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Non-malignant occupational respiratory diseases in Germany in comparison with those of other countries

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Abstract *Objective*: To present recent data on the occurrence of non-malignant occupational airway diseases in Germany and to compare mainly affected occupations of obstructive airway diseases caused by allergens and irritants with available surveillance data from other countries. *Methods*: Sources of German data were statistics for the year 2003 of the Ministry of Labour and Social Affairs and of the federation of statutory accident insurance institutions for the industrial sector. *Results*: Confirmed cases of non-malignant occupational respiratory diseases in Germany are mainly benign asbestos-associated diseases (occupational disease no. 4103: 1,975 cases), silicosis/coal worker's pneumoconiosis (occupational disease no. 4101: 1,158 cases), obstructive airway diseases due to allergens (occupational disease no. 4301: 935 cases), chronic obstructive bronchitis and/or emphysema in hard coal miners (occupational disease no. 4111: 414 cases), obstructive airway diseases due to irritants and toxic agents (occupational disease no. 4302: 181 cases), diseases caused by ionising radiation (171 cases), diseases due to isocyanates (occupational disease no. 1315: 55 cases), and 22 cases of other rare occupational lung and airway diseases. Miners, bakers, chemical workers, hairdressers and health care workers are mostly affected. Bakers were also frequently affected by occupational asthma in Finland, France, Sweden, the United Kingdom, the Piedmont region in Italy, South Africa, and New Zealand. Further, high frequencies of occupational asthma were reported for health care workers in France, Italy, New Jersey, Michigan, and South Africa. *Conclusion*: Despite completely different legal definitions and regulations, comparably high numbers of occupational obstructive diseases in western countries require better primary and secondary prevention in industries with high incidence, especially in bakeries, the health care sector, farming, and mining. Furthermore, there is a urgent need for harmonization of recognition and compensation systems for occupational diseases as well as of respective preventive strategies within the European Union.

Keywords Surveillance · Statutory accident insurance institutions · COPD · Occupational asthma

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Introduction

The prevalence of asthma and chronic obstructive pulmonary disease (COPD) in the general population ranges between 3 and 10% (Anto et al. 2001; Arif et al. 2002; Halbert et al. 2003). Recent publications attribute about 15% of all asthma as well as COPD cases to occupational origins (American Thoracic Society 2003; Arif et al. 2002; Bakke et al. 1991; Becklake et al. 1999; Kogevinas et al. 1999; Mak et al. 2001; Turpin et al. 2003; Viegi et al. 1991; Xu and Christiani 1993). The statistical bureau of the European Union, Eurostat, recently identified pulmonary disorders as the third most common work-related health problem, particularly in the mineral extractive industries (European Commission 2003). The general population burden of non-malignant respiratory diseases attributable to occupational agents varies considerably depending on the countries' predominant industries, employment conditions, preventive measures, etc. In addition, the methods of disease ascertainment and recognition differ among countries depending on legal definitions and regulations, administrative procedures, benefit structures, purposes of the reporting system, registration methods and applied diagnostic criteria (EUROGIP 2002).

In addition to these factors, diagnostic methods of individual physicians may differ depending on expertise and available diagnostic methods. For example, the gold standard for detection of occupational asthma—the inhalation challenge test—is only rarely performed, and in some countries it is not performed at all. Another problem in the ascertainment of occupational airway diseases is the healthy worker effect that leads to the selection of susceptible workers out of the workforce and progression of chronic respiratory diseases after cessation of exposure. Without a comprehensive surveillance program, work-related respiratory diseases may be under-reported and under-recognized.

In spite of these shortcomings, statistics on causative occupational agents and on the number of affected workers are important in order to initiate focused and effective preventive measures. In this paper, we review currently published statistics on non-malignant occupational respiratory diseases in various countries and compare these to the number of confirmed respiratory disease cases ascertained through the workers' compensation system in Germany. Moreover, measures to prevent occupational diseases of the respiratory system are suggested.

Methods

Regulations concerning occupational diseases and respective procedures performed by branch-orientated statutory accident insurance institutions

In Germany employers have to insure all workers for occupational diseases and accidents. As shown in Fig. 1, in Germany, physician's reporting of all suspected occupational disease cases is mandatory. Less frequently, employers, employees, employment offices and health insurance institutions report such cases. After a report on an occupational disease, the case is filed to the statutory accident insurance institutions that assess working contracts, exposure conditions, work-related risks of diseases. It may also include a comment from the state physician for industrial health and requests for a medical expert opinion based on a detailed medical examination. On the basis of the results of the investigation, the insurance claim is either accepted or rejected.

