticed that cases either appeared simultaneously or at long intervals. In the "C" family, Tom and Vera commenced on March 17th and 19th respectively, their father on April 17th. In the "K" family, Jack commenced on June 17th; Arthur, attending a different school, in which there were no cases at the time, commenced on July 14th.

There were in all 39 instances of case to case spread, the intervals between which were as follows.

In 6 instances the interval was	26 days.
" 6 " " " "	" 27 "
" 4 " " " "	" 28 "
" 7 " " " "	" 29 "
" 5 " " " "	" 30 "
" 5 " " " "	" 31 "
" 2 " " " "	" 32 "
" 1 instance " " "	" 33 "
" 2 instances " " "	" 34 "
" 1 instance " " "	" 35 "

These figures suggest an incubation period varying from twenty-six to thirty-five days, thus confirming and slightly modifying Dr. Booth's conclusion that it was not less than twenty and not more than forty days.

*Period of Infectivity.*

The periodicity of the cases in families, of which a typical instance is quoted above, surely suggests that the infective period of any one case is short. If this was not so, it is unlikely that the monthly interval would have been preserved.

*Degree of Infectivity.*

Close contact appears to be necessary for the transmission of the disease. In the "K" family already mentioned the two boys slept together; a little sister (aged 4), the mother, and the father escaped infection. In another family two grown-up girls who slept together developed the disease on March 21st and April 19th respectively. No other members of the household, which is a large one, were affected.

*Age and Sex Incidence.*

Out of 118 cases attended personally, 40 were in patients above the school age, a proportion greater than in previously recorded epidemics. The ages of the patients were as follows:

Age.	Cases.
0-5 ... ..	7
6-10 ... ..	41
11-15 ... ..	33
16-20 ... ..	13
21-30 ... ..	13
31-40 ... ..	6
41 and upwards ... ..	5

The youngest patient was 2 years old, and the oldest 79. Thus it appears that it is a disease attacking all ages indiscriminately; it occurs mainly among school children simply because the school provides the opportunity of infection. Of the 118 patients, 62 were males and 56 females.

*Clinical Features of the Disease.*

Cockayne<sup>2</sup> suggested that most cases of catarrhal jaundice were sporadic instances of the disease he described, and the long incubation period renders this feasible. However, in this epidemic, abdominal pain was occasionally of a severity not usually associated with catarrhal jaundice. It occurred in the early stages of the disease, and, combined with vomiting and consequent collapse, gave a picture so like an acute surgical condition that the diagnosis was a matter of great difficulty. The following case illustrates this.

H. A., a farmer, aged 35, on April 17th, 1929, complained of indigestion. On April 21st he was slightly jaundiced, but said he felt better, and asked to be allowed to take a short walk. This concession was construed into a tramp of several miles, including a climb of 500 feet, to see his sheep. On April 22nd, at 7 a.m., an urgent message was received, to the effect that he had had severe abdominal pain for several hours, and had vomited once. He was found to be collapsed, with a feeble and rapid pulse; the face was blanched and pinched. There was tenderness in the epigastrium. The abdomen was full, but not rigid; liver dullness was present; the bowels had not been opened. His condition gradually improved, but he was watched anxiously for several hours, and a diagnosis of perforated duodenal ulcer was seriously considered.

This is not an isolated instance, and it would cause me no surprise to hear that abdomens have been opened in such cases on the assumption that perforation had taken place. What we always deplore—the distance of forty miles from hospital and surgeon—was for once in the patient's favour.

Another apparent difference is the infrequent enlargement of the liver; in only 16 out of the 118 cases was this made out, the edge of the organ being felt in 4. As in other respects the cases conformed to the usual conception of catarrhal jaundice it is not necessary to give the symptoms in great detail. There was a pre-icteric stage lasting from four to ten days, with loss of appetite, nausea, vomiting, abdominal pain, and pains in the back and limbs. The temperature was usually raised, 103° F. being the highest recorded. Jaundice, rarely deep, lasted usually for fourteen days, but occasionally for a longer period, and in the worst case for three months.

The disease was in marked contrast to Weil's disease, or spirochaetal jaundice. Haemorrhages were represented by epistaxis in three instances, and petechial rashes in two.

There were no marked nervous symptoms, although mild delirium occurred in some of the children during the pyrexia, and in one the disease commenced with a convulsion. There was no evidence of nephritis, as out of twenty-five urines examined two alone showed albumin, and then only as a trace.

The duration of the disease was most variable. In a few it was hardly an illness, and patients went about their work, the farmers even attending the markets. Several of the patients were in bed for three weeks and felt ill for two months. The usual period of invalidity in insured patients was three to four weeks. There was no fatal case.

The Ministry of Health was informed of the epidemic, and by the courtesy of Dr. W. A. Lethem, an officer of the Ministry, who came into the district on two occasions (and incidentally gave me the greatest help and encouragement), various examinations were made of nasopharyngeal swabs, the blood, and urine, but with negative results.

