

COLLECTIVE INVESTIGATION

A SURVEY OF "FARMER'S LUNG"

from the Research Organization of the College of General Practitioners

Recorders

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I was sitting one evening in the Mitre at Oxford in the summer of 1946, talking to Janet Vaughan, Robb-Smith, and James Spence. "Tell me something new", the latter said to me. This disease came into my mind, and "What about farmer's lung?" I replied. The disease was quite new to my companions, though I, as a general practitioner, had been familiar with it for a number of years. . . .

(Extract from a letter to the recorders from W. N. Pickles, M.D., first President of the College of General Practitioners.)

The disease has been known to the farmers in Iceland for over 100 years. My grandfather, who was born in 1855, told me that he suffered from it as a young man. The farmers have given it the name Heymaedi, meaning "hay-shortness-of-breath". Only now are the doctors recognizing what the farmers have known for so long.

(Personal communication from O. Björnsson, 1960.)

Historical

This disease was first reported and described in the medical literature by J. Munro Campbell at Carlisle, in 1932. Description was continued in England by Fawcitt at Ulverston in 1936 and 1938. Further reports were published by Pickles in Yorkshire in 1946, Mann and Miall (also in Yorkshire) in 1952, Studdert at Carlisle in 1953, and by Joyce and Kneafsey in Co. Roscommon, Eire, in 1955. Knowledge of the disease was consolidated, organized, and defined by Fuller at Exeter in 1953.

An industrial outbreak of a very similar illness was reported, as a form of asthma, by Towey *et al.* in New York State, U.S.A., in 1932. In Europe, description was added by Törnell in Norway in 1946, Hoffmann in Switzerland in 1946, by Zettergren in Sweden in 1950, and by Raton in France in 1951. A further report was published by Soucheray in Minnesota, U.S.A. in 1954.

This was the picture in 1957. At that time the total of cases published in the world literature was under 100. Three general practitioners, one each from Cornwall, Devon, and Breconshire,

found in conversation that they had between them seen a round dozen of cases in their practices. The total population of these practices was about 8,000 persons.

From this evident contrast in numbers arose the idea of a survey to ascertain the size of the disease-problem in Great Britain. In the course of operational planning under the guidance of the research committee of council of the College of General Practitioners, and with the help of Dr C. J. Fuller of Exeter, the aims and methods described below were evolved.

Subsequent to the early planning, reports of this disease have been published by Williams and Mulhall (Breconshire, U.K.), by Dickie and Rankin (Wisconsin, U.S.A.), Bringham *et al.* (Pennsylvania, U.S.A.), and Totten *et al.* (Pennsylvania, U.S.A.). An editorial annotation was published in the *British Medical Journal*. A personal communication has disclosed that a number of cases have been treated by Björnsson (Hella, S. Iceland). A somewhat similar condition, occurring in the workers at an industrial fermentation plant, was reported by Horejsi *et al.* (Pilsen, Czechoslovakia). A newly described disease (silo-filler's disease) which is entirely distinct from farmer's lung but is sometimes confused therewith, has been reported by Lowry and Schuman from Minnesota, U.S.A. A series of short papers were given at the Annual Scientific Meeting of the British Medical Association, 1960 (Fuller, Staines, Stewart Smith, and Trobridge; Devon and Cornwall).

The aetiology of this disease is still unknown. The symptomatology has been fully described by the above authors, and is primarily breathlessness and cough arising specifically after the inhalation of dust from mouldy hay or other vegetable matter, either acutely or in an insidious manner. The physiological origin of these symptoms is now established. The radiological appearances of the lungs may be quite specific, but an apparently normal x-ray picture may also be found in the presence of moderately severe illness. The pathological disciplines of bacteriology and mycology have as yet little to offer on the diagnostic plane; but as a result of published biopsy studies the tissue pathology is established in a small number of cases. Work is now proceeding at a number of centres in the U.K. on the immunology of the disease and on the physical and biological properties of the causative dust.

Against this background, general practitioners have notified to this survey 227 cases. They are distributed from Cornwall to the Orkneys and from Sussex to Co. Mayo. Consultants have notified 217 cases in England, Scotland, Wales, and Eire.

Operational

The declared aims of the survey were:

1. To discover the prevalence of this disease in the community.
2. To add to the present clinical knowledge of the disease.
3. To provide evidence whereby to judge whether the disease should eventually become "scheduled" by the appropriate Ministry as an "industrial disease".

A as by-product of the first declared aim, a direct comparison was attempted of the case-experience of "three special areas of differing rainfall, altitude, and farming habits". For this purpose were chosen the whole of Wales, the whole of the South-western Faculty of the College, and an area of East Anglia from Suffolk to the Humber.

Methods. The methods chosen to achieve these aims were entirely postal.

1. Enquiry was made of every member and associate of the College in the three special areas. Similar enquiry was made of other Midland, Northern, Scottish, and Irish faculty areas. This distribution of enquiry covered mainly rural areas but included in contrast practices within the cities of Plymouth and Bristol, the South Wales coal belt, part of the West Midland industrial belt, and industrial Lanarkshire with Clydeside.

2. A national "scatter" distribution from London to the Highlands was achieved by enquiry from all members of the Respiratory Disease Study Group, and from all members of the College Research Register who had specified an interest in either chest diseases or industrial diseases.

To all the general practitioners herein specified was sent an invitation to participate, a description of the disease as published and as known by general practitioners, the "criteria of diagnosis" agreed for this survey, and a case-questionnaire. An explanation of the survey, but without a questionnaire, was sent to all major chest clinics in the areas where general practitioners have received circulars.

The general practitioner's questionnaire asked, as well as the notification of cases, for information on the location and type of practice from all participants, and on the size of practice (i.e., the N.H.S. list) from every participant who notified one or more cases.

The *criteria of diagnosis* agreed for the survey after discussion with and advice from the consultant advisers and a committee of the Medical Research Council were:

- POSITIVE
1. A history of recent or continuing exposure to *vegetable dust* which is believed to be fungus-contaminated.
 2. Dyspnoea (defined as "shortness of breath") and/or cough.
 3. Abnormal physical signs in the chest.

- NEGATIVE**
4. The absence of "positive and certain" findings diagnostic of other pulmonary diseases, in particular pulmonary tuberculosis, mineral pneumoconiosis, or neoplasm.
 5. The absence of a clinical course characteristic of "conventional" acute bacterial infection.

All the above were obligatory. It was intended to check the admission of cases to the series by means of the examination of x-ray films by a panel of five members. The inability of some practitioners to obtain the x-ray film of their patients from the hospitals or departments where these are filed, and the absence of x-ray records in many cases, led to the abandonment of this scheme. The demonstration by Trobridge at Hawkmoor Chest Hospital (reported to the sections of Chest and Industrial Diseases at the Annual Scientific Meeting of the British Medical Association, 1960) that severe deviation from normal respiratory function can coexist with a normal radiograph, has rendered this abandonment of lesser import than was at first feared.

The *description of the disease* circulated to all participants carried the cautionary heading ". . . the following notes are a composite picture, and are given as a guide only". These descriptive notes are here summarized:

Patient's complaint. Cough and shortness of breath. (Duration one day to several weeks.)

History. Past respiratory disease from nil to "episodes, some serious, over a number of years, with good health between". Exposure to an atmosphere heavily charged with dust, some hours (or days) before the onset of illness. Examples: threshing, cattlefeeding, corn grinding, poultry houses, sawmills, barns.

Clinical examination. Pyrexia present or absent. Tachycardia usual, hypotension possible. Moist sounds in the lower half of the chest expected. Dyspnoea expected "may be extreme and accompanied by cyanosis, at the effort of undressing". Wheezing possible; if present, predominantly inspiratory. Dullness to percussion unlikely.

General outline. A mild case is rather like a dust-provoked asthmatic bronchitis. . . . A moderate or severe case probably starts similarly, or perhaps in the manner of a pneumonia, but the continued dyspnoea leads to suspicions of tuberculosis, heart disease, or malingering. Occasionally a case will present in such a way (tachycardia, hypotension, breathlessness) as to be mistaken for a myocarditis or silent cardiac infarction.