It is noteworthy that the detailed assessment and investigation by statutory accident insurance institutions of each claim frequently leads to rejection of the reported occupational disease claim; e.g., in 2003 56,900

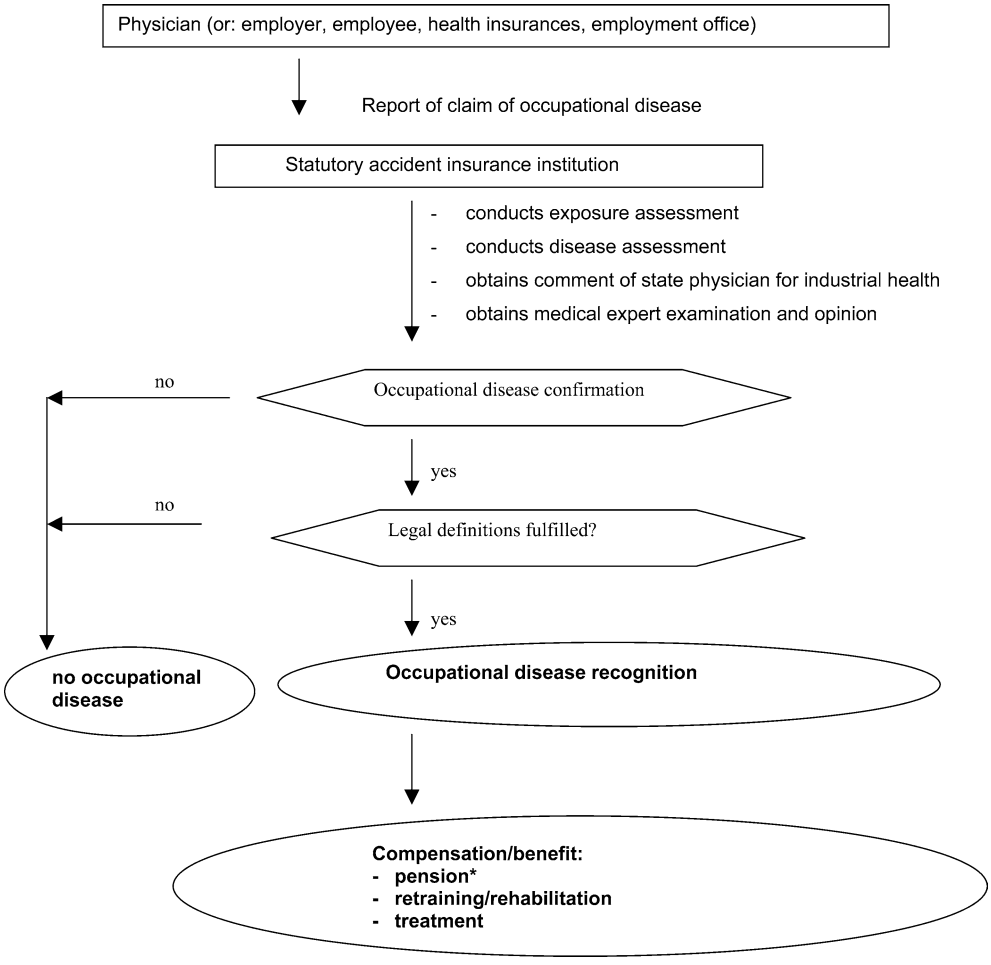

Fig. 1 Scheme of reporting occupational disease claims and subsequent procedures organized by statutory accident insurance institutions in Germany. For details, see text

claims but only 23,522 confirmed cases were filed by statutory accident insurance institutions for the industrial sector. Moreover, not all claims for recognition and compensation of an occupational disease fulfill the German legal definitions. In particular, one prerequisite of recognizing an obstructive airway disease due to allergens, irritants or isocyanates is that it has forced the affected person to refrain from all activities, which led or could lead to the development, aggravation or recurrence of the illness. A prerequisite of chronic obstructive bronchitis and/or emphysema of hard coal miners is the beginning of the disease after December 31, 1992 (retrospective clause; Table 1).

The recognition of an occupational disease usually results in benefits. If the worker has to give up his/her job, money will be paid for up to five years to compensate for the loss of income. If the disease-related impairment of the individual hypothetically available positions on the labour market is at least 20%, a pension is paid as long as this impairment exists. The degree of lung function impairment is decisive for its level (Fig. 1).

The German list of legal definitions of presently 69 occupational diseases includes 12 non-malignant lung and airway diseases (Table 1). In this paper, the broader term ''obstructive airway diseases'' is used instead of ''bronchial asthma''. Occupational obstructive airway diseases involve occupational allergic rhinitis (see definition of disease no. 4301), occupational asthma and COPD due to allergenic substances (disease no. 4301, sometimes also disease no.1315), occupational asthma and COPD due to irritative or toxic substances (disease nos. 4302 and 1315) and COPD due to hard coal mine dust (disease no. 4111). Isocyanate-induced disorders (asthma, COPD, and alveolitis) have a heterogeneous pathogenetic background (allergic, irritative or toxic).

