

# Farmer's lung in Northern Ireland

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## Abstract

**A total of 381 farmers in Northern Ireland were studied using a questionnaire, pulmonary function tests, and antibody levels to *Micropolyspora faena* to assess the incidence of farmer's lung. Twenty (4.9%) had a history of a previous diagnosis of farmer's lung by their doctor. Forty four (10.4%) had delayed onset symptoms compatible with farmer's lung, 32 (7.9%) had precipitant antibody, and 61 (15%) had raised antibody by the enzyme linked immunosorbent (ELISA) method. Restricted lungs were present physiologically in 40 (9.8%). A confirmation of delayed symptoms and precipitant antibody was present in seven (1.7%) whereas delayed symptoms and ELISA antibody was present in nine (2.2%). Using either antibody method only two (0.5%) had a combination of antibody to *M faenae*, delayed onset symptoms, and restricted pulmonary physiology.**

Farmer's lung is recognised as an intrinsic alveolitis<sup>1,2</sup> and the classic textbook description of this illness includes a history of delayed onset dyspnoea, cough, influenza like symptoms in the acute stage, and perhaps weight loss and haemoptysis in the later stages.<sup>3</sup> In the acute stage fever may be present and crepitations audible over the lung fields. The patients also typically have antibody to *Micropolyspora faenae* or mouldy hay antigens and their pulmonary function tests show a restrictive pattern.

As with most diseases, not all sufferers have all the features of the condition and this makes epidemiological work difficult. This is especially so in a disease of the respiratory system in view of general high levels of respiratory morbidity from cigarette smoking and asthma. From 15% to 38% of farmers with clinical farmer's lung do not have precipitin antibody to *M faenae* in their blood.<sup>1,4</sup> Disease in these patients may be due to activation of complement by the alternative pathway which does not require antibody,<sup>4</sup> although more sensitive methods may demonstrate antibody in some of them. It has also been

shown that precipitin antibody may be present in about 18% of otherwise healthy farmers.<sup>1</sup> There is evidence, however, that lung biopsy of such patients may disclose alveolitis.<sup>5</sup> The use of a more sensitive method for antibody estimation may therefore disclose more subclinical patients.

We have assessed the incidence of farmer's lung in Northern Ireland using a questionnaire, antibody estimated by both the precipitant<sup>1</sup> and enzyme linked immunosorbent assay (ELISA),<sup>6</sup> and the pulmonary function testing.

## Methodology

Altogether 506 farmers were randomly selected from the 25 000 registered farms in Northern Ireland. When communication was established it was discovered that nine were dead and 34 had retired from farming. Six farmers were in hospital or generally unwell from non-respiratory disease. The one selected woman was excluded. Twenty nine farmers refused to take part in the study for various reasons. It was not possible to contact 25 farmers, usually because the owner was only a part time farmer or the farm could not be found. Thus of those working farmers potentially suitable for the study 406 (88.7%) participated.

Each of the 406 farmers donated 10 ml of venous blood. Serum was stored at -20°C. An antigen was prepared from cultured *M faenae*.<sup>7</sup> The Ouchterlony plate double diffusion method<sup>8</sup> was used to measure precipitating antibody. The enzyme linked immunosorbent assay (ELISA) was used to estimate IgG antibody in a serum dilution of 1:100 using PB5/TWEEN 20 containing 3% bovine serum albumin (J Langlands, personal communication). The mean optical density reading on four aliquots was recorded. Using this method in 75 urban blood donors in Northern Ireland, the mean optical density reading was 0.259 (SD 0.027).

Spirometry was performed using a dry spirometer (Vitalograph). Twenty five (6%) of the patients produced unsatisfactory tracings and these were discarded, leaving 381 spirometry results for analysis. The mean of three readings for the forced vital capacity in one second (FEV<sub>1</sub>) and forced vital capacity (FVC) were made and the ratio (FEV<sub>1</sub>/FVC) calculated. The predicted values for age and height were taken from Coles's reference value.<sup>9</sup> A restrictive defect was considered present if the FVC was less

than 80% predicted and the FEV<sub>1</sub>:FVC ratio was more than 80%.

The only symptoms significantly related to the presence of antibody to *M faenae* are delayed onset cough and chills (C F Stanford *et al*, unpublished data). In the present paper we have used these as indicators of alveolitis symptoms.

Statistical tests such as analysis of variance, linear regression, and chi-squared were carried out using the SPSS statistical package.