Additional method. A short explanation of the survey, including the criteria of diagnosis, was published in the *Journal of the College of General Practitioners*. Thereafter the Epidemic Observation Unit procedure of the College was used. A tear-off slip is printed in the quarterly *Journal*, and therefore received by the whole membership of the College (wherever practising). The slip makes provision for notification of cases, or for nil returns, and is voluntarily completed and sent by post to the Unit director. After the elimination of "repeat" notices, 9 positive and 175 nil returns

were received from individual practitioners in this voluntary and indirect manner.

Discussion of method. No attempt was made to obtain a sample statistically representative of N.H.S. practitioners. To succeed with such a plan it is necessary either to "detail your volunteers" (before consulting them), or to obtain a very large number of true volunteers (and the details of their practices) and then to inform some of them that they are not wanted after all. It is also necessary to ensure that all of the chosen samples give total and accurate information.

Methods of this nature will give, at considerable expense, accurate information, when they relate directly to the persons approached (as used by the Royal Commission on Doctors and Dentists Remuneration). When used to obtain information indirectly about a third party (i.e., the practitioner's patient), the expected inaccuracy and the almost certain unpopularity of that method made some other plan necessary.

The combination of methods chosen and herein described was expected (and has proved) to give a sufficiently wide and varied sample, at an economic cost, to achieve the declared aims, in spite of the differing training and nosological standards of practitioners.

It was in mitigation of these variables that all those who received a questionnaire also received the "description" of the disease and the Criteria of Diagnosis described above. As some evidence of how they were used, only 4 of 160 clinical case histories had to be excluded from the series as a result of non-compliance.

Results

1. *Administrative*

The overall return-rate of the questionnaire was 36 per cent. As has been shown, trouble was taken to interest participants, but as returns were made entirely at the expense and trouble of the recipients (only 5 of whom had directly volunteered to participate) such a percentage was most gratifying. A total of 632 general practitioners and 23 consultants (these numbers including those mentioned above under Epidemic Observation Unit) have provided the information upon which the following results are based. Regional inequalities of distribution of returns will be discussed below.

2. *The national picture*

The overall numbers of practices notifying the presence or absence of cases, and the total cases notified (at 1 September 1960) divided as to source and country of origin, can be seen in tables I and II.

TABLE I
PLACES NOTIFYING THE DISEASE

	<i>G.P. positive</i>	<i>G.P. negative</i>	<i>Consultant positive</i>	<i>Consultant negative</i>
England	76	419	9	3
Scotland (and Islands) ..	15	57	2	1
Wales	15	27	4	0
Ireland (North and Eire) ..	7	16	4	0
Totals	113	519	19	4

The numbers refer to practices, departments or clinics, *not* to individual cases. All returns included.

TABLE II
CASES NOTIFIED

	<i>General practice</i>	<i>Consultants</i>	<i>Total</i>
England	153	61	214
Scotland (and Islands) ..	24	6	30
Wales	37	140	177
Ireland (North and Eire) ..	13	10	23
Totals	227	217	444

The numbers refer to individual cases.

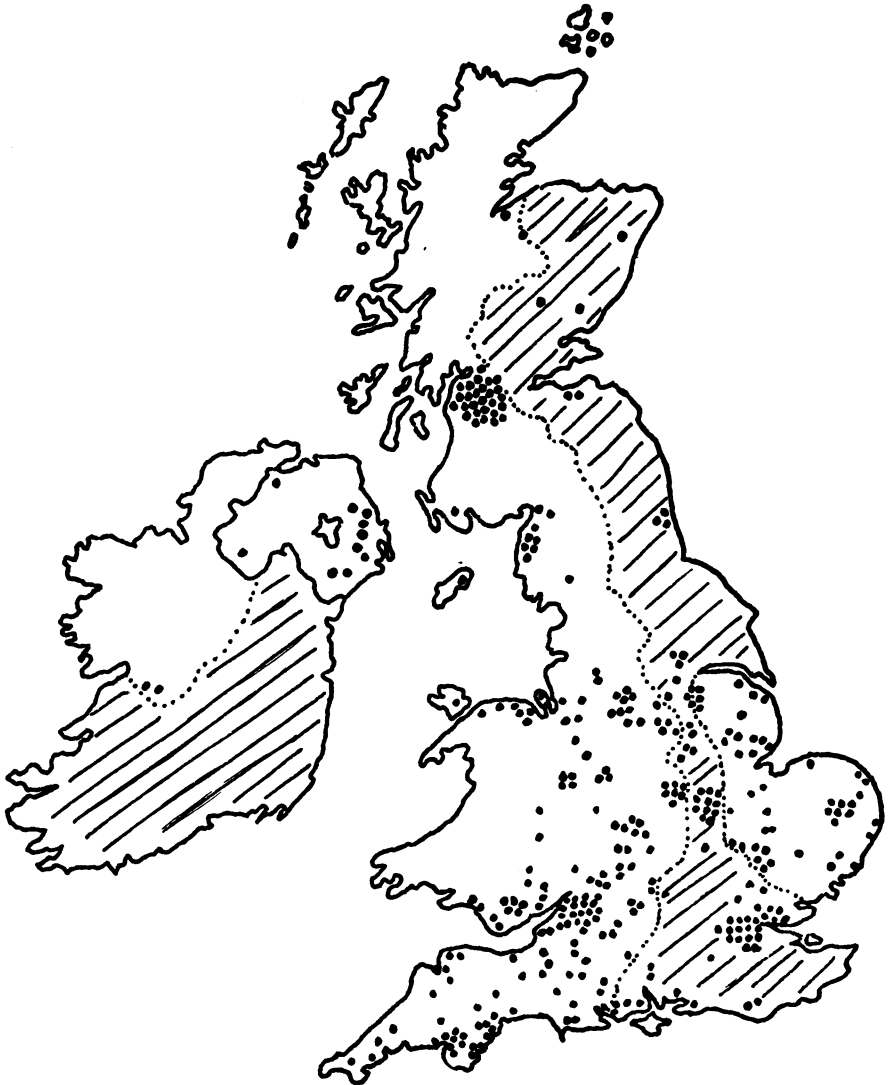
The cases numbered in table II have been notified as occurring within a period of "10 to 12 years ending 1960". This period seems, judging from a number of letters received both from general practitioners and from consultants, to be about the effective limit of general-practitioner memory for identifying names and records, and also the effective limit of clinic filing systems for rapid search. The error inherent in these figures is therefore under-reporting, not over-reporting. A sample only was approached. Those reporting may not have notified every case. It is noteworthy that letters making this point came, unasked, from many parts of the British Isles.

Map 1 shows the distribution of locations from which a positive return has been received, and Maps 2 and 3 those locations from which nil returns have come. General-practitioner sources only are mapped. The areas fully covered by the questionnaire are



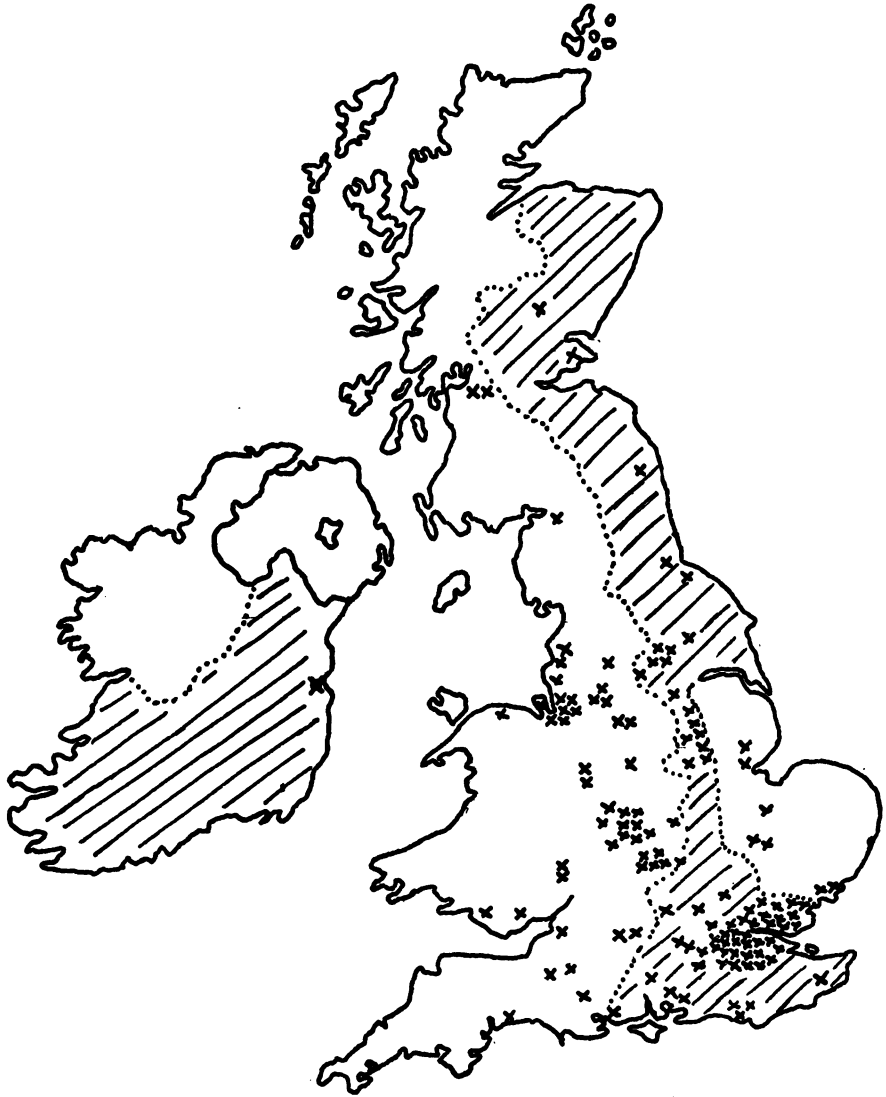
MAP 1. Positive returns — General practice

plain, and those areas not fully covered (operational, methods (2) above) are shown hatched. It can be seen that very little of the British Isles is unrepresented, apart from South-east Eire and the Hebrides.



MAP 2. Nil returns (Questionnaire) — General practice

The general-practitioner questionnaire included (as described above) a section asking that the N.H.S. list (i.e., the population at risk) be disclosed whenever a case, or cases, were notified. Fourteen of 113 practitioners did not wish to do this, and the gaps were



MAP 3. Nil return (Epidemic Observation Unit) — General practice

filled by using an average figure (2,250) for these practices. There was also a means whereby the cases occurring in a fixed period could be separated from the total. The information provided by the returned questionnaire can therefore be considered in greater detail.

Rural/urban relativity (general-practitioner cases only). Three cases were notified by *urban* practitioners—one by each of three practices. In contrast, 244 urban nil returns were made.

One hundred and sixteen cases were notified by 47 *rural* practices. Rural nil returns numbered 59.

The remaining 108 cases were notified by “mixed” practices, with 219 nil returns.

Prevalence (general-practitioner cases only). In the 4 years 1956–9 inclusive, one urban practice, 28 “mixed” practices, and 30 rural practices identified a total of 111 cases in a total practice population of 252,000. Therefore within these 51 notifying practices the prevalence was about 11 per 100,000 per year. The total general-practice population surveyed was not defined, but by taking the average figure for those practices whose actual size is not known, this population cannot be less than 1,400,000. The *total prevalence* in this population can therefore be estimated as fractionally above 2 per 100,000 per year.

It may be re-emphasized here that the error inherent in this calculation is under-reporting, in that this hitherto ill-defined disuse is probably sometimes missed, especially in its milder forms.

The total of cases notified to this survey is four times greater than the total of cases previously published elsewhere. The number reported from a population of just over six million (see table III)

TABLE III
COMPARISON OF THE SPECIAL “AREAS”

Area	Total population (millions) of areas	Total number of G.P.s in the area	Percentage of total sampled	Return rate of Questionnaire (percentage)	Total cases		Relative rate per 100,000	
					G.P.	Clinic	G.P.	G.P.+ clinic
East Anglia Area ..	1.56	952	18.3	34	14	4	0.9	1.2
S.W. England Area ..	2.78	1515	16.5	37	50	58	1.9	4.0
Wales ..	1.70	1008	13.3	28	37	143	2.0	10.5

The numbers refer to practices, clinics, or departments, not to individual cases.

is equal to those previously published in the world. If these figures be applied to the whole British Isles, the speculative incidence may be as high as 1,000 cases yearly.

3. Local variations

East/west comparisons. As well as a variation between town and

country, this disease shows a variation between East and West. In the three "special" areas it has been possible to correlate the notification of cases with total population and with total numbers of general practitioners practising. In table III the total population, the totals of general practitioners, the sampling percentages and the return-rates are actual and of the year 1959; the rates per 100,000 are based on actual population, but are relative rates over comparable periods and not annual rates.

TABLE IV
COMPARISON OF THE "SPECIAL AREAS"

<i>Area</i>	<i>General practices +</i>	<i>General practices nil</i>	<i>Consultants +</i>	<i>Consultants nil</i>
East Anglia Area..	8	71	1	2
S.W. England Area	32	100	2	1
Wales	15	32	3	0

The numbers refer to practices, clinics, or departments, not to individual cases

Discussion of tables III and IV. It can be seen that the area with the highest case-rates (Wales) has the lowest sampling and return rates. The sampling rate at least is due simply to the fact that the College has a low membership in Wales compared with some other areas, two Welsh counties having at the time of the survey no members or associates. But the low sampling and return-rate does not adversely affect the comparison of the rates per 100,000 which are based simply on the ratio of total cases to total population at risk. A further 20 replies from Wales could not lower the number of cases notified, and might well raise it. Conversely, the shortfall of cases in East Anglia, even if due to under-reporting as mentioned above, occurred in the area with the highest sampling percentage, and a return-rate 6 per cent higher than Wales. In support of this shortfall it can be stated that Suffolk (included in the East Anglian area) reported no cases; Essex—not included therein—though lightly sampled (return-rate of sample 80 per cent) also reported no cases. A consultant practising in this area reported . . . "being familiar with the disease when formerly practising in N.W. England, I can say that no case has occurred at this clinic in the last 9 years".

Two further points may be considered here. Firstly, the very large number of cases notified by consultants in Wales. In the

operation of this survey the consultants informed of our interest in these patients were the physicians in charge of chest clinics only—general physicians or general medical departments of hospitals were not circularized. In the Principality of Wales, the chest clinic service was for many years the most widely distributed and rapidly obtainable source of opinion and advice upon thoracic disease. Outside Wales, opinion and advice has often in the past been obtainable more readily from a source other than a chest clinic. In spite of changes, on both sides of the Welsh border, during the recent evolution of the health services, tradition and habit still play a part in deciding to which special centre the difficult or puzzling cases will be referred.

Secondly, the possibility of double notification of cases (i.e., both by the clinic and by the general practitioner) is recognized. However, identification details have allowed the elimination of this potential source of over-reporting in all except 21 of the 444 total cases in table II. Only six cases were known to have been doubly notified, and these were removed from the consultant figures before compilation of the tables or of the final case-total.

The Agricultural Census branch of the Ministry of Agriculture, Fisheries, and Food has kindly supplied figures of the 1959 Agricultural Census, from which a "total farming population" can be calculated. The census shows the total number of employed workers (by counties) and also the total number of holdings above 1 acre in extent. Therefore by adding these totals, the farmer is added to his workers; this joint total is used (in all three areas) in table V. The east/west slope is now even greater.

TABLE V
COMPARISON OF THE "SPECIAL AREAS"

Area	Total farming population	Cases		Relative rates per 100,000	
		G.P.	Total	G.P.	Total
East Anglian area ..	156,623	14	18	8.9	11.5
S.W. England area ..	146,085	50	108	34.2	73.1
Wales	93,239	37	180	39.7	193.1

As in table III, the rates are relative over similar periods, and the "total" columns include the general practitioner columns.