International surveillance data

To compare the frequency and causes of obstructive airway diseases caused by workplace allergens and irritants in the German statistics on occupational diseases to the surveillance data of other countries, the database MEDLINE was systematically searched for surveillance data on occupational obstructive airway diseases with information on causes and/or occupations (Latza and Baur 2005).

Results

Overview of all claims for recognition and compensation of occupational diseases

The latest report on accident prevention in the year 2003 issued by the Federal Ministry of Labour and Social Affairs in 2004 (Bundesministerium für Arbeit und Sozialordnung 2004) shows a total of 64,856 claims for recognition and compensation of occupational diseases (i.e., all notifications of reports among 38,246,000 insured workers). Non-malignant airway diseases had the third highest number of claims with a total of 5,804, followed by non-malignant lung and pleural diseases with a total of 5,588 claims. The highest number of claims was for skin diseases (16,730 claims) and work-related hearing loss (11,093 claims).

Non-malignant occupational respiratory diseases confirmed during 2003

Obstructive airway diseases due to allergens (occupational disease no. 4301)

The occupational disease documentation 2003 provided by the German federation of statutory accident insurance institutions for the industrial sector (Hauptverband der gewerblichen Berufsgenossenschaften and Sankt Augustin (2004)) shows a detailed classification of occupational diseases confirmed by these health insur-

Table 1 Occupational lung and airway diseases in Germany

Number	Disease
1315	Conditions caused by isocyanates[a]
2402	Conditions caused by ionizing radiation
4101	Quartz dust-related lung disease (silicosis, coal worker's pneumoconiosis)
4102	Quarz dust-related lung disease combined with active pulmonary
4103	Benign asbestos dust-induced lung disease (asbestosis) or pleural diseases
4106	Conditions of the lower respiratory tract and the lungs caused by aluminium or aluminium compounds
4107	Pulmonary fibrosis caused by metallic powder present in the production or processing of hard metals
4108	Conditions of the lower respiratory tract and the lungs caused by Thomas meal (basic slag)
4111	Chronic obstructive bronchitis or emphysema of underground hard coal miners caused by exposure to a cumulative dose of generally 100 fine dust years [(mg/m^3) *x* years]
4201	Extrinsic allergic alveolitis
4202	Conditions of the lower respiratory tract and the lungs caused by dust from raw cotton, raw flax or raw hemp (byssinosis)
4301	Obstructive respiratory tract diseases (including rhinopathy) caused by allergenic substances[a]
4302	Obstructive respiratory tract diseases caused by chemical irritants or substances with a toxic effect[a]

[a]These conditions must have forced the person to refrain from all activities which led or could lead to the development, aggravation or recurrence of the illness

ances. It comprises 922 confirmed cases of allergic obstructive airway diseases (occupational disease no. 4301; see Table 1). The majority of affected employees worked in bakeries (n = 495; the estimated number of bakers and confectioners in Germany is 350,000) (Fig. 2). Causative agents were mainly flour dust (n = 465), food and feed dust (n = 110), natural latex (n = 75), fruit/vegetable/plants (n = 41), hair/bristles/feathers (n = 29) and several other organic compounds.

Obstructive airway diseases due to irritants and toxic agents (occupational disease no. 4302)

There were 181 confirmed obstructive airway diseases caused by irritants or toxic agents (occupational disease no. 4302). A large percentage of these cases were hairdressers (n = 27), welders and flame-cutters (n = 22) or chemical workers (n= 19). Correspondingly, welding and cutting fumes (n = 30) proved to be the main triggers followed by hair dyes (n = 13), metal and alloys' dusts (n = 11), preservatives and disinfectants (n = 9), solvents and diluents (n = 9).

Isocyanate-induced diseases (occupational disease no. 1315)

There were 55 confirmed cases of isocyanate-induced disease. Predominantly chemical workers (n = 13), painters and varnishers (n = 11) suffered from isocyanate-induced asthma and/or other rare disorders. Isocyanates are frequently used as basic material for various types of foams and plastics, hardeners for glues, varnishes and others.

Chronic obstructive bronchitis and/or emphysema of hard coal miners (occupational disease no. 4111)

414 claims of chronic obstructive bronchitis and/or emphysema of hard coal miners (occupational disease no. 4111) were confirmed.

Benign asbestos-associated diseases (occupational disease no. 4103), silicosis/coal worker's pneumoconiosis (occupational disease no. 4101) and silicotuberculosis (occupational disease no. 4102)

About 1975 confirmed cases of asbestosis/pleural plaques/diffuse pleural fibrosis caused by asbestos dust (occupational disease no. 4103; see Table 1) were recorded (Fig. 3), 1158 cases of silicosis/coal worker's pneumoconiosis (predominantly among miners; Fig. 4), and 29 cases of silicotuberculosis.

Extrinsic allergic alveolitis (occupational disease no. 4201) and other rare occupational lung and airway diseases

Seventeen cases of extrinsic allergic alveolitis (occupational disease no. 4201) were confirmed in the industrial sector. In addition, agricultural accident insurance institution and accident insurance carriers of the public sector recognized about 40 additional diseases, mainly farmer's lung disease.

