Occupational Hypersensitivity Pneumonitis
Reported to the Czech National Registry of
Occupational Diseases in the Period 1992–2005

Zdenka FENCLOVÁ1, 2, Daniela PELCLOVÁ1*, Pavel URBAN1, 2, Tomáš NAVRÁTIL1, 3,
Pavlína KLUSÁČKOVÁ1 and Jindřiška LEBEDOVÁ1, 2

1Charles University in Prague, First Faculty of Medicine, Department of Occupational Medicine of First Faculty
of Medicine and General Teaching Hospital, Na Bojišťi 1, 120 00 Prague 2, Czech Republic
2National Institute of Public Health, Šrobárova 48, 100 42 Prague 10, Czech Republic
3J. Heyrovský Institute of Physical Chemistry of AS CR, v.v.i., Dolejškova 3, 182 23 Prague 8, Czech Republic

Received December 21, 2006 and accepted January 27, 2009

Abstract: Between 1992 and 2005, 72 cases of occupational hypersensitive pneumonitis were
reported to the Czech National Registry of Occupational Diseases. This represented 0.24% of
all occupational diseases reported in the Czech Republic during that period. The greatest num-
ber of cases occurred in 1997 (10 cases), of which men constituted 58.3% (42 cases) and women
41.7% (30 cases). The most prevalent cases were farmer’s lung (50 cases), malt worker’s lung
(7 cases) and chemical worker’s lung (6 cases). Agriculture was the most common economic
activity (total 48 cases), with cattlemaster and dairyman (total 26 cases) the most frequent occu-
inations; less common were tractor driver (8 cases) and maltster (7 cases). Typical case reports
after different exposures are presented. A peak in frequency was observed in the age groups of
45–49 and 50–54 yr (20.8% and 19.4% of cases, respectively) and within the first four years of
employment (22.2% of cases). Median age was 48 yr and median exposure 12.5 yr. Incidence
was in the range of 0.00–0.20 per 100,000 workers, which appears rather low. Due to the diffi-
cult diagnostics of hypersensitive pneumonitis, the actual number of cases is undoubtedly high-
er, and this disease is probably under-reported.

Key words: Hypersensitivity pneumonitis, Incidence, Branch of economic activity, Occupation, Age,
Exposure

Introduction

Hypersensitivity pneumonitis (HP), also known as
extrinsic allergic alveolitis, is a group of related granulo-
matous, inflammatory and immunologically mediated
interstitial lung diseases in the distal bronchioles and alve-
oli that result from hypersensitivity immune reactions to
repeated inhalation of various antigens derived from fun-
gal, bacterial, animal and vegetable protein, or reactive
chemical sources1, 2. The most common antigens are
thermophilic actinomycetes and avian proteins, with the
most common diseases being farmer’s lung and bird fanci-
er’s lung3, 4.

The disease may present as an acute, subacute or chron-
ic illness. In the acute form, influenza-like symptoms
often predominate, consisting of chills, fever, sweating,
myalgias, lassitude, headache and nausea that begin 2 to
9 h after exposure, peaking typically within 6 and 24 h,
and last from several hours to days. Respiratory symp-
toms such as cough and dyspnoea are common but not
universal2. The subacute form may appear gradually over
several days to weeks. It is marked by cough and dysp-
noea, and may progress to severe dyspnoea and cyanosis,
leading to urgent hospitalization. The chronic form has
an insidious onset over a period of months, with increas-
ing cough and exertional dyspnoea. Fatigue and weight
loss may be prominent symptoms. Significant predictors
of HP are as follows: exposure to a known offending anti-
gen (the most important predictor), symptoms 4–8 h after exposure, positive precipitating antibodies, and recurrent episodes of symptoms, inspiratory crepitant rales and weight loss3).

Diagnosis is based on a combination of the patient’s clinical history, physical examination, chest radiography and high-resolution computed tomography (HRCT) abnormalities, bronchoalveolar lavage (BAL) cell analysis, lung function tests with a decrease in the diffusion capacity of the lung for carbon monoxide, immunological tests and lung biopsy, if necessary2).