The conclusion therefore is that "farmer's lung" is much commoner in Wales than in East Anglia; on a total-population basis between 2 and 9 times commoner, and on a farming-population

basis, between 5 and 17 times commoner. South-west England occupies an intermediate position.

4. The sources of patients

All the data so far considered have been extracted from the notifications received. The findings now to be described, both epidemiological and clinical, have been extracted from clinical case-notes or "record-forms".

Clinical notes of 191 accepted cases have been collected. These include 119 from general practitioners and seven from consultants (survey-designed record-forms), and a series of 65 cases (hereafter called the Welsh series) from a consultant in Wales, in another type of record-form.

The survey requested information in 37 parameters. Not every form was complete in every parameter, and in consequence the number of cases for analysis varies from section to section; this number will be stated as each section is considered.

Sex distribution (combined figures). Sex, together with age at onset of the disease, was recorded in 147 cases; of these, 140 were male, and seven female. The ratio of 20 : 1 is considered simply to reflect the preponderance of male workers over females in the dustier jobs of agriculture. The Agricultural Census figures, calculated as described above, make no allowance for farmer's wives; any estimate would be simply guesswork, and yet wives work on farms. It is not therefore possible to draw any conclusion from the difference between the survey ratio (20 : 1) and the ratio in the industry (8.5 : 1), except to state that the female is not immune.

Age distribution (combined figures). Age was recorded (in the same 147 cases) as . . . "at onset of the attack" . . . i.e., the attack of "farmer's lung" recorded in the clinical notes.

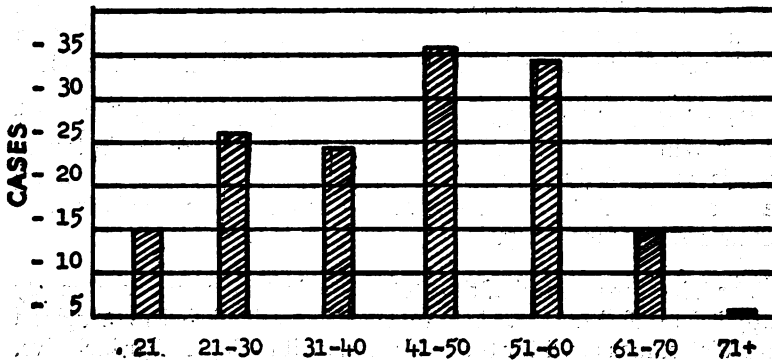


Figure 1. Age-groups.

The range was 15–74 years, and the peak frequency is the 41–60 section. This age-group is of course under investigation in other pulmonary diseases (see fig. 1).

Multiple attacks. In 112 cases it was noted whether the attack of illness recorded was a first or a later attack; also whether the patient was known to have suffered other attacks (either before or after that which was the subject of clinical record).

74 cases were first attacks.

20 cases were later attacks.

39 patients (including the above 20) were known to have suffered "other" attacks.

In 31 of the 39 cases where "other" attacks were known, the number of such attacks were specified by the recording practitioner.

15 patients suffered one other attack.

8 patients suffered 2–4 other attacks.

5 patients suffered "several" other attacks.

3 patients suffered many attacks (5, 11, and 14 each).

Thus, about 35 per cent of these 112 cases had suffered more than one illness.

Month and year of onset (combined figures). June and July are the main months of hay-harvest, and July and August of corn-harvest, in this country; the latter may spread to September in Wales and Scotland. The disease is frequently associated with the manipulation of these products following harvest and a period in storage (see below). Therefore, the 1st July is the most convenient date to start the "farmer's lung" year.

Accurate information was obtained in 145 cases. The only month providing no cases at all was July, and only 16 of the 145 occurred in the five months May–September inclusive. For the purposes of a table, those cases occurring earlier than July 1953 have been eliminated, as their number (15) is insufficient to provide accurate data over the 101 months of their onset. The distribution of the remaining 130 cases over 84 months is shown in table VI.

Correlation with rainfall. It has been previously reported (Fuller (1953) Williams and Mullhall (1956)) and was mentioned in letters to this survey (Glynn-Jones, Pickles, Munro Campbell) that more cases are seen following a wet than a dry summer. This is fully confirmed by this survey.

The Director-General of the Meteorological Office has courteously supplied rainfall details. The average general rainfall for England and Wales, measured for the half-year April to September inclusive, is shown in table VII.

TABLE VI
(INCLUDING THE WELSH SERIES.)

<i>July</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>Apr.</i>	<i>May</i>	<i>June</i>
1953 -	-	-	2	2	-	1954 1	-	1	-	-	-
1954 -	-	-	2	2	5	1955 4	6	5	4	1	1
1955 -	-	-	-	-	3	1956 2	-	1	-	1	-
1956 -	1	-	4	2	2	1957 3	1	6	1	1	2
1957 -	-	-	-	1	-	1958 5	1	-	1	-	1
1958 -	3	1	2	7	3	1959 12	10	9	7	-	-
1959 -	-	-	1	-	-	1960 -	-	-	-	-	-
<i>Totals</i>	4	1	11	14	13	27	18	22	13	3	4

TABLE VII
(INCLUDING THE WELSH SERIES.)

<i>Harvest year</i>	<i>Average rainfall (inches)</i>	<i>Number of reported cases (July to following July)</i>
1953	18.1	6
1954	18.7	30
1955	13.1	7
1956	19.0	23
1957	17.2	9
1958	21.7	56
1959	10.5	1

Allowing for the fact that recent memory is the most reliable, and that much publicity was directed to the notifying practitioners during the summer (the finest for many years) and autumn of 1959 the conclusion can only be that harvest-time rain increases the case-load, and a fine summer decimates it.

A rainfall gradient is also found between the three "special

areas" described above (table III). The 1916-1950 average total rainfalls (for the months April to September), measured at three-points within each area, are respectively:

East Anglian area (Low caseload)
(Gorleston, Sprawston, Lincoln)
Range 11.4 — 12.3 Average 11.9 in.

South-west area (Intermediate caseload)
(Gloucester, Taunton, Plymouth)
Range 12.8 — 14.9 Average 14.1 in.

Welsh area (High caseload)
(Cardiff, Dolgelly, Trefarthen Anglesey)
Range 15.8 — 33.5 Average 22.9 in.

Occupation, source of dust, and job causing exposure. 138 cases were available for this section, as details in the Welsh series were not in a comparable form.

The patient's occupation was specified in 120 of these 138 case-records:

Farmers	}	113	}	Farming and general agriculture
Farm workers				
Farmer's wives				
Horticulturists				
Agricultural contractors				
Agricultural students				
Farmer's child				
Millers	}	5	}	Occupations allied to agriculture
Seedsmen				
Estate carpenter				
Tilemaker	}	2	}	Other occupations
Jobbing gardener				

Among those employed in "Farming and general agriculture" were five patients with mixed occupations: two were farmers and quarrymen, one was a bus conductor and horticulturist, one was a signaller (B.R.) and farmer, and one a schoolboy working on his father's farm in the holidays.

The causative dust presumed to have been the source of the illness was specified in 103 cases.

Hay only	60 cases
Hay and straw	7 cases
Corn and straw	28 cases
Others	8 cases

In 13 of the "corn and straw" cases, the type of corn was specified: oats 9, wheat 2, barley 2.

The 8 "other" dusts were reported by six different general practitioners, and all but one are obvious farm dusts: woodwork of farm buildings, sawdust, barn-floor dust, cocoa dust (a peat substitute), chickenfeed and droppings, peas bagged with pod and haulm for seed, grain and grass-seeds.

Job causing exposure to dust. The job being performed at the time that exposure to the dust (which was presumed to have caused the illness) occurred, was specified by the responsible general practitioner in 103 cases:

Cattlefeeding and allied haywork including baling and unbalancing of stored hay	59 cases
Threshing	30 cases
Work with corn and grains	6 cases
Others	8 cases

The 8 "other" jobs were: cleaning seeds, repairing farm buildings, straw

packing of farm produce, general work in cow and pig houses, floor-tiling, spreading peat substitute on the land, cleaning henhouses, and mixing peas for seeding. Six of these eight jobs are obviously agricultural, and not at all likely to be performed other than on a farm or smallholding.