There was one case of occupational disease no. 4106 associated with aluminium/aluminium compounds. Four cases of lung fibrosis caused by hard metal powder (occupational disease no. 4107) were reported. Cases of Thomas meal-induced conditions (occupational disease no. 4108) and of byssinosis (occupational disease

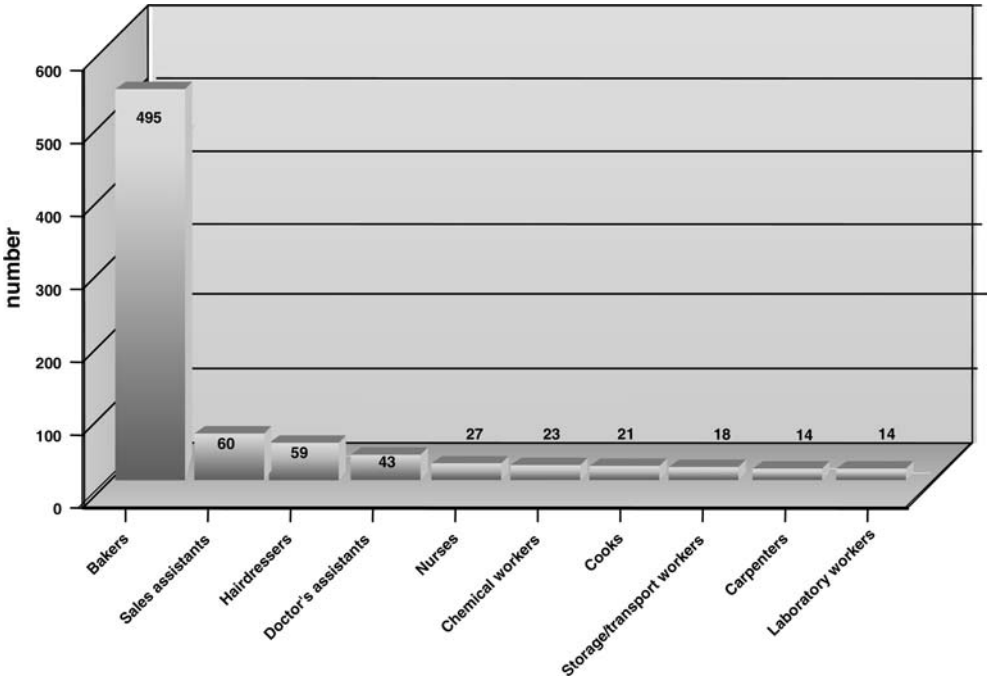

Fig. 2 Confirmed cases of occupational disease no. 4301 in 2003 by the federation of statutory accident insurance institutions for the industrial sector: obstructive airway diseases (including rhinitis) due to allergising substances forcing employees to refrain from all activities that were causative or could be causative of occurrence, deterioration or recurrence of the disease. Total number in 2003: 935. *Source:* Federation of statutory accident insurance institutions for the industrial sector; Occupational disease documentation 2003 (Hauptverband der gewerblichen Berufsgenossenschaften, Sankt Augustin (2004))

