year later the same patient was again given sedormid. On this occasion, however, it was not until a total of $11\frac{1}{2}$ tablets had been taken over a period of nine days that haemorrhagic phenomena associated with marked thrombopenia appeared. In most reported cases it seems that the test dose has been administered shortly after recovery from an attack of purpura, and this may account for a correspondingly high proportion of positive results.

In Case 1 the first test doses were not given until some 20 months had elapsed after sedormid had apparently last been taken. Case 4, which was a very mild case, showing bruising as the only symptom, was not given a test dose until eight months after the last dose of sedormid. It seems not beyond possibility that such intervals of time might have allowed an acquired sensitivity to sedormid to disappear completely.

If, then, we assume that sensitivity to sedormid by mouth can diminish considerably, or even disappear altogether with the passage of time, this reasoning may surely apply equally well to *in vitro* tests. Ackroyd (1949b) says, "Hypersensitivity, once it has been established, persists for an unknown, but often considerable, period," and refers to one of his cases in which hypersensitivity was found nine years after the original attack of purpura. It appears (Ackroyd, 1949d) that he was able to demonstrate *in vitro* sensitivity in his patients, at periods ranging from 28 months in his Case 3 and 50 months in his Case 1 to some 112 months in his Case 2. The interval in his Case 2 was probably less than this, for he mentions inducing an experimental attack of purpura after December, 1940, the last recorded time of an attack due to sedormid.

The usefulness of both *in vitro* tests and the giving of a test dose in confirming a provisional diagnosis of sedormid purpura depends, therefore, on the length of time that sensitivity persists after subsidence of the purpura. If this interval is relatively long, to be measured in months or years, then there is no need for undue haste in performing the tests. If, on the other hand, the sensitivity passes off in a matter of days, as it certainly appeared to do in Case 5 above, and probably in Case 6, then *in vitro* tests should preferably be carried out as soon as possible and at the height of the purpuric attack. In Case 5 the first estimation of plasma clot retraction was performed four days after the last dose of sedormid. Clot retraction in the control specimens was normal, but in the presence of sedormid it was reduced by 50%. Three days later the reduction had fallen to 13%, and two days after this there was no reduction. All subsequent tests were negative. Case 6 followed an essentially similar pattern, except that there was an apparent return of sensitivity one month after tests had become normal. These results indicate a steadily decreasing sensitivity over a period of a few days. After experience with these cases, I referred again to our Cases 1 and 2. In both of these a reduction of clot retraction in the presence of sedormid (using the method of Macfarlane) had occurred. As this reduction had been found only during the earlier stages of the purpura, and later vanished entirely, I had been inclined to discount the results. In view of the later findings in Cases 5 and 6, I now feel that perhaps the results in Cases 1 and 2 were valid after all.

I may mention here, in passing, that I have never had a positive sedormid response in clot-retraction estimations performed on patients with florid purpura due to other causes—for example, aplastic anaemia, leukaemia.

My findings, therefore, are somewhat at variance with those of Ackroyd. From his work it would appear that there need be no undue haste in the attempt to make a retrospective diagnosis of sedormid purpura, because of the long duration of sensitivity in his patients. From my work it seems that the sensitivity may be of relatively short duration. To avoid, therefore, the possibility of, as it were, "false negative" *in vitro* tests, I venture to suggest that such tests be carried out as soon as the provisional diagnosis of thrombocytopenic purpura due to idiosyncrasy to sedormid has been made.

Summary

The use of *in vitro* tests in the diagnosis of sedormid purpura is discussed.

Evidence is presented that sensitivity to sedormid, presumed to be due to a plasma factor in the blood of patients recovered from sedormid purpura, may be of short duration.

It is therefore suggested that *in vitro* tests be carried out on the patient as soon as the provisional diagnosis of sedormid purpura is made, and preferably at the height of the purpura.