Therefore, it appears that within the totals of this survey this disease known as "farmer's lung" is aptly named. It occurs almost exclusively (118 of 120) in those engaged in the agricultural industry; is associated with the inhalation of dust found only in that industry (102 of 103); and the actual jobs which were associated with the onset of illness are almost (101 of 103) without counterpart outside that industry. In support, the Welsh series, while not detailing job or dust in a comparable manner, gives evidence on the association with haywork in 54 cases, threshing in 2, and general farm work in 4 (i.e., 60 of 65 cases).

The conclusion that this syndrome is an industrial disease is inescapable.

5. *The clinical picture*

A large amount of information has been collected on the purely clinical aspects of the disease—history, symptoms, signs, investigations, pathological findings, course, disability, and sequelae.

Differences between farming crops and practices in Iceland and Great Britain suggested a possible division of the disease into two distinct syndromes. In Iceland, threshing is almost unknown, and haydust is the major source of dust to the farmer; rigors, pyrexia, and pain are rarely seen, and haemoptysis has not been recorded—(Björnsson, 1960, personal communication). Therefore the data of this survey were examined to see whether any differences were to be found between those cases stated to be caused by threshing, and those stated to be caused by haywork.

The differences were thought to be: (1) a condition of rapid onset (48 hours or less), with acute symptoms (e.g., chest pain, pyrexia, haemoptysis), running a short course, and found more often in threshers and grainhandlers; and (2) a condition of insidious onset (1 week or more), with chronic symptoms (e.g., incessant useless cough, effort dyspnoea), and long course, found more often among those working with hay.

The evidence will be presented below. We have found chronic symptoms and long course associated with both acute onset and threshing, and conversely acute symptoms and short course associated with both insidious onset and hay work. No absolute division can be demonstrated from our records; overlap between the types of clinical picture occurs. Therefore such division as

is apparent cannot be related to the causal work, although some other unidentified factor may be involved.

History (general-practitioner cases only). It is traditional to start the description or record of an illness with the family history. This is far from ideal in general practice (from where this report comes), the presenting symptom being the starting-point of all general-practitioner histories. However, it is most convenient here to follow tradition.

The *family history* was recorded in 80 of 119 cases, and was negative to respiratory disease in 68 of the 80, and negative to allergic diseases in 73 of the 80. Precise details of the "positives" are not available, but one of the former is known to be a father with "farmer's lung", another a father, mother, and sister with pulmonary tuberculosis; one of the latter is known to be a daughter with asthma.

The *personal history* was recorded in 94 of 119 cases, and revealed no previous respiratory disease in 67 of the 94 cases, no pulmonary tuberculosis in 90 of 93 cases (one case no information), and no allergic disease in 78 of 94 cases. Again, precise details of all the "positives" are not known, but the 27 with previous respiratory history included 11 patients who had had previous attacks of "farmer's lung", one with both former "farmer's lung" and former pneumonia, five with previous pneumonia, four with previous bronchitis, and one case each with previous influenza, postoperative pulmonary embolus, and empyema. The 16 with history of allergy included 4 cases with previous asthma, and one case each with previous allergic rhinitis, pruritus ani, sensitivity to barn dust, sensitivity to cattle louse powder, skin sensitivity to grass seed, and childhood eczema.

Four other past illnesses were reported, unasked, because it seemed to the responsible practitioner that the illness bore on the overall judgment of the case. There was one case with arthritis (affecting his subsequent mobility); one with pernicious anaemia (a combination of these two conditions must be exceedingly rare); one with psoriasis (which got very much worse during the course of the illness); and one with Weil's disease (the patient was not restored to normal health after a severe bout of Weil's disease when he became ill with "farmer's lung"—this may have affected the long course of the second illness).

It is reasonable to conclude from the details reported here that the cases recorded in this survey are not being confused by the recording practitioners with tuberculosis, asthma, or chronic bronchitis. Further evidence will be presented on these points, and that of sarcoidosis, in the section on pathological investigations

below. The history is straightforwardly one of an illness arising *de novo*.

Onset of the present disease (general-practitioner cases only).

1. *History of onset.* A history of exposure to vegetable dust (believed to be fungus-contaminated), before onset of the illness, was, as described above, a necessary criterion for the selection of cases. No case has been considered here without such a history. The story may not be volunteered by the patient unless specifically asked for, and, when clearly obtained, such a history may well be the linch-pin of diagnosis. It is of great importance that the possibility of dust-inhalation as a cause of chest or upper respiratory symptoms be borne in mind when such symptoms present in the rural, as well as the urban, consulting-room. The early attainment and recording of this history (that is to say, before the problems of disability and sick-pay present), may be of considerable importance to the patient for his welfare; and to the state, for the proper and economical discharge of its responsibilities.

2. *The method of onset* was known in 87 cases. (A) 53 cases were known to have a *rapid onset*, time-lapse from exposure varying from 4 hours or less (21 cases) to 48 hours (9 cases). (B) 34 cases were known to have an *insidious onset*, time-lapse from first exposure varying from about a week (10 cases), through 4 weeks (8 cases) to 16 weeks (2 cases). In four-fifths of these insidious-onset cases, the type of work was such that frequent, if not daily, re-exposure would be expected. In the majority such contact was specified in the record.

3. Information on the *source of the dust* believed to have caused the illness, and on the *job being done* at the time of exposure is here included to compare the rapid-onset and the insidious-onset cases. These figures are extracted from, and not additional to, those on the same subjects already given above.

Jobs. Rapid onset cases (53).

Threshing	27
Cattle feeding, haywork	19
Concentrate	2
Grain drying	2
Moving corn	1
Mixing peas	1
Barn repairs	1

Insidious onset cases (34).

Hay work, cattle feeding	27
Threshing	3
Straw packing	1
Spreading peat substitute	1
Floor tiling	1
Work on corn-dryer	1

Dusts.	<i>Rapid onset cases (53)</i>						
Grains	..	..	..	..	..	..	28
Hay	..	..	..	..	..	..	23
Barn dust	..	..	..	..	..	..	1
Peas	..	..	..	..	..	..	1
	<i>Insidious onset cases (34)</i>						
Hay	..	..	..	..	..	..	26
Straw and grain	..	..	..	..	..	..	5
Sawdust	..	..	..	..	..	..	1
Cocoa dust	..	..	..	..	..	..	1
Cattle cake	..	..	..	..	..	..	1

Symptoms (general-practitioner cases only). These have been divided for the purposes of this report into *primary symptoms* (i.e., the first symptom of which the patient was aware); *presenting symptoms* (i.e., those which decided him to consult his doctor); and the symptom that, in retrospect, was the *most troublesome* to the patient through the course of his illness.

Primary symptoms. (Recorded in 73 cases only, because bad grammatical construction of the record form misled a number of contributors to record a date instead of a symptom.)

Dyspnoea alone	..	24 cases	} 49/73
(Rapid onset 12/53, insidious onset 12/28)	..	19 cases	
Cough alone	..	9 cases	
(Rapid onset 10/53, insidious onset 9/28)	..	21 cases	
Dyspnoea + cough	..	21 cases	} 21/73
(Rapid onset 5/53, insidious onset 4/28)	..	21 cases	
Others	..	21 cases	
(Rapid onset 18/53, insidious onset 3/28)	..		

The "other" symptoms (some cases having more than one symptom) were: dry throat (3), rigor (3), headache (3), tightness of chest (2), rhinorrhoea (2), pyrexia (2), lassitude (2), sweating, aching, malaise, chest pain, sputum, haemoptysis, anorexia (1 each).

Presenting symptoms were recorded in 119 cases; in 34 of these the method of onset was not known.

Dyspnoea alone	..	34 cases	} 68/119
Cough alone	..	10 cases	
Dyspnoea + cough	..	24 cases	
Other	..	51 cases	
	..	51 cases	51/119

Of these 46 "others", 35 were known to have had a rapid onset, and only 7 an insidious onset.