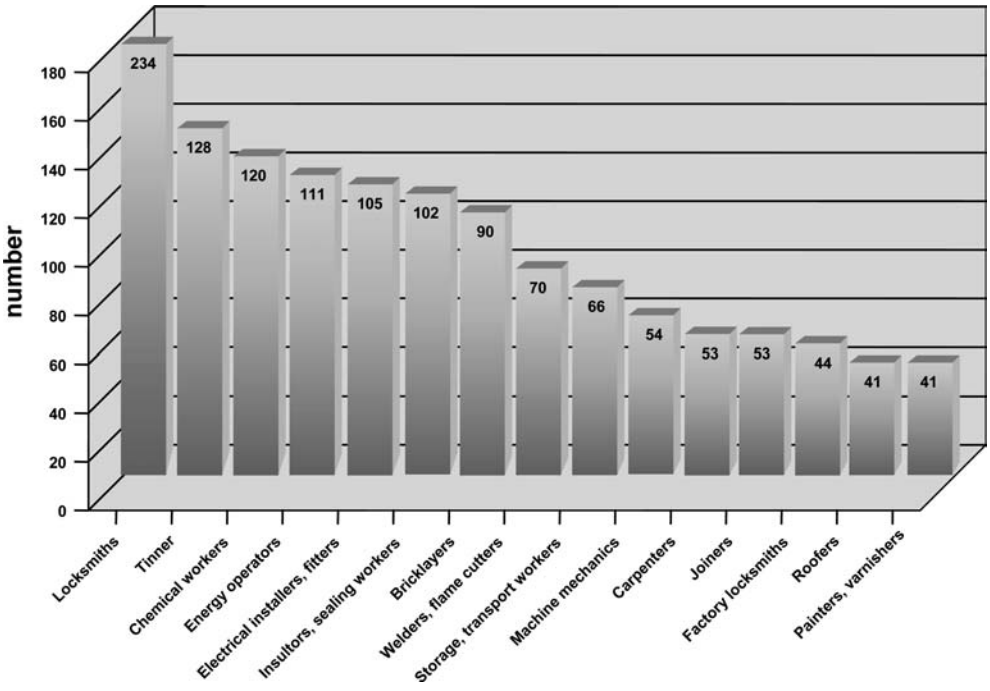

Fig. 3 Confirmed cases of occupational disease no. 4103 in 2003 by the federation of statutory accident insurance institutions for the industrial sector: asbestosis or pleural plaques/diffuse pleural fibrosis due to asbestos. Total number in 2003: 1975. *Source:* Federation of statutory accident insurance institutions for the industrial sector; occupational disease documentation 2003 (Hauptverband der gewerblichen Berufsgenossenschaften, Sankt Augustin (2004))

no. 4202, see Table 1) were not reported. Furthermore, there were 171 confirmed diseases caused by ionising radiation. Nearly all of these cases were former uranium miners suffering predominantly from lung cancer and a few from lung fibrosis.

Discussion

In spite of continuous industrial changes in western countries involving a reduction of the number of workers exposed to hazardous substances, data from many countries still show a relatively high occurrence of non-malignant occupational respiratory diseases. Several recent general population-based studies report associations between occupational exposure and occupational respiratory diseases. According to the SAPALDIA study (Leuenberger et al. 2000) done in Switzerland, occupational exposures to dusts or fumes were associated with significantly increased methacholine responsiveness in never-smokers.

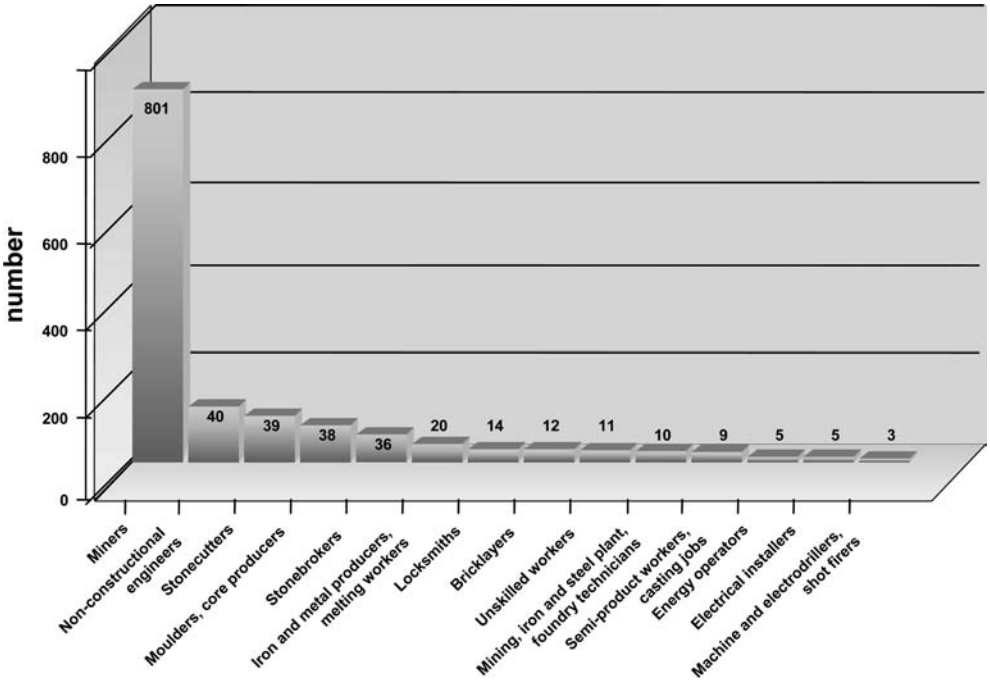

Fig. 4 Confirmed cases of occupational disease no. 4101 in 2003 by the federation of statutory accident insurance institutions for the industrial sector: quartz dust lung (silicosis) and coal worker's pneumoconiosis. Total number in 2003: 1158. *Source:* Federation of statutory accident insurance institutions for the industrial sector; Occupational disease documentation 2003 (Hauptverband der gewerblichen Berufsgenossenschaften, Sankt Augustin (2004))

Based on the European Community Respiratory Health Survey (ECRHS) performed in twelve industrial European countries, an estimated 5–10% of asthma cases are work-related (Kogevinas et al. 1999). The ECRHS found that the work-related risk of bronchial hyper-reactivity with asthmatic symptoms was highest for farmers, painters, workers in plastics production, cleaning workers, spray painters and farm workers. Similarly, the NHANES III report mentioned more than a twofold prevalence of bronchial asthma in workers in agriculture, forests, fisheries, wood processing, health care system, rubber and plastics industry and leather processing in North America with evidence for an occupational origin in more than 30% of all asthma cases (Arif et al. 2002). A recent study of 317,629 Swedish construction workers (Bergdahl et al. 2004) observed a significantly increased mortality from chronic obstructive lung disease associated with inorganic dust especially in never-smokers.