The prevalence of HP in the Czech Republic is not known. A range from 0.4% to 37.5% has been reported in other countries, depending on diagnostic method, type of exposure, various forms of HP, region, climate, season, farming practices, etc2, 3, 5–14).

Data on the incidence of HP are very rare. Only a few studies have been published around the world on the incidence of the disease in exposed populations, due to difficulties in studying its epidemiology. The standardized annual incidence of farmer’s lung leading to hospitalization during 1980 in Finland was 50 per 100,000 persons employed in farming15). In contrast, in a population-based study in New Mexico, the estimated annual incidence of HP was reported as 0.6 per 100,00016).

Moreover, a comparison of the incidence of occupational HP in individual countries is not entirely possible at present, given that each state has specific legislative procedures and differing clinical criteria for acknowledging and reporting the occupational diseases mentioned above2, 17–20).

The aim of our study was to estimate the incidence of occupational HP in the Czech Republic in the period 1992–2005, to describe the distribution of cases by gender, branch of economic activity, occupation, age and exposure, and to present some typical cases in different occupations.

### Materials and Methods

We analyzed HP acknowledged as an occupational disease in the Czech Republic during the period 1992–2005.

The source of data was the Czech National Registry of Occupational Diseases operating at the National Institute of Public Health in Prague21), which monitored information on diagnosis, gender, economic activity, occupation, age and exposure in each case. Inclusion criteria for this study were all cases of HP acknowledged as an occupational disease by 18 centres of occupational diseases at university or regional hospitals in the Czech Republic.

Diagnostic criteria are as follows: exposure to typical antigens known to cause HP confirmed by an occupational hygienist for every patient, typical clinical symptoms and findings and their development, ventilatory impairment with a decreased transfer factor, lymphocytosis in BAL, and an HRCT finding typical for HP. A positive agar precipitation reaction, if available for the antigen, was considered a supporting factor. Subjects from different occupational environments are presented.

### Results

Table 1 presents the total number of cases and the incidence of all occupational diseases and HP acknowledged as an occupational disease in the Czech Republic from 1992 to 2005.

Altogether, 72 cases involving 8 different diagnoses of HP were recognized. This represented 0.24% of all occupational diseases reported throughout that period in the Czech Republic.

The absolute number of occupational diseases in the Czech Republic has exhibited a decreasing trend since 1992. New cases of occupational HP were reported only sporadically. The greatest number of cases occurred in 1997 (10 cases).

Table 1. Number of cases and incidence of all occupational diseases and of occupational hypersensitivity pneumonitis in the Czech Republic in the period 1992–2005

<table>
<thead>
<tr>
<th>Year</th>
<th>Total N (%)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>3,393</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>2,983</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>2,675</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>2,806</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>2,519</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>2,350</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>2,054</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>1,845</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>1,691</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>1,627</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>1,531</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>1,486</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>1,329</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>1,340</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>29,629</td>
<td></td>
</tr>
</tbody>
</table>

| OHP  |             |   |
| 1992 | 6           |   |
| 1993 | 8           |   |
| 1994 | 8           |   |
| 1995 | 6           |   |
| 1996 | 4           |   |
| 1997 | 10          |   |
| 1998 | 4           |   |
| 1999 | 4           |   |
| 2000 | 5           |   |
| 2001 | 2           |   |
| 2002 | 3           |   |
| 2003 | 7           |   |
| 2004 | 5           |   |
| 2005 | 0           |   |
|     | 72          |   |

OD – all occupational diseases; OHP – occupational hypersensitivity pneumonitis; N – number of patients.

Industrial Health 2009, 47, 443–448
The most frequent cases were farmer’s lung (50 cases), malt worker’s lung (7 cases) and chemical worker’s lung (6 cases), of which men constituted 58.2% of the cases and women 41.8% (Table 2). Agriculture was the most common economic activity (total 48 cases) with cattleman and dairymen (total 26 cases) the most common occupations (Tables 3 and 4).