The "other" symptoms recorded (again sometimes more than one symptom per case) were: chest pain (8), fever (8), headache (6), weakness (5), rigors (5), "tight chest" (5), myalgias (3), sweating (3), haemoptysis (3), rhinorrhoea (2), tachycardia, loss of weight, nausea, malaise, abdominal pain, and lassitude (1 each).

The *most troublesome symptom* was recorded in 117 cases; in

35 of these the method of onset was not known.

Dyspnoea alone	73 cases	} 96/117
Cough alone	..	..	..	..	..	19 cases
Dyspnoea + cough	..	..	..	..	..	13 cases
Others	13 cases		11/117

The "other" symptoms recorded as the most troublesome were weakness (7), malaise (2), pain (2), sputum (1), sweating (1), "tight chest" (1), lassitude (1). Symptoms not previously recorded in this disease were noted in nine cases: four developed nocturnal frequency of micturition, two suffered disorders of gastrointestinal function, one developed a 3-finger hepatomegaly without splenomegaly, one a generalized lymphadenopathy, and one a blurring of vision. These symptoms are not explained.

Two consultants and nine general practitioners informed us, spontaneously and unasked, that they had frequently noticed that the patient's symptoms were out of all proportion to the physical signs. This observation is endorsed and confirmed by the recorders from their personal experience of 22 (10 + 12) cases; and it is explained by the demonstration by Trobridge (1960) that measurable deviations from physiologically normal lung function exist in marked degree during the illness, and remain well beyond subjective recovery.

Cyanosis was also noted by some observers, though mention of this was not specifically requested on the clinical record sheets.

The general picture by symptoms is therefore of a disease starting in 75 per cent, presenting in 60 per cent, and continuing in 85 per cent of sufferers with shortness of breath and/or cough. Symptoms other than these occurred most frequently in the "short-onset" type of case, but were not exclusive thereto. The complaint of sputum, contrary to experience in chronic bronchitis, was noticeable by its rarity. The total symptom-picture presented here conforms with, and perhaps amplifies, previous reports.

We conclude that no case has been made out in this paper for the division of the disease into two syndromes separable by the source of dust, type of job, or method of onset. We believe that all these cases are of one syndrome, and that the differences are of degree and not of kind. (See also "Length of course of illness" below.) Factors responsible for differences may be the total dose of irritant, length of contact, repetition of contact, and individual sensitivity. Until the irritant factor is identified, further speculation seems profitless.

Physical signs (general-practitioner cases only). Recording practitioners were asked to state the presence or absence of crepitations, ronchi, wheezes, or dullness. The last sign needed no definition, but the first three were defined respectively: "Short single

noises of any type or intensity”, “ bubbling repetitious noises or whistles”, “ musical noises”. We did not ask for other physical signs to be recorded, but the presence of at least one sign in the chest or lungs (e.g., poor air-entry, loss of expansion) was a necessary criterion for admission of cases (experience has now shown us that conventional “ bedside ” physical signs may be virtually absent; see case 114 below). The tally for 121 cases was:

Crepitations	..	present	..	77	absent	..	28
Rouchi	..	present	..	61	absent	..	43
Wheezes	..	present	..	41	absent	..	62
Dullness	..	present	..	6	absent	..	98

Information on these physical signs was incomplete in 14 cases; only in four was it specified that none of these four signs were present.

One patient showed an unusual physical sign. In an acute attack (one of several), he was distressed, and using all the accessory muscles of respiration. The chest measurement at the nipple was $\frac{1}{4}$ inch *less* in full inspiration than in full expiration. No explanation is offered here for this curious fact.

6. *Investigations and pathology* (general-practitioner cases).

Investigations. (A) *X-rays.* Radiological examinations were performed in all 65 of the Welsh series. As this series originated from a chest clinic, and as the appearances were not “ reported ” to a general practitioner, but extracted for us from the clinic notes, we do not comment here on these extracts. It is sufficient to record that descriptive terminology and the appearances, to our eyes, of a large number of films supplied, agree fully with examples originating in East Anglia, Scotland, Eire, and the west country.

In the general practitioner cases, chest radiology was recorded as having been performed in 101 of 119 cases. In 11 of the 101 no “ x-ray report ” was received; so that 90 cases are presented with reports on the films. In 58 of these 90 the report was recorded to be positive, in either diagnostic or descriptive terms, i.e., in about 64 per cent of the series.

The expected appearances have been fully described by Fuller (1953), but can be summarized as a discrete generalized fine mottling concentrated mainly in the mid and lower zones.

Of the 32 reports which were not positive, 5 cases had a total course of less than a week; one report was simply “ no evidence of pulmonary tuberculosis ”; 20 reports were of apparent normality or absence of obvious pathological change. Among the descriptive terms used for the remaining “ non-positives ”, the terms “ col-

lapse", "emphysema", and "bronchitis", were each used once only.

One report (origin a Mid-Cheshire hospital) is perhaps significant. "Chest x-ray is perfectly clear, but pulmonary ventilation tests show a reduction to one half of the capacity normal for a man of his age. . . ."

Two other patients will be reported below (respiratory function tests) in whom a similar occurrence was noted; these three cases support previous reports, that "moderately severe illness can co-exist with a normal radiograph". Unfortunately, it is not possible to say how many of the 20 "normal x-ray report" cases could have been added to these three, as coincident tests of function were not performed, but all were properly diagnosed within the criteria of diagnosis of this survey.

It is clear that the cases recorded in this survey are not, from the radiological angle, to any significant extent cases of other diseases masquerading under the title of "farmer's lung".

It must also be accepted that, while "positive" or "typical" x-ray appearances can make, or help to make, a positive diagnosis of this disease, the absence of such "positive" or "typical" appearances does not negative the diagnosis. A positive chest film can no longer be considered the primary diagnostic finding. The diagnosis at present rests on the history of exposure, the clinical findings and course of the disease, and the exclusion of other chest pathology; confirmatory evidence is likely to come mainly from serial tests of pulmonary function.

(B) *Sputum examinations* were noted as having been performed, and reports detailed, in 49 of 119 cases. As the precise cause of the disease is not yet elucidated, and no bacteria or fungi have yet been casually implicated, there is no question of positive or negative reports. A tally of the details received (often summarized from the originals) is however included.

In the 49 cases, 66 specimens were known to have been examined. These examinations included 48 known direct films (including Ziehl-Neelsen) and 28 known cultures. No examination or culture was reported positive to tuberculosis; 33 reports specifically stated that tubercule bacilli (or A.F.B.) were not seen or isolated. Yeasts or fungi were specifically reported as absent on 18, and as present on 17 occasions.

The other bacteria reported as present included *Streptococcus viridans* (8 times), *N. (or M.) catarrhalis* (7 times), "other" or "mixed" streptococci (6 times), staphylococci (5 times), coliforms (5 times), diphtheroids (twice), pneumococci (twice), *H. influenzae*,

B. subtilis, and several others (once each).

The yeasts or fungi reported as present included yeasts (9 times), *Monilia* (5 times), *C. albicans* (4 times), "mycelia" (twice), "coccidium" (once) and *Aspergillus fumigatus* (once).

The only conclusions that can be drawn from these reports are that, again, the cases reported were not tuberculosis (or other major documented disease) misdiagnosed by the reporting practitioners; and that no constant bacterial or fungal flora have been demonstrated. It is highly probable that this latter conclusion is aetiologically significant, but no claim can be made that it is statistically significant.

It may be noted that in 19 cases the time lapse reported between exposure to dust and onset of symptoms was less than 4 hours, which seems to rule out bacterial infection in these cases at least.

(C) *Other pathological information*, obtained at varying stages in the illness, was given in 46 cases.

The erythrocyte sedimentation rate was reported in 27 cases; 23 of these were evenly distributed within the range 2 — 33 mm./hr., the remainder being 37, 40, 45 and 56.