Some data suggest that there may be a decline in the occurrence of non-malignant airway diseases in Germany. Compared to the 1995 figures on the incidence of occupational obstructive airway diseases due to allergens, irritants or isocyanates (corresponding to the term "occupational asthma" used in most countries) of 5.1 confirmed cases per 100,000 employees in the industrial sector (Baur et al. 1998), there was a reduction in 2002 to 4.1 confirmed cases per 100,000 employees (total 1,245/30 million fulltime workers in the industrial sector). The incidence is 5.8 per 100,000 (total 1749) employees when chronic bronchitis or emphysema of hard coal miners is included (there is no respective figure for the latter in 1995 since this occupational disease was enforced in 1997). For German bakers/confectioners, an estimate of the annual incidence for the years 1991–2000 is in the range of 617 per 100,000 (Latza et al. 2002, in press) as compared to 404–444 in the Finnish registry where bakers also have the highest incidence of all occupations (Karjalainen et al. 2000).

For occupational respiratory diseases in the United Kingdom average annual rates in 1996–2001 were found to be 3.2 per 100,000 male workers with the highest rates of 10 per 100,000 for craftsmen (Cherry and Donald 2002). An EU-wide evaluation of occupational diseases of the year 1995 (Karjalainen and Virtanen 1999) showed a broad range of incidences (0.3–39.4 per 100,000 workers) of respiratory ailments of an allergic nature caused by the inhalation of substances consistently recognized as causing allergies and inherent to the type of work, namely for: (Table)

Due to legal definitions, regulations and several other reasons, data from accident insurance carriers do not reflect the actual potential of health hazards in workplaces, factories and industrial branches. They only show the tip of the iceberg because a great number of cases do not fulfil the legal definitions of recognition, are not reported or not detected. Nevertheless, the documentation of occupational diseases according to causes and occupations offers decision-makers optional activities, especially with regard to deficits in workplace protection and environment-related prevention.

Country	Incidence per 100,000	(n)
Belgium	1.9	(52)
Denmark	5.7	(145)
Germany	4.0	(1423)
Greece	0.7	(13)
Spain	1.9	(184)
France	2.5	(385)
Ireland	0.3	(4)
Italy	0.6	(117)
Luxembourg	1.9	(3)
The Netherlands	–	(10)
Austria	4.6	(168)
Portugal	3.5	(99)
Finland	39.4	(719)
Sweden	1.2	(48)
United Kingdom[a]	5.3	(1173)
Total	3.5	(4543)

[a]With the inclusion of miners

International comparison of the "hit lists" of substances causing non-malignant respiratory diseases

It should be mentioned that there are efforts to enforce unique European regulations relating to occupational diseases and causative agents. Currently the respective list of the European Union includes more than 20 respective disorders or causative occupational agents (see extract of the Commission recommendations of 19th September 2003 in Table 2 (Commission of the European Communities).

However, medical and legal definitions, insurance systems and regulations still differ considerably among EU countries. This makes it difficult to compare data on the occurrence of occupational diseases. Nevertheless, some common trends exist. For example, in Germany, employees in bakeries have the highest risk of occupational obstructive airway diseases (Baur et al. 1998). Bakers were also reported to be frequently affected by obstructive airway diseases/asthma in Finland (Karjalainen et al. 2000), France (Ameille et al. 2003; Kopfersmitt-Kubler et al. 2002), Sweden (Takahashi et al. 1993), the United Kingdom (McDonald et al. 2000; DiStefano et al. 1998), the Piedmont region in Italy (Bena et al. 1999) as well as in South Africa (Esterhuizen et al. 2001; Hnizdo et al. 2000) and New Zealand (Walls et al. 1997, 2000) (Table 3). High frequencies of occupational asthma were reported for health care workers in Germany, France (Ameille et al. 2003), Italy (Bena et al. 1999), New Jersey, Michigan (Jajosky et al. 1999) and South Africa (Esterhuizen et al. 2001). Also workers in the food processing industry in Finland (Karjalainen et al. 2000) and South Africa (Esterhuizen et al. 2001) were shown to frequently contract airway diseases. Painters are often reported to suffer from these diseases in Finland (Karjalainen et al. 2000), France (Ameille

Table 2 Extract from the commission recommendation concerning the European schedule of occupational diseases (2003) (Commission of the European Communities 2003)

1	Diseases caused by the following chemical agents
102	Beryllium (glucinium) or compounds thereof
104.03	Isocyanates
109.02	Oxides of nitrogen
109.03	Ammonia
113.01	Oxides of sulphur
124	Formaldehyde
3	Diseases caused by the inhalation of substances and agents not included under other headings
301	Diseases of the respiratory system and cancers
301.11	Silicosis
301.12	Silicosis combined with pulmonary tuberculosis
301.21	Asbestosis
301.22	Mesothelioma following the inhalation of asbestos dust
301.31	Pneumoconioses caused by dusts of silicates
302	Complication of asbestos in the form of bronchial cancer
303	Broncho-pulmonary ailments caused by dusts from sintered metals
304.01	Extrinsic allergic alveolites
304.02	Lung diseases caused by the inhalation of dusts and fibres from cotton, flax, hemp, jute, sisal and bagasse
304.04	Respiratory ailments caused by the inhalation of dust from cobalt, tin, barium and graphite
304.05	Siderosis
305.01	Cancerous diseases of the upper respiratory tract caused by dust from wood
304.06	Allergic asthmas caused by the inhalation ob substances consistently recognized as causing allergies and inherent to the type of work
304.07	Allergic rhinitis caused by the inhalation of substances consistently recognized as causing allergies and inherent to the type of work
306	Fibrotic diseases of the pleura with respiratory restriction, caused by asbestos

et al. 1998; Kopferschmitt-Kubler et al. 2002), Sweden (Toren 1996), the United Kingdom (McDonald et al. 2000; Meredith et al. 1991) and New Zealand (Walls et al. 1997). Welders were shown to have an increased risk of occupational asthma in Sweden (Toren 1996). Elevated frequencies of hairdressers' airway diseases were reported in France (Ameille et al. 2003) (6.8% of subjects with occupational asthma) and Germany. Correspondingly, Brisman et al. 2003 described increased frequencies of respiratory symptoms in Swedish female hairdressers.

Other causes often mentioned in the literature are animal fur/proteins and isocyanates (Table 3).

With regard to the risk of contracting occupational airway diseases, data from national and supranational health surveys may also give valuable information.

Obviously due to major differences in the industry, extraordinarily high numbers of certain occupational disease causes are reported in some regions only. For instance, agricultural workers (frequently sensitized to cow allergens) were shown to have a high risk of occupational asthma in Scandinavia (Karjalainen et al. 2000; Toren 1996) and in the United Kingdom (Di Stefano et al. 1998; Gannon and Burge 1991).

In some countries, high frequencies of affected workers exposed to enzymes/detergents, snow crabs/clams/shrimps or guar gum/carpet manufacturing dust, platinum or colophony fume were found (Becklake et al. 1999; Meyer et al. 1999).

Hard coal mine dust is the major cause of benign respiratory diseases in Germany, and mineral and inorganic dust were found to be the second most frequent environmental cause of occupational asthma in the USA (Jajosky et al. 1999).

Similarly to Germany, asbestos-induced pleural plaques/fibrosis and asbestosis are frequent in many industrial countries affecting mostly insulators, workers in the metal, chemical and construction industries as well as in shipyards (Bianchi et al. 1991; Kishimoto et al. 2000; Koskinen et al. 1998; Meyer et al. 2001; NIOSH 2002; Takahashi et al. 1993). Furthermore, in western countries silicosis and coal worker's pneumoconiosis are still a widespread problem but are declining whereas byssinosis nearly disappeared (Burgdorf et al. 2003; EUROGIP 2002; Meyer et al. 2001; NIOSH 2002).

Prevention

In principle, occupational lung and airway diseases caused by air-borne organic and inorganic pollutants and gases in the workplace can be avoided. The most effective primary preventive measure is the substantial reduction of air-borne inorganic dust, sensitizers and irritants in workplace atmospheres (Commission of the European Communities 2002; Latza et al. 2002). Examples exists, where effective regulations recently resulted in a substantial disease burden reduction in a country. In Denmark, for example, the introduction of the new legally binding Permissable Limit of Exposure (PEL) of 1.5 mg/m^3 for inhalable flour dust resulted in a substantially decreased incidence of baker's asthma (Sigsgaard, personal communication). In Germany, the prescription of non-powdered low-allergen gloves in the

Table 3 Selected frequent causative substances of occupational obstructive airway diseases