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AN OUTBREAK OF TRICHINIASIS IN BARRY, GLAMORGAN

IMPROVED TECHNIQUE FOR DEMONSTRATION OF TRICHINELLA IN MUSCLE

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In May, 1952, an outbreak of trichiniasis occurred in the Borough of Barry, Glamorgan (population 41,000), in which at least 25 people were affected as a result of eating pork sausage-meat. We report this outbreak not only because of its size but also because the infected pigs came from a district which has been incriminated on six previous occasions, resulting in 47 human cases. Hitherto, trichinellae have not been demonstrated in pigs or rats in the district (Howell, 1941, 1942), but, arising out of the inquiries into the present outbreak, it was possible to demonstrate live trichinellae in rats and pigs from the suspected area. We do not propose to review the literature of trichiniasis in Britain, as this has been done recently by Young (1947).

The Outbreak

On May 3, 1952, two persons were seen by their doctors with symptoms suggestive of trichiniasis. Inquiries amongst the other practitioners in the area revealed a further 23 patients with a similar illness. All except one admitted eating sausage, sausage-meat, or Scotch eggs within three weeks of the onset of symptoms. The sausage and sausage-

meat were obtained from one or other of two pork butchers, and the Scotch eggs were prepared in a local café from sausage-meat obtained from one of the butchers. One patient had eaten raw sausage-meat.

Between March 28 and April 26 182 pigs were slaughtered at Barry abattoir and 31 carcasses were received from other areas. With the exception of three carcasses, graded as "manufacturing meat," all the pigs came from the town's usual source of supply, the Vale of Glamorgan. The three pigs which were used for the manufacture of sausage-meat came from West Pembrokeshire, and it was shown that on April 4 one of these carcasses had been divided between the two butchers whose sausage-meat was incriminated in the outbreak. Between March 29, when the pigs were slaughtered, and April 4 the pigs had been kept in storage at -6°C . The sausages were on sale between April 7 and 11 and possibly on the 15th and 16th. By the time the existence of the outbreak was realized it was not possible to obtain samples of the suspected meat.

Incubation Period.—In 17 of the patients it was possible to estimate the incubation period, which ranged from 11 to 27 days. In 14 (82%) the first symptoms came on between the 15th and 24th days.

TABLE I.—Age and Sex Distribution

Age	Male	Female	Total
0-9	—	—	—
10-19	1	—	1
20-29	—	1	1
30-39	4	12	16
40-49	1	4	5
50-59	1	—	1
60-69	—	1	1
Total	7	18	25

Age, Sex, and Income Level.—It was remarkable that 16 of the 25 patients were between 30 and 40 years of age and a further 5 between 40 and 50 (Table I). There did not appear to be any tendency to involve one social class.

Mortality.—There were no deaths, although at one time two patients were critically ill. A feature of the disease in Britain is that there is a low mortality as contrasted with case fatality rates of 16-30% in Germany and 3-10% in the United States. This may be due to the fact that pork is not eaten raw in this country, and thus the infecting dose is smaller.

Symptoms.—Table II shows the frequency of the main symptoms encountered. The typical history, described in early accounts, of gastro-enteritis followed by oedema and

TABLE II.—Frequency of Symptoms

Symptoms	No. of Cases	Percentage
Periorbital oedema	25	100
Muscle pains	24	96
Fever	11	44
Headache	10	40
Neck pain and stiffness	6	24
Diarrhoea	4	16
Abdominal pain	4	16
Vomiting	3	12
Oedema of limbs	2	8
Conjunctival haemorrhage	1	4

muscle pains was seen in only four patients, the most common presenting symptoms being periorbital oedema. This agrees with the findings in outbreaks described in recent years in this country and in the United States. The duration of symptoms was four to nine weeks, but 14 patients reviewed after 18 weeks still complained of some muscle pain and lassitude.