The total white blood cell count was reported in 27 cases (30 readings). All except 2 readings fell within the range 4,000 — 12,000/cu.m.m. The exceptions were a first reading of 23,400 on a patient on whom a subsequent count three weeks later was 10,600 (In this patient there was an eosinophilia of 66 per cent and 8 per cent in these respective readings); and a reading of 14,000 in one patient.

The differential white blood cell count was reported in 21 of the cases in whom a total count was recorded. Apart from the patient mentioned above, eosinophils were reported as normal or absent in 9 cases, and as 0.6 per cent, 1.5 per cent, 2.0 per cent, 3.0 per cent (3), 4.0 per cent (2), and 8 per cent in the others.

The haemoglobin was reported in 16 cases. In only one case was an anaemia (iron-deficiency, 59 per cent haemoglobin) reported. The patient with pernicious anaemia had a value of 100 per cent. The other cases fell within the ranges 90–100 (7 cases), 100–120 (5 cases), 120–140 (2 cases).

The blood group was reported in six cases only—3 were A, 2 were O, and one B.

Serum agglutinations were performed in three cases, proving negative to brucellosis, glandular fever, and "virus" (unspecified).

Skin sensitivity tests were reported as negative to dusts and fungi in two cases, and positive in four: a mixed extract of moulds;

Cladosporium herbarum; *B. typhiflavium*; and aspergillus, cladosporium, mucor, penicillium, and mixed grasses.

Mantoux and Heaf tests were reported also—four negative and three positive. Mantoux reversion has been reported in this condition; the details of dilution and stage of the disease at the times of these tests were insufficient to be of any value.

Bronchoscopy was reported in four cases. In all these, the report was “no evidence of tuberculosis or neoplasm”—three macroscopic and one microscopic.

While not strictly pathological reports, it is convenient to record here that in one case lung fibrosis was shown by tomography; in another a minor saccular bronchiectasis was proved by bronchogram after the patient's third attack and four years after his original attack; and that a normal electrocardiogram was recorded during the differential diagnosis in four patients.

Respiratory functions tests were reported in 11 cases. One is noted in the section on x-rays above. Wright peak flowmeters were used for the others.

In two cases, “before and after” figures were reported to us from the experimental inhalation, after full recovery from the illness, of a dust similar to that which had provoked the original illness. Figures (litres per minute) were 480 → 425, and 520 → 510. No opinion is here offered on the significance of the reductions. However, the aetiological significance of the dust can be regarded as fully proven—both patients became ill, one for a week. This procedure is not recommended, experimentally at least; though of course it occurs naturally, if the farmer returns to his work unwarned, or against advice.

Peak flowmeter readings in the acute stage, and later during and after recovery, were reported from nine cases. These were very informative. Three of these are quoted:

Case 114. Cough, headache, and shortness of breath shortly following threshing a rick of heated barley (and corn grinding on the same day). Reported to his general practitioner 4 days later, in partial recovery; reading 420 l/min. After a week's treatment, he re-exposed himself at corn grinding, and the next day rang for a visit saying that he had not the breath to drive his car to the doctor's surgery. On examination in bed, he looked perfectly fit, the only abnormal physical sign being a slight loss of chest expansion. The maximum of five flowmeter readings was 220 l/min. and the minimum 170 l/min. Two days later, a chest x-ray was reported as normal. A subsequent test has shown him capable of 495 l/min.

Case 115. This patient developed the same symptoms the evening after threshing the same rick as case 114. He consulted his general practitioner next day, and on the second day of his treatment recorded an average of 560 l/min. At the point of return to subjective normality a week later, he averaged 680 l/min. A subsequent test has shown him capable of 790 l/min.

Another case reported by a Cornish colleague, but not recorded in detail

and therefore not included in the numbers of this survey, became ill with severe dyspnoea, cough, and chest pain after a couple of weeks of daily indoor cattle-feeding with musty hay, and on the 10th day of his illness averaged 380 l/min. At the point of subjective stabilisation, 5 months later, he was capable of 460 l/min. Recovery is incomplete.

These few tests have been reported in some detail, as we believe that this easily portable instrument is of the greatest value to the general practitioner, both in deciding (and objectively recording) the degree of severity of the illness, and in checking progress, as well as in evaluating the problem of an apparently ill patient with an apparently normal radiograph.

Another patient, aged 19, was reported to us as having been investigated at a teaching hospital. The report was in summary, but is interesting. "Haemoglobin 100 per cent; x-ray small heart, chest clear; ECG inverted T waves V1 and V3; vital capacity 1.5, reserve 0.55, tidal vol. 0.51., resp. rate 21/min., mixing efficiency (helium) 41 per cent, MBC 66 l/min. at 76 R/min." These bare details again confirm a respiratory abnormality, and again without radiological evidence.

Biopsy of lung was performed on two patients in this series—one by bronchoscopy and one by thoracotomy. The former is reported as "chronic granulomatous lesion of the bronchus with ulcerated surface and a necrotic structureless debris. No tuberculosis or carcinoma". The latter is reported as "a nodule of fine fibrous tissue with diffuse fibrosis in surrounding lung. No evidence of malignancy", and "band cells, plasma cells, and giant cells present; there is no necrosis; acid-fast bacilli not found". The macroscopic appearance of the rt. upper lobe was of "diffuse fibrosis".

Kveim tests were reported as negative in two patients of this series. Biopsy of a lymph node in one case was also reported "to exclude sarcoidosis".

Post-mortem examination was reported in one case. The cause of death was coronary thrombosis and infarct of the right cerebral hemisphere. Death occurred 6 months after onset of the illness of "farmer's lung", and the pulmonary appearances are recorded as "extensive lung fibrosis, not suggestive of pneumoconiosis".

A further case came to our notice (but has not been included in the series) of post-mortem and inquest. The histological findings (which included fibrosis) are to be reported elsewhere (Lecutier, 1960), but the verdict of the inquest was that the patient "died from the industrial disease of 'farmer's lung'". As we have no knowledge of this verdict having been published in the medical literature, we record it here.

From these pathological reports we conclude (*a*) that again this series did not include numbers of other illnesses in error; (*b*) that a number of the patients are very puzzling to their general practitioners, and even perhaps to the consultants to whom they are referred,

and necessitate a number of "eliminating investigations"; and (c) that fibrosis of lung is now recorded in this condition. This fact may be of administrative, rather than medical value (Industrial Injuries Act, Sect. 57—3 and CMD 8866 H.M.S.O.).

A number of pathological observations were recorded in the notes of the Welsh series. As the methods and conditions of reporting differed materially from those in the general practitioner cases, we do not detail them here. However, we can report that the general results of sputum, blood, and skin tests (tuberculosis and sarcoidosis) almost exactly parallel those of our series.

7. *The course and results of the illness (general practitioner cases)*

The length of the course of the illness was recorded in 111 cases.

Less than 1 week	..	..	..	..	..	8 cases
1 week — 1 month	..	..	..	..	..	28 cases
1 month — 3 months	..	..	..	..	..	31 cases
3 months — 6 months	..	..	..	..	..	29 cases
6 months — 1 year	..	..	..	..	..	10 cases
More than 1 year	..	..	..	..	..	5 cases

Of the five cases where the illness lasted longer than one year, two are classified as "not recovered" at 5 and 4 years respectively.

The length of course was recorded in 46 of the "rapid-onset" cases. Twenty-five of these illnesses lasted one month or less, and six of them 6 months or more.

The length of course was recorded in 30 of the "insidious-onset" cases. Four of these illnesses lasted one month or less, and six of them 6 months or more.

The illnesses with a rapid onset seem much the more likely to be favoured with a short course; but in those with an insidious onset the risk of a long illness is not so greatly in excess. For proper evaluation of this point, treatment must obviously be considered; because aetiology is as yet imprecise, treatment was not among the objects of this investigation.

With more than one quarter of the patients in this series ill for three months or longer, and one seventh of them ill for 6 months or longer, we conclude that "farmer's lung" is a severe illness.

