13.6). After adjusting for age, employment duration, silicosis grade and past TB, the adjusted IRR was 3.7 95% CI 1.5-8.9). **Conclusion:** The incidence of TB among gold miners was almost 4 fold higher than among platinum miners. HIV status was not known for individual miners. However, HIV prevalence was similar between the 2 workforces based on cross-sectional studies done in 2000. The significantly higher incidence of TB among gold miners is attributed to silica dust exposure. Control of silica dust exposure is a high priority.

45 Silicosis in Québec (Canada) from 1988 to 1997

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The present study was initiated following a surveillance project (PROPULSE) that called on chest physicians and allergologists of the Province of Québec, Canada, to report all new cases of occupational respiratory disease diagnosed in their practice during one year. Cases of silicosis were underreported and we decided to explore data from the Workers' Compensation Board of our province, (Commission de la santé et de la sécurité du travail du Québec or CSST), where suspected new cases are usually referred.

Objectives: The objectives of the study were to establish the incidence of silicosis from the data collected by the CSST, and to describe the characteristics of the workers. This was done to assess the potential of the compensation data to be used in the surveillance of silicosis.

Methods: The files of workers diagnosed with silicosis were selected from among those who submitted a claim to the CSST from 1988 to 1997, and were reviewed. Data on their health status and work history were collected.

[redacted] the 10 years of the study, 308 workers, all osed with silicosis. Eleven of them also had d to exposure to silica. Between 18 and d per year with an overall decreasing ng the ten years of the study. Sixty- ad simple silicosis, 23% conglomer- d silicosis, and 4% other types of e 308 cases was 58, and the mean was 24 years. The accelerated sil- ears old) and had a shorter du- ears). The cases were then di- their silica exposure: the min- (20%), stone working (10%), nd mixed exposure (10%). h accelerated silicosis were ner sources of exposure, and all e sandblasting. Conversely, 46% of the mple silicosis were exposed in the mining in- Workers with conglomerated silicosis were exposed in mines (28%), foundries (25%), and were among the group subjected to other sources of exposure (21%).

Conclusion: Our compensation data were useful for surveillance. They showed that accelerated silicosis developed among younger workers after a shorter duration of exposure to silica while sandblasting. These results led to an intervention program focusing on the prevention of accelerated silicosis among car body shop workers doing sandblasting.

46 Volcanic ash from the island of Montserrat: some recent toxicological and epidemiological studies

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Background: Since 1995, intermittent volcanic eruptions on the island of Montserrat have exposed residents to ash containing up to 20% cristobalite, mostly through re-suspension of deposited dust. UK Government Departments (International Development, Health) have funded a programme of toxicological and epidemiological studies to help estimate the risks to health of past and likely future exposure. We report on three linked studies led by the IOM.

Aims: estimate the risks of silicosis developing in the future; give early warning of any other adverse health effects.

Methods: i. a two-month animal inhalation study of Montserrat ash and of TiO_2, with exposures designed to induce an inflammatory reaction; ii. a questionnaire-based epidemiological study of 465 Montserratians who emigrated to the UK since 1995; iii. a respiratory survey (questionnaires, simple spirometry, radiology) of 421 higher-exposed workers on Montserrat. Both epidemiological studies estimated individuals' exposures to Montserrat volcanic ash, based on histories of occupation, activity and residence, linked to sampling of personal exposures on Montserrat, including during ash-clearing activities.

Results and Conclusions: The studies have only recently been completed; reports and papers for publication are in preparation. The results suggest that: the toxicity of Montserrat ash is more like mixed coalmine dust than freshly-fractured silica; there are some mild effects on the respiratory health (higher rates of self-reported symptoms, some reduction of lung function) in some of the most exposed groups; and the risks of silicosis (because of latency, assessed indirectly, by comparison with other dusts) are likely to be small.

47 Pneumoconiosis from agricultural dust exposure among California farmworkers

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Aim: We measured the prevalence, severity and histologic character of pulmonary lesions due to dust exposure among Hispanic farmworkers in California.

Methods: Lung autopsy specimens were obtained on consecutive coroner's cases of Hispanic males in Fresno County, California (n=100). Work and smoking histories were obtained from next-of-kin. Specimens were fixed by standardized protocol. Gross pathology is described from medial sagittal sections, microdissections are done for 12 airway generations, airway pathology and dust content is scored, and tissue samples are analyzed for quantitative dust loading. Findings in farmworkers were compared to non-farmworkers, and histologic changes in high vs. low dust loadings compared.

Results: Of the first 41 cases, farmworkers comprise 51% (median age 37 yrs., 48% smokers) and non-farmworkers 49% (median age 29 yrs. and 57% smokers). Airway structure was normal by microscopic exam to the sixth airway generation with little mineral dust accumulation, but respiratory bronchioles showed evidence of wall thickening and remodeling associated with heavy carbonaceous and mineral dust accumulation. Increased collagen and interstitