chest tightness, shortness of breath on exertion, chest wheezing, physician diagnosed asthma (odds ratio OR=7.9,95%CI=2.3,26.8) and COPD (OR=2.8, 95%CI=1.2,65) were all significantly more prevalent among the asphalt workers. Asphalt workers aged 30 years or less had the highest prevalence of asthma. The prevalence was not related to smoking. COPD prevalence was related to age and to smoking.
Conclusion. Asphalt workers are at higher risk of developing obstructive lung disease than outdoor construction workers and the general population.

P144 Occupational allergy due to freeze-dried raspberry powder: preliminary results

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Background. The purpose of this study is to define the prevalence of allergic sensitization to the inhalation of freeze-dried raspberry (Rubus ideaus) powder among workers involved with this production. A factory started coating chewing gum with pure freeze-dried raspberry powder 3 years ago. An index case of work-related asthma was found with classic peakflow variability as well as a positive prick test and RAST for raspberry. Work-related asthma from raspberry has not previously been reported.
Methods. 63 workers from the coating department were studied. Prick tests with the 5 fruit powders mixed with sterile saline were carried out. Standard RAST (Rf343, Pharmacia, Copenhagen) and histamine release test with raspberry powder (Reference Lab, Copenhagen) were performed.
Results. Breathing zone measurements when the lids of the mixing drums were opened showed 5.9 mg/m³ respirable dust. Six of the 63 workers (9.5%), including the index case, had positive prick test with raspberry powder including 2 with pseudopodia. Average positive test was 7.5 mm, range 5-11 (average histamine control of 7.2, range 7-8). Average blood eosinophil count was 0.2 109/l (0,1-0.3) and IgE was 251 kU/l (2-1000). None of the 9 controls tested had positive prick tests with the fruit powders. Only 2 of the workers had positive RAST tests (0.84 and 1.78 kU/l) and 1 had a positive histamine release test for raspberry. Two workers had no work-related complaints. Among the others 1 had rhinitis, 1 had both asthma and rhinitis and 2 had asthma symptoms. None had symptoms when they ate raspberries. All workers stopped working with raspberry powder.
Conclusion: This study demonstrates that workers can be sensitized to the inhalation of freeze-dried raspberry powder. Improved hygienic conditions were established including the use of air-supplied masks during drum cleaning to reduce exposure and risk of future sensitization. Natural products often have a significant sensitization potential. Thus, caution is needed when introducing new products.

P145 Occupational asthma in the UK health service

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Background. The British health service, with some two million employees, is probably the largest employer in Europe. The level of ascertainment of occupational asthma is high, thanks to the availability of chest and occupational physicians, who have reported, since 1989, new cases of work-related illness to the national Occupational Disease Intelligence Network (ODIN). As reasonably complete incidence rates are thus obtainable by sex, occupation and agent, priorities for prevention can be identified.
Methods. Between 80-90% of chest and occupational physicians have participated in the SWORD or OPRA components of ODIN, with standardised reporting procedures since 1992. Average annual incidence rates were therefore calculated for this period against denominators from the national Labour Force Survey.
Results. In the 9 years, 1992-2000, 834 cases were reported in the health-related professions: 713 in women and 109 in men. Annual rates rose in females from 49 in 1992 to 80 in 1998-2000, but remained at about 30 in males. The rates for *Health Professionals* (mainly doctors) averaged 33; *Associate Professionals* (mainly nurses), 97; and *Other Health-Related Occupations* (mainly assistant nurses), 20. In all three, female rates were about twice the male rates. Other specific occupations of note were radiographers (52 cases), technicians (21 cases) and midwives (15 cases). Relatively few cases of asthma were reported among other categories of employees in the health service. The percentage distribution of incriminated agents by occupational category is shown below:

	Professional	Assoc. professional	Other health-related	Total
Glutaraldehyde	4	315	47	366 (44%)
Latex	29	140	9	178 (21%)
Laboratory animals	16	117	0	133 (16%)
Other*	15	78	56	149 (18%)

*including unspecified (74), acrylates (17), plaster (13), cleaning materials (13), photographic chemicals (12), misc. chemicals (rest)

Conclusion. Occupational asthma, though not the most frequent cause of work-related illness in the health service, is a seriously disabling disease. Its specificity is remarkable in that it is virtually confined to three agents: glutaraldehyde, latex and laboratory animals, and two occupations: nurses and animal technicians. The fact that glutaraldehyde is probably an irritant and not a sensitiser does not lessen its immediate impact, nor that related dusts, rather than rubber *per se*, create the problem with latex. Clearly, prevention of exposure to both these agents must be achieved, but an effective method for protecting laboratory animal workers remains elusive.

P146 Prevalence and risk factors of occupational asthma among florists in Turkey

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Background. There are few studies of occupational asthma among florists. In this study, we evaluated questionnaire-based prevalence and possible risk factors of occupational asthma among florists in Turkey.
Methods. We collected data from 60 (71.4%) florist shops with 128 (86.5%) florists selected by a cluster sampling method and investigated occupational history, respiratory, ocular, dermal, and nasal symptoms based on a modified version of the American Thoracic Society questionnaire. We evaluated work-site pulmonary function tests and atopy by skin prick test for the most common allergens in the region (D. farinae, D. pteronyssinus, Mould mix) and flower mix (Aster chinensis, Chrysanthemum koreanum, Dahlia cultorum, Solidago virgaurea, Chrysanthemum leucanthemum). We calculated work intensity from total working years and weekly working hours. We measured humidity and temperature, and evaluated ventilation systems in shops. Florists who reported having any one of the following symptoms: non-productive cough, dyspnea, chest tightness, or wheezing, were defined as having asthma, and, if those symptoms were related to work, we defined them as occupational asthma. Possible risk factors were analyzed by age- and gender-adjusted logistic models comparing symptomatic and asymptomatic florists. Smoking status had limited effect on the results, so we excluded smoking from the models.

Results. The median age was 28.0 years. 85.9% were males, 63.3% were current smokers. The prevalence of occupational asthma was 14.1% (n=18). We observed work related excess risk factors among florists with a high work intensity (OR=7.3, 95% CI=1.1-51.8) and long work duration (OR=5.1, 95% CI=1.2-21.6). Florists with occupational asthma were 5.9 times more likely to have positive allergen skin test for flower mix (95% CI=1.4-24.3). We also observed an excess risk of allergic rhinitis (OR=13.2, 95% CI=3.1-56.4) and conjunctivitis (OR= 8.4 95% CI=2.4-29.24) among florists with occupational asthma.
Conclusion. This study showed that most prominent risk factors of occupational asthma were work intensity, work duration, and specific atopy in florists. We believe that new studies from developing countries are needed to understand etiologic factors of occupational asthma.

P147 Respiratory symptoms and occupational exposures in New Zealand plywood mill workers

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Background. A number of studies have shown that workers in wood processing industries are exposed to relatively high levels of dust in their working environment, and that they report higher rates of both lower and upper respiratory tract symptoms than control groups. Pine dust has been found to induce respiratory symptoms including asthma, and a recent New Zealand study reported an increased prevalence of asthma and cough symptoms, and of eye and nose irritation, among sawmill workers exposed to pine (Pinus radiata) dust. The objectives of this study were to evaluate the prevalence of respiratory symptoms in New Zealand plywood mill workers, to quantify occupational exposures, and to evaluate the association between the two.
Methods. A respiratory health questionnaire was administered to 112 plywood mill workers, and personal inhalable dust (n=57), bacterial endotoxin (n=20), monoterpene (n=20) and resin acid (n=20) measurements were taken.
Results. One-third of the dust exposures exceeded 1 mg/m³ with only one sample exceeding the New Zealand Workplace Exposure Standard of 5 mg/m³ (GM=0.8 mg/m³; GSD=2.0). Workers in the composer area were significantly ($p<0.05$) more highly exposed. Endotoxin levels were low to moderate (GM=24.7 EU/m³; GSD=2.7). Total terpenes (a-pinene, b-pinene, D3-carene, unidentified wood volatiles) ranged from 4.6-33.6 mg/m³ with a GM of 8.9 mg/m³ (GSD=1.9), and levels were significantly ($p<0.001$) higher for job titles in the "green end" of the process up to and including the veneer dryers. Total resin acids (abietic acid and unidentified resin acids) ranged from LOD (0.5 µg) - 11.3 µg/m³. Abietic acid (GM=0.69 µg/m³; GSD=1.82) and unidentified resin acid (GM=5.65 µg/m³; GSD=1.57) levels per milligram dust were both significantly ($p<0.05$) higher in the pressing section and significantly ($p<0.05$) lower in the finishing end. Asthma was more common in plywood mill workers (20.5%, n=112) than in the general population (12.8%, n=415; adjusted OR (95% CI): 1.5 (0.9-2.8)). Asthma symptoms were associated with duration of employment, and were reported to lessen or disappear during holidays. No clear association with any of the measured exposures was found.
Conclusions. Plywood mill workers are exposed to significant levels of inhalable dust, bacterial endotoxin, monoterpenes and resin acids, and they appear to have an increased risk of developing work related respiratory symptoms. Although no specific causal association has been identified, a general reduction of levels of exposure to both volatile and particulate contaminants would minimise the risk of plywood mill workers developing work-related respiratory symptoms.

P148 Measurement of colophony IgE: the use of in vitro challenge of immune cells to produce reagents for use in the radioallergosorbent test (RAST)

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Background. Colophony is a known cause of occupational asthma. However, the mechanisms by which the pyrolysis products of colophony (e.g. abietic acid) cause sensitisation are unclear. We have previously shown that constituents of colophony are able to induce oxidative burst in immune cells (Elms et al 2000). We have used this finding to develop an in vitro system for the production of colophony-protein conjugates for use in the radioallergosorbent test (RAST).
Methods. Monomac-6 cells were cultured with 25 µg/ml extracts of four different colophony preparations for 24 hours. This concentration had been shown to induce oxidative burst in our previous studies (Elms et at, 2000). After 24 hours, harvested cells were lysed and sonicated to release cell contents. The protein content of these extracts was estimated using bichinconinic acid. Paper discs for use in RAST were prepared using both a preparation of colophony treated cells and a preparation of cells alone. Serum from unexposed controls exposed but asymptomatic individuals and exposed symptomatic subjects was tested for binding to these discs. Each serum was tested against the four extracts (where available volume allowed). Raised binding of IgE to the colophony-cell discs was defined as binding greater that that observed with cells alone.
Results. In the unexposed group we detected 5 samples which showed raised binding compared with 39 which did not. In the asymptomatic exposed group we detected 2 samples which showed raised binding and 37 which did not. In the symptomatic exposed population, we detected 17 samples with raised binding, and 13 with no increase.
Conclusions. We have shown that in vitro challenge of immune cells with extracts of colophony can provide the conditions necessary for the production of colophony-cell conjugates. This method for the production of reagents for use in RAST may offer an alternative approach to that offered by standard protein conjugation, and may more accurately reflect the situation in vivo.
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P149 Work related respiratory symptoms among fish filetting workers

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Background. Previous investigations have shown that handling herring may cause non-allergic respiratory symptoms. We investigated employees in two herring filetting stations and compared them with local municipality workers not exposed to fish.
Methods. Questions on respiratory symptoms, spirometry measurements, serial peak expiratory flow (PEF) measurements, bronchial provocation tests with histamine chloride and skin prick tests (SPT) were obtained from 39 exposed workers (26 females and 13 males) and 34 controls (18 females and 16 males).
Results. There was no difference in lung function between exposed and unexposed subjects, except for FEV1/FVC being lower in exposed females (79.6 vs. 83.8 P = 0.048) than in unexposed. There was a significantly lower Il-8 release in whole blood after incubation with fish rinsing water in exposed vs unexposed workers. Frequencies of selected symptoms among exposed subjects vs. unexposed (N (%)) (P) were: wheeze: 8 (38.5) vs. 12 (37.5) (1.000); dyspnoea: 11 (28.2) vs. 3 (9.4) (0.071); cough: 8 (20.5) vs. 2 (6.3) (0.102); work related symptoms 24 (61.5) vs. 4 (12.5) (0.000); doctor diagnosed asthma 9 (23.1) vs. 2

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