Subsequent asthma and bronchitis. "Before and after" assessments were recorded for asthma in 58 cases, and for chronic bronchitis in 92 cases. Three patients were classified as suffering from asthma before their "farmer's lung", and being no worse after. Two patients are classified as suffering from asthma after their "farmer's lung" where none was known before. Three patients are classified as suffering from chronic bronchitis before and after their "farmer's lung", and nine are recorded as suffering from chronic bronchitis after their attack of "farmer's lung" where none was known before. In other words, almost ten per cent of

those assessed are considered to have developed chronic bronchitis as a sequel.

Final disability. The patient's disability remaining after recovery from the illness was assessed in four grades—nil, mild, moderate, and severe—and both to his own job (generally farm work with the possibility of further exposure to dust) and for other jobs. This assessment was made as a judgment only (i.e., no scale was stated), by the patient's general practitioner, when completing the record form. There were almost 100 assessors; but in more than half the cases the assessment has the benefit of long hind-sight, in that the general practitioner has had ample opportunity to observe his patient's capacity for work and liability to illness, in the interval between the attack of "farmer's lung" and the assessment. In this matter at least, a retrospective enquiry has certain advantages. (Table VIII.)

TABLE VIII
(GENERAL-PRACTITIONER CASES ONLY.) FINAL STATE IN 121 PATIENTS

<i>Disability</i>	<i>To own job</i>	<i>To other jobs</i>
Nil	51	62
Mild	25	13
Moderate	24	8
Severe	11	2

121 cases available for assessment. 111 were assessed to "own job" and 85 only to "other jobs". One patient died and was not assessed.

The significant finding here is that, although this series included a large number of mild cases (eight illnesses lasted less than 1 week, and 38 in all less than 1 month), more than half are assessed as having been left with some degree of disability to their own skilled job; nearly one tenth are assessed as having severe disability to that job. Between one fifth and one sixth are assessed as having been left with some degree of disability to any job. Chronic cor pulmonale is known to have developed in three of the disabled (and one of these died therefrom after assessment).

It is difficult to escape the conclusion that "farmer's lung" is a disease wherein the risk of permanent disablement is high, and the risk of death present.

8. *Additional information*

"Outbreaks" of the disease. Where the actual cause of a disease is unknown, and a potential cause is suspected, it is generally agreed that, if a number of persons are exposed together to that potential

cause, and several become ill together of the disease in question, then, so far as those patients are concerned, the potential cause is accepted to be the actual cause.

In the above account, the dust associated with onset of this illness has been treated as a potential cause. Three sets of cases in this series fulfil the requirements of the preceding paragraph. Statement of this occurrence, but with record-forms and clinical details of one of the cases only, is made nine times.

The first "outbreak" occurred in S.E. Yorkshire in September 1958, when six men spent a day and a half threshing "heated" barley under a Dutch barn. The man who fed the sheaves into the machine and the man who was removing the chaff and carrying the bags of corn were both ill with dry mouth, weakness, headache, and marked shortness of breath, necessitating a week off work. The other four men all had the same symptoms, but did not stay off work. (Cases 68, 69).

The second occurred in Dumfriesshire in November 1958, when three agricultural students and a young farmer were threshing "spoiled" oats. All became ill immediately following the work, with symptoms of headache, dry throat, cough, oppression of the chest, and shortness of breath. Three of the four had recovered in a week, but the fourth was ill for 6 months. His first x ray 6 weeks after onset was reported as "typical" of this disease, and the last, 5 months after onset, was reported as showing "no further deterioration, though still not normal". (Cases 168, 169, 170, 171.)

The third "outbreak" occurred in Cornwall in October 1960, when seven men were threshing "heated" barley under a Dutch barn. Three of the men were ill that night with severe headache, tight chest, cough, and shortness of breath. One did not report to his doctor, one was off all work for 2 days and worked only 2 hours daily for the next week, and the third had an illness lasting 3 weeks during which he worked part-time, against his family doctor's advice. (Cases 114, 115.)

The 12 known episodes of multiple exposure caused 17 illnesses of which we have records, and are stated to have caused ten further illnesses of which we have no records. Thus 17 of the 147 cases described in the clinical part of this report (11.5 per cent) occurred in circumstances where there can be no doubt as to the actual cause of their illness.

Discussion

A number of conclusions have been made, and follow the sections wherein the evidence for them is presented. We shall not recapitulate here.

It was perhaps a mistake in our planning that the whole of the

United Kingdom was not covered by the questionnaire. However the several methods used did in fact give "cover by scatter" sufficient to show that major differences in case-experience were not missed.

The demonstrated differences in the seasonal and geographical distribution of cases are, we believe, caused by factors of meteorological and agricultural, but not biological, origin. The types of crops, methods of harvesting, traditions of use and storage of harvest products, stock-handling practices, and buildings, and the differences imposed thereon by the type of farming, altitude, and rainfall, in our opinion account for the whole variation. More rain falls on western uplands, and more often, than on eastern plains. Smaller western crop acreages are slower harvested by manpower: crops lie longer outdoors to spoil. Machinery to speed work is more economic on broad flat lands. In smaller under-capitalized holdings, ventilation in building is less, and the likelihood of dust is greater.

The question of whether this disease is of one kind, or whether it should be subdivided into syndromes, has been discussed above. We believe that the large number of cases in this series allows the conclusion that we there made: that all are cases of one disease. We have shown the potential danger (an illness of 6 months duration with possible permanent disorder) that can follow a single day's exposure in a particular job.

We have given evidence to support the conclusions of others to the effect that an apparently clear chest x-ray does not exclude the diagnosis of this disease. We believe that this fact should be more widely recognized. We also believe that portable apparatus for lung-function tests is most valuable for diagnosis, management, and prognosis—and perhaps in administration.

Summary

(1) The literature and history of this condition is briefly reviewed. Distribution over much of the northern hemisphere is recorded.

(2) The aims and methods of this survey are described and discussed.

(3) 444 cases were notified, and 191 clinical case-histories were studied. Information is collated under various headings.

(4) Evidence is presented on the distribution of cases between town and country, and between three chosen areas of special interest. Correlation with rainfall, both in geography and season, is shown, and a probable explanation offered.

(5) Evidence is presented that the cases in this series were in fact "farmer's lung", and that other diseases were not being mistaken for this syndrome. Presumptive proof of the causative effect of inhaled dust is offered for above ten per cent of the general-practitioner series.

(6) The symptomatology is tabulated, the possibility of the occurrence of two separate syndromes is suggested, examined, and rejected.

(7) Evidence is recorded that illness and pulmonary dysfunction may be severe in the presence of a normal radiograph. Suggestion is made that portable apparatus for "screening-type" lung function tests, together with an industrial history, may overcome this problem. A plea is made for the wider use of these tests, and for the recording of their results.

(8) An analysis of age, sex, general occupation, job at which exposure occurred, and source of dust, is presented from clinical case-records. We conclude that this syndrome is an industrial disease.

(9) Some evidence that pulmonary fibrosis may occur, and opinion that chronic bronchitis may follow recovery, is presented. Histories of multiple attacks (both of several persons made ill at one time, and of one person made ill on several occasions), of long periods of illness, of permanent disability, and death, show that this industrial illness can be of great severity.

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buted to our presentation. We thank all our contributors, jointly, for their work, and for all the information without which this paper could not have been written. We wish to record our admiration of the standards of clinical note-keeping and reporting of which we have had such abundant evidence.

Our results, our presentation, and our conclusions are our own, and do not necessarily represent the opinions of any of the authorities or institutions herein mentioned.

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Hospital Medical Staffing (The Platt Report)—A General Practitioner's Opinion.

Under this heading, the *British Medical Journal Supplement* (29 April 1961) reports comments by Dr A. Talbot Rogers of the General Medical Services Committee, as follows:

“ . . . There must be a place in the hospital for the general practitioner who had the necessary training and could so organize his life as to give adequate time to hospital work. He must be welcome there as part of the consultant team and not there on sufferance. It was asking a lot of him to give part of his life to work in the hospital. He had to arrange his practice accordingly and could do so only if he had some security of tenure. The status and remuneration he was given must make it worth his while. Experience had shown that a general practitioner in a hospital could be in charge of house physicians. . . . ”