#### Summary.

The epidemic under observation was one of epidemic catarrhal jaundice.

The method of spread was respiratory.

The incubation period varied from twenty-six to thirty-five days, and the period of infectivity was probably short.

The condition was, on the whole, free from danger, and no fatal case occurred, but in some instances serious acute abdominal disease was simulated, and the invalidity in many was prolonged.

In conclusion, I wish to acknowledge the stimulus I received from Professor C. W. Vining to write this paper; I wish also to express my thanks to him for kindly criticism and suggestions, and to my partner, Dr. Dean Dunbar, who saw all the patients, and gave me the full benefit of his observations and great help in compiling the report.

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## TREATMENT OF PULMONARY TUBERCULOSIS ON THE LINES OF MINERAL DEFICIENCY.

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THE treatment of pulmonary tuberculosis on the assumption that mineral deficiency is a basic factor is no new thing. Various observers, chiefly in America, France, and India, have reported beneficial results from the use of iodine, and others, including observers in this country, have made similar claims for calcium. I have not been able to trace any reference to results obtained by a combination of these two minerals.

There seems to be little reason to doubt that mineral deficiency is a factor of the utmost importance in determining the resistance of the body to tuberculosis. Those periods which are known to be periods of mineral drain—for example, lactation (as pointed out by Orr at the British Association meeting at Southampton in 1925)—are definitely known to be periods of lowered resistance to tuberculosis. Investigations in Cumberland, carried out over a period of about five years, chiefly among school children, have demonstrated that iodine, and to a lesser extent calcium, are of great value as factors in the prevention and treatment of disease. Iodine proved to be particularly valuable in the case of pre-tuberculous children, and in due course, as the investigation was extended, the treatment of pulmonary tuberculosis by means of iodine came under consideration.

Three years ago I began to use intramuscular injections of iodine in sesame oil in advanced cases of pulmonary

tuberculosis, cases so advanced, in fact, that if the treatment did no good it could not very well do much harm. The results in general were a decided fall in temperature, a marked diminution in cough and sputum, a definite, though temporary, improvement in general health, and a gain in weight. One patient, a woman aged 25, was practically moribund at the commencement of the injections, having a temperature fluctuating between 104° and 96° F., with very extensive disease of both lungs. She responded immediately, and in six weeks her temperature was practically normal. Her improvement throughout has been steady, and although her sputum is still positive the area of active disease is steadily clearing up; she is up and about daily, able to go for walks, and to attend for examination in Carlisle (a distance of eight miles) without any ill effects. After some months calcium was introduced into her treatment, and the improvement has been quite definitely more marked than when she was treated with iodine alone. Encouraged by these results in advanced cases, variable and sometimes transient though they admittedly were, I decided early in 1929 to try the effect of calcium and iodine in four cases. Three were early cases with positive sputum, but with limited lesions in the lungs; the fourth was an advanced case with extensive lesions in both lungs, including cavitation in one of them. This patient was included at the request of one of my colleagues, and against my own judgement. Two of the cases were markedly febrile, two were afebrile.

#### Details of Treatment.

Two patients (Nos. 1 and 2) received weekly intramuscular injections of 0.5 c.cm. collosol calcium and 3 minims of tincture of iodine (without potassium iodide) in a dessertspoonful of cod-liver oil cream thrice daily throughout, and are still continuing with this treatment. Patient No. 3 received iodine in cod-liver oil cream as above, and calcium lactate (5 grains daily) by the mouth. Patient No. 4 has received iodine in cod-liver oil cream throughout and intramuscular calcium as above for the first six months. The cod-liver oil cream with iodine is prepared for me by Thomson of Elgin.

#### Results.

The results in all four cases have been remarkable; infinitely better, in fact, than one could possibly have expected.

*The Sputum Count.*—The most striking result in each case has been the diminution in the number of tubercle bacilli present in the sputum. The sputum counts have been conducted by the Clinical Research Association, and the results given are the average count of forty fields. Experts in tuberculosis have told me that the number of tubercle bacilli in the sputum is not a matter of prime importance; that may be true in a general way—I do not know—but it cannot possibly be when a sputum becomes negative.

The sputum counts in the four cases are shown in the accompanying table.

Average Number of Tubercle Bacilli per Microscopic Field.

Case No.	Before Treatment began.	After being under Treatment for :							Subsequent Reports.
		Two mths	Four mths	Five mths	Six mths	Eight mths	Nine mths	Ten mths	
1	11		1		1 in 40 fields		Negative		Two: negative.
2	3	3	4		1		Negative		One: 1 in 10 fields.
3	23	5		Negative					Not due.
4	11	7		3		5		1 in 3 fields	Not due.

It will be seen that three of the four cases became negative in nine months or less, while in the fourth case