After stratification by age group, HP was most commonly observed in the age group of 45–54 yr (total 29 cases). The youngest patient was 24 yr old and the oldest 62. The shortest duration of employment in a workplace at risk amounted to 2 months (in malt worker’s lung); the longest was 40 yr (in farmer’s lung). The median age was 48 yr and median exposure 12.5 yr. About 22.2% of patients acquired the disease within the first four years of employment (Table 5).

Case reports of typical patients

A 34-yr-old maltster (smoker of 20–30 cigarettes a day) worked occasionally with mouldy barley. After 5 months, he began to feel tired at the end of his shift, was coughing and feeling chills. He was treated for a supposed common cold. At the physical examination both crepitation and wheezing were present above the left lung base; a chest x-ray showed a disseminated process in both lungs. On ventilatory examination there was a restrictive

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total OHP</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>10</td>
<td>4</td>
<td>10</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>0</td>
<td>72</td>
<td>(100.0)</td>
<td>N (N)</td>
</tr>
<tr>
<td>Men</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>42</td>
<td>(58.3)</td>
<td>N (N)</td>
</tr>
<tr>
<td>Women</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>30</td>
<td>(41.7)</td>
<td>N (N)</td>
</tr>
<tr>
<td></td>
<td>N (%)</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OHP – occupational hypersensitivity pneumonitis; * – causative antigen diisocyanate; N – number of patients.
disorder, with the transfer factor within a normal range. The agar precipitation reaction to common antigens was negative. Maltster’s lung was acknowledged, but the maltster was not removed from the workplace. Four years later he had a relapse after repeated exposure to mouldy barley. This time, the agar precipitation reaction was positive (Aspergillus, S. rectivirgula); the patient’s chest x-ray showed increased bronchovascular marking, with lung functions indicating an obstruction disorder with a normal transfer factor. Ten years later, the x-ray was normal with a severe obstructive ventilatory disorder and normal transfer factor.

A 62-yr-old tractor driver (non-smoker) presented repeatedly with fever, cough and dyspnoea after exposure to mouldy hay and straw. After the initial attacks he improved spontaneously, but later on dyspnoea persisted. Crepitation could be found on auscultation above the lung bases, in addition to a mild restrictive ventilatory disturbance and severe decrease in the transfer factor (30% of the predictive value). Increased bronchovascular marking and reticulonodular opacities were seen in the lower lung fields. Bronchoscopy showed only diffuse bronchial inflammation, but lymphocytosis (62%) was found in BAL. The HRCT documented interstitial lung fibrosis. Despite the agar precipitation reaction for common antigens being negative, farmer’s lung as an occupational disease was acknowledged.

A 47-yr-old cow breeder (non-smoker) felt dyspnoea and chills and was coughing after returning from work. Her symptoms disappeared during her two week’s of temporary disability, but re-appeared after coming back to work. She presented with wheezing and crepitation above the lung bases, and her chest x-ray showed increased bronchovascular marking at the lower parts of the chest. A restrictive ventilatory disorder with medium grade impairment of the transfer factor was noted. The agar precipitation reaction was positive (S. rectivirgula), and farmer’s lung caused by mouldy hay and straw was acknowledged. Twelve years later she had no symptoms, with the x-ray showing a very mild increase in bronchovascular marking and only a slight decrease in the transfer factor.

A 39-yr-old worker (smoker of 10 cigarettes a day) had been working for one month with methylene diphenyl 4,4’-disocyanate (MDI) during the production of elastic bricks, which involved heating MDI in a room without ventilation. He presented with fever (38°C), dry cough, dyspnoea and fatigue about 4–6 h after the end of his shift. The symptoms always resolved during the night, but re-appeared 5 times after new exposure over the course of 7 months. He was twice treated with antibiotics, but his dyspnoea became permanent. On physical examination, tachypnoea, crepitation and rhonchi were present. A lung function examination revealed a severe restrictive disorder with mild impairment of the transfer factor. On the chest x-ray, mild opacities in the upper and lower lung fields were found. The proportion of lymphocytes in BAL was 84% (with 89% of CD8).
CD4/CD8 ratio was 0.089. Mild small-size opacities and ground glass opacities corresponding to alveolitis were visible on the HRCT of the lungs. The patient was excluded from exposure to MDI and treated with prednisone. Isocyanate lung was acknowledged as an occupational disease. One year later, a chest x-ray showed a normal finding and HRCT a regression. In addition, lung functions and transfer factor had normalized.