Laboratory Findings

Eosinophilia.—Differential counts were made in all the cases described (see Table III). In cases in which repeated counts were done the highest percentage of eosinophils

TABLE III.—Highest Eosinophil Count in 25 Patients

Percentage of Total White Cells	No. of Cases	Total Eosinophil Count per c mm.	No. of Cases
10-19	3	Under 500	0
20-29	6	500-1,000	1
30-39	5	1,000-2,500	3
40-49	5	2,500-4,000	5
50-59	4	4,000-5,500	6
60-69	1	5,500-7,000	6
70-79	1	7,000-8,500	2
		8,500-10,000	2

obtained was recorded. Of the 25 cases, 20 showed an eosinophilia of 10% or over within seven days of onset of the illness and the remaining five developed eosinophilia within a further week. These results substantiate the opinion that the most useful single test in the diagnosis of trichiniasis is the eosinophil count, done either as a differential or, preferably, as a total count. Although cases of trichiniasis have been reported without eosinophilia they are rare, and unless the parasites can be demonstrated in the tissues the diagnosis may be doubted. In none of the patients did examination of the centrifuged deposit of lysed venous blood show the presence of trichinellae.

Skin Tests.—It was possible to obtain enough trichinella antigen to test 12 of the patients selected at random. Of these, nine gave an immediate positive reaction, two a delayed positive reaction (after 24 hours), and one was negative. All tests were done four weeks after onset of symptoms. The one patient who was negative had the highest eosinophil count of all (76%).

Biopsy.—Two patients were admitted to hospital, and in both of these muscle biopsy showed the presence of *Trichinella spiralis* larvae.

Epidemiology

The infected meat was traced back to two pork butchers and through them to one of three sows from small farms in West Pembrokeshire. Both these farms were visited by one of us. It was found that all pig swill was boiled and that trimmings from locally killed pigs were not available as foodstuff. Since it appeared, therefore, that pigs did not become infected by eating uncooked pig tissue it was decided that rats killed on these farms should be examined. Unfortunately only four such rats were submitted, but it was possible, by using the modified technique described below, to show the presence of *T. spiralis* larvae in one of them.

At the same time we arranged to examine diaphragms from pigs from West Pembrokeshire and also from the area which usually supplies Barry—the Vale of Glamorgan. Of 288 diaphragms from West Pembrokeshire, 4 were shown to contain trichinella larvae, whereas none of the 262 from the Vale of Glamorgan were infected.

We believe this is the first time that either rats or pigs in West Pembrokeshire have been shown to harbour trichinellae, although pork from the area has been incriminated on many occasions on epidemiological grounds. It is hoped that in the near future it will be possible to examine large numbers of rats from various districts in order to determine the true incidence of rodent trichiniasis.

Method of Examination of Pigs' Diaphragms and Rats

The method recommended by Young (1947) was tried for the first specimens, but was found difficult because of the persistence in the deposit of a proportion of undigested muscle fibres. By using the modification described below it was found that the larvae showed very active motility when examined at 37°C . This motility, which is not a feature of the original technique, made the demonstration of trichinellae easier.

The porcine specimens were examined in batches of not more than 10. Approximately 5 g. of each specimen was taken and freed from any adhering fat and tendon. The specimens were then pooled and passed through a good-

quality domestic mincer, using the fine-cutting blade. Rats were skinned, the feet cut off, and minced without difficulty. The minced tissue was then placed in an artificial gastric juice consisting of 0.5% pepsin B.P. plus 0.5% HCl, between 10 and 12 ml. of fluid being used for each gramme of tissue. The mixture was incubated at 37° C. in a water bath for six hours and stirred every half-hour.

The partly digested tissue was poured through two copper sieves one above the other, the upper one being 44 mesh per inch (0.353 mm. aperture), the lower 120 mesh per inch (0.124 mm. aperture) B.S.S.410/1943. Both sieves were then washed with 1 litre of tap-water at 37° C. The coarse particles contained in the upper sieve were washed back with 500 ml. of the digesting fluid and were incubated for a further four hours at 37° C. The finer deposit from the lower sieve was washed back with 500 ml. of tap-water and kept at 4° C.

The material at this stage consisted of the *T. spiralis* larvae, if present in the original specimen, greatly obscured by fine muscle fibres.