Substance	Country	Percentage of all reported occupational asthma/chronic obstructive airway disease cases	References
Flour/grain dusts	Germany	51.1	Baur et al. (1998)
		36.6[a]	This paper
	France	25.1	Kogevinas et al. (1999)
		20.3	Ameille et al. (2003)
	Italy (Piedmont region)	27.0	Bena et al. (1999)
	Finland	22.3	Karjalainen et al. (2000)
	South Africa	9.9	Hnizdo et al. (2001)
Latex	Italy (Piedmont region)	51.0	Becklake et al. (1999)
	South Africa	24.0	Hnizdo et al. (2001)
	United Kingdom, West Midlands	7.6	Di Stefano et al. (1998)
	France	7.5	Kogevinas et al. (1999)
	Germany	4.8[a]	This paper
Isocyanates	USA (MI)	19.9	Meyer et al. (1999)
	South Africa	19.5	Hnizdo et al. (2001)
	France	16.6	Kogevinas et al. (1999)
	United Kingdom, West Midlands	12.7	Di Stefano et al. (1998)
	USA (CA, MA, MI, MD)	9.4	Jajosky et al. (1999)
	Finland	4.8	Karjalainen et al. (2000)
	Germany	3.5[a]	This paper
Welding/soldering fumes	USA (CA, MA, MI, MD)	5.1	Jajosky et al. (1999)
	United Kingdom	4.0	Di Stefano et al. (1998)
	South Africa	3.6	Hnizdo et al. (2001)
	Canada, B.C.	3.2	Contreras et al. (1994)
	Germany	1.9[a]	This paper
Animals	Finland	33.0	Karjalainen et al. (2000)
	Germany (hair/bristles/feathers)	1.9[a]	This paper
Hard coal mine dust	Germany	26.3	This paper
Mineral/inorganic dust	USA (CA, MA, MI, MD)	7.2	Jajosky et al. (1999)

[a]Percentage of all confirmed cases including hard coal miners suffering from chronic obstructive bronchitis and/or emphysema; (occupational diseases no. 4301, 4302, 1315 and 4111)

health care sector led to the reduction of latex-induced occupational obstructive airway and skin diseases by approximately 70% (Latza et al. 2005).

If primary prevention is not fully effective, other measures to avoid employee exposure should be implemented. These include:

(a) Continuous qualified occupational medical and technical risk determination in individual workplaces; risk communication and management involving employer, employees, physicians specialized in occupational medicine, safety technique specialists, state authorities and statutory accident insurance institutions; (Commission of the European communities 2002).
(b) Instruction and training of endangered employees with regard to individual health risks and required precautions.
(c) Health and safety measures to prevent the exposure of workers to air-borne or contact allergens (e.g. installing exhaust systems, wearing respirators, gloves).
(d) Additional immediate and efficient secondary prevention if there are indications of a special individual health risk in the workplace (e.g. clinically still non-symptomatic sensitization to a substance or a pre-stage of a work-related disease).
(e) Employees' removal from endangering workplaces if they have already developed respiratory symptoms caused by occupational allergic sensitizers or irritants.We suggest that in the European Communities risk groups with a high incidence of work-related diseases like bakers, laquerers, welders, hairdressers and chemical workers are offered an annual respiratory questionnaire screening identifying work-related symptoms and potential causative exposures. In case of suspect conditions, lung function measurements (preferably before and after a work shift) and allergy tests supplementing the routine occupational medical surveillance examinations should be performed (Baur et al. 1998; Gannon and Burge 1991; Jajosky et al. 1999; Toren 1996). The purpose of the surveillance would also be to introduce intervention measures leading to exposure reduction at an early stage before a disease develops.

In Germany, periodical medical surveillance examinations every 2–3 years are prescribed for hard coal miners, workers exposed to asbestos (including former asbestos workers), silica, isocyanates (>0.05 mg/m^3 or hand contact), welding fumes (>3 mg/m^3 inhalable dust), flour/cereals/feed dust (>4 mg/m^3), hard wood dust (>2 mg/m^3), latex (if protein content of gloves is >30 μg/g), laboratory animals (listed exposures) and

expoxy resins (listed or inhalative exposures). They are also recommended for all workers with an increased risk of contracting an occupational airway disease.

This implies the need for a unified system of recognition and compensation of occupational diseases as well as of preventive standards and regulations within the European Union. It should include, e.g. full statutory financial compensation of disease-related loss of income as well as enforcement of common Permissible Exposure Limits (PEL) for hazardous substances in the workplace. This is important since an open labour market and unique industrial economic systems are already developing, but rather different industrial hygiene levels and standards as well as occupational disease regulations exist in individual member countries.

The importance of a general healthy lifestyle, especially tobacco smoking, should also be stressed, since synergistic adverse health effects can be prevented. Active and passive tobacco smoking is a definite risk factor of occupational airway and lung diseases (World Health Organisation 2002) through interaction with occupational exposures including asbestos, radiation, nickel, arsenic, beryllium, zinc chloride, silica and probably also polycyclic carbonhydrides. Therefore, the projected anti-tobacco campaign in the EU (World Health Organisation 2003) based on a WHO initiative should be insistently supported.

Effective measures to prevent occupational diseases also necessitate substantial data on their frequencies and causes. To obtain such data, the recent initiative of the European Union Commission aims at promoting research in the field of ailments linked to an occupational activity, ensuring that all cases of occupational diseases are recorded and that documents to assist in the diagnosis of occupational diseases are disseminated widely (Commission of the European Communities 2003)

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