A 44-yr-old worker (non-smoker) experienced chills, fever (39˚C) and cough after having worked for two week’s with mushroom production substrate (mushroom mycelium, straw, poultry excrement and soil). The symptoms resolved during the night, but re-appeared after substrate exposure. There was crepitation and expiratory wheezing on the chest base, and the chest radiograph showed mild opacities in both lungs, mostly prominent in the basal part of the left lung. A mild restrictive disorder and mild decrease of the transfer factor were determined. The percentage of lymphocytes in BAL was 32. According to the HRCT, signs of subacute alveolitis, especially on the left side, and of interstitial lung fibrosis were present. The agar precipitation reaction to common antigens was negative. Lung biopsy confirmed a combination of fibrotizing alveolitis with granulomas with bronchiolitis obliterans. The patient was removed from his workplace and treated with prednisone, and mushroom-worker’s lung was acknowledged as an occupational disease.

Discussion

As our data show, occupational HP occurred only sporadically in the Czech Republic between 1992 and 2005. A limitation of the study is that the incidence in the population exposed to risk factors of occupational HP cannot be calculated, since the total number of exposed subjects in the country is not known, as in other countries.

Occupational HP induced by isocyanates was diagnosed for the first time in the Czech Republic in 199522, 23). Farmer’s lung was among the most frequently reported diseases during this time period. Cattlemen or dairymen ranging in age from 45 to 54 yr, exposed to organic dust minimally for one year, belong to the occupations most endangered by HP in the Czech Republic.

However, the fact that the occurrence of occupational HP in the Czech Republic has been relatively sporadic is not particularly heartening, since unfortunately the reported state was not really achieved by positive factors such as elimination of occupational risks, improvement of the working environment, conditions and safety, and measures aimed at promoting health at work, or the improvement of occupational healthcare. Our experience showed that medical care for employees, for farmers as well as tradesmen, has worsened over the last fifteen years. A deterioration of the situation has been also observed in other above-mentioned parameters.

Impairment of diagnostics in the late nineties might have resulted from the breakup of large companies and change in the occupational medicine system due to the collapse of the socialist political system. Additionally, surveillance of employees in small enterprises is performed mostly by general practitioners with relatively little experience in diagnosing allergic lung diseases. Furthermore, a considerable number of patients underreport their symptoms, either from fear of losing their jobs or, on the other hand, because being self-employed they do not pay their own social security for occupational diseases.

In fact, diagnosing this disease is often very difficult even for an experienced physician, because the patients underestimate and get over their symptoms, and then come late to medical examinations. Moreover, appropriate attention is not paid by physicians to patients’ occupational histories, and therefore they frequently do not take into consideration the etiology of this type of disease within the framework of differential diagnosis.

This is also why we consider it important to inform both healthcare specialists and the general public of the danger of HP so that patients with suspicion of HP are sent as early as possible to specialized centres of occupational diseases for diagnostic examination and removal from the noxious environment. Information concerning economic sectors, occupation, age, type of exposure and latency should help focusing on groups of subjects at risk and starting the appropriate intervention.

Conclusion

The incidence of occupational HP in the Czech Republic in the range of 0.00–0.20 per 100,000 workers appears rather low. However, the situation concerning the occurrence of occupational HP is far from satisfactory. In our opinion, the actual numbers of reported occupational HP in 1992–2005 underestimate the current situation and do not correspond to the real numbers of affected persons. Therefore, we surmise that HP is and will continue to be a real problem in our country.

Acknowledgement

This research was supported by the Czech Ministry of Education, Project No. MSM0021620807. We would like to thank Prof. Steve Diskin, PhD, for his linguistic assistance.
References