It was found that a further digestion, using pancreatin, 0.2%, and NaOH, 0.2%, for two to three hours at 37° C., removed the remaining fibres completely, leaving nothing but trichinellae. The digest was passed through the finer sieve, washed back with water at 37° C. into a glass Petri dish, and examined under a plate microscope ($\times 40$). The active motility of the trichinellae made them easy to recognize.

The value of the modification is shown in the following experiment. Two rats were infected by feeding with tissue containing live trichinellae. They were killed after four weeks and all the muscles removed. The tissues were minced by passing through the mincer three times, after which the finely divided material was thoroughly mixed by stirring. Portions of 5 g. were taken, half being examined by the technique described by Young (1947) and half by the modification described above. Counting was facilitated by placing a sheet of paper with 1 cm. squares under the Petri dish. The results are shown in Table IV. The advantages of the modified technique were the increased numbers of trichinellae, their motility, and the absence of muscle fibres.

TABLE IV.—*Number of Trichinellae Found by Different Techniques*

Experiment No.	No. of Trichinellae/5 g. Tissue	
	Original Method	Modification
1	68	105
2	82	121
3	47	100
4	77	123
5	50	130
6	54	108
Total	378	687

The four specimens of diaphragm from pigs which were found positive gave the results shown in Table V.

The first 102 specimens of diaphragms from Pembrokeshire were examined histologically as well as by digestion, and in no instance were any trichinellae demonstrated, although one specimen (No. 87) was positive by the digestion

TABLE V.—*Number of Trichinellae Found by Different Techniques*

Specimen No.	No. of Trichinellae/5 g. Tissue	
	Original Method	Modification
87	4	9
108	17	25
131	27	51
173	3	10
Total	51	95

technique. Owing to the limited material available it was unfortunate that an accurate comparison between the histological and digestion methods could not be made.

The three rats infected experimentally were apparently quite healthy when killed four weeks later. This experience would appear to differ from that quoted by Howell (1941).

Summary

The clinical and laboratory findings in an outbreak of trichiniasis affecting 25 persons in an area hitherto free from infection are described. The vehicle was found to be pork sausage-meat manufactured from a pig imported from one of two farms in Pembrokeshire. Pembrokeshire has been incriminated in earlier outbreaks in Wales, but on this occasion, for the first time, live trichinellae were demonstrated in rats and pigs from the suspected farms.

The clinical findings did not follow classical textbook accounts, but were similar to those described in recent years. Periorbital oedema as a presenting symptom is stressed in this outbreak. This, combined with eosinophilia developing within fourteen days, is in our opinion pathognomonic of trichiniasis. Muscle pains were almost always present, but gastro-enteritis occurred in only 16% of the cases.

In contrast with outbreaks in Germany and the U.S.A., no deaths occurred, though two persons were seriously ill. This is, in our view, due to a lower infecting dose from consumption of undercooked as opposed to raw sausage-meat.

A modified digestion technique for the demonstration of trichinellae in muscle is described. It makes use of both peptic and tryptic digestion of the muscle fibres and leaves the larvae still motile. Compared with Young's method, it revealed nearly twice as many larvae in rat muscle and in pig diaphragms.

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The results of experiments in the control of blowflies in North London railway sidings where refuse is collected and sorted is given in the report of the Pest Infestation Research Board for 1952, which was published recently. At the height of the season it was estimated that there were some 25,000,000 blowfly grubs in 15,000 sq. ft. of ground. A dust insecticide was found to be the most effective in their control, and D.D.T. was used twice weekly. In order to obtain information about the rate of dispersal of the flies the Laboratory fed them on a radioactive phosphorus salt and then released them from the refuse sorting depot. Traps were placed over a radius of two miles, and it was established that the flies covered a distance of at least a mile a day. Some of them were examined at the Central Public Health Laboratory, and all were found to be carrying food-poisoning organisms. The report is published for the Department of Scientific and Industrial Research by H.M. Stationery Office, price 2s.