## Results

Thirty two (7.9%) of the 406 farmers had precipitin antibody to *M faenae* and the mean ELISA optical density reading was 0.25 (SD 0.44). An analysis of variance technique showed a highly significant relation ( $p < 0.0001$ ) between the presence of precipitin antibody and the ELISA optical density reading.

Thirty six (8.9%) of the 406 farmers gave a history of delayed onset cough and 19 (4.7%) of delayed chills some hours after working with hay. Forty three (10.6%) had a combination of these symptoms. Small or restricted lungs were present in 10.5% of the farmers and 20 (4.9%) had a history of a diagnosis of farmer's lung before the survey was carried out.

The table shows the above results and the numbers of farmers who had a combination of antibody and symptoms or antibody, symptoms, and restricted lungs. It is noted that although more farmers had antibody measured by the ELISA method, the numbers with antibody and symptoms or antibody, symptoms and small lungs were similar for either method of antibody estimation.

## Discussion

It may be seen from the results that the prevalence of farmer's lung in Northern Ireland in 1985 may be variously estimated as between 500 and 15 000 per 100 000 depending on which criteria are used to make the diagnosis. The highest value taken from the ELISA antibody result probably indicated the "at

risk" or sensitive group, many of whom will have subclinical disease whereas the smallest number, comprising those with symptoms, antibody, and abnormal physiology represents those with established chronic disease with restricted lungs. Since the survey was done in the early autumn, it is unlikely that any of the farmers were suffering from acute disease at the time of the survey. Precipitin antibody to *M faenae* tends to fall over a 16 month period after exposure to antigen ceases but complement fixing antibody persists.<sup>10</sup> This latter persistence may also apply to the antibody measured by the ELISA method and hence its presence would indicate farmers exposed over a greater number of years. Interestingly, although the ELISA method shows the extent of sensitivity to *M faenae*, both it and the precipitin method produce the same results when clinical and physiological considerations are taken into account.

Surveys in other parts of the United Kingdom show different prevalences of the diseases depending on the method of survey. Thus Staines and Forman in a general practitioner and chest clinic survey estimated the prevalence in East Anglia to be 11.5 per 100 000 whereas that in Devon was 73 per 100 000 and 193 per 100 000 in Wales.<sup>11</sup> In surveys of randomly selected farmers Morgan *et al* found exposure to hay related symptoms in 11 700 per 100 000 in Devon and 12 900 in Wales.<sup>12</sup> When symptoms were combined with precipitin antibody the prevalences were 2200 and 5400 respectively. Grant *et al* described hay related symptoms in 2300 per 100 000 farmers in East Lothian and 8600 in each of Orkney and Ayrshire.<sup>13</sup> When symptoms were combined with precipitin antibody the prevalence was zero, 4300, and 3600 per 100 000 respectively. In north west Ireland Shelley *et al* found a symptomatic prevalence of 2600 and when combined with precipitin antibody this fell to 583 per 100 000.<sup>14</sup> The Northern Ireland prevalence results for symptoms (10 600 per 100 000) and symptoms combined with antibody (1700 per 100 000) are of the same general order of magnitude.

Medical and public health knowledge about farmer's lung has been widespread from the mid-1960s. In view of the fact that the disease is preventable by the use of effective masks or dust control measures,<sup>15</sup> it is a matter of concern that the prevalence is not lower. The farming community is probably the only major industry that does not have specialised industrial medical officers and yet in Northern Ireland, at least, agriculture is the biggest source of employment. By its widespread, often isolated, nature and individual ownership, supervision by an industrial medical service such as that in other concentrated industry might not be possible. It is, however, time for improved coordination of the services available to try to reduce this ill health in farmers.

Numbers of farmers with clinical, serological, and physiological changes consistent with farmer's lung

	No (%)
Previous diagnosis of farmer's lung	20 (4.9)
Delayed postexposure symptoms	44 (10.4)
Precipitin antibody to <i>Micropolyspora faenae</i>	32 (7.9)
ELISA antibody OD > 3 SD above control	61 (15.0)
Restricted lungs	40 (9.8)
Delayed symptoms and precipitin antibody	7 (1.7)
Delayed symptoms and raised ELISA antibody	9 (2.2)
Delayed symptoms, precipitin antibody, and restricted lungs	2 (0.5)
Delayed symptoms, raised ELISA OD, and restricted lungs	2 (0.5)

OD = Optical density.

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Accepted 24 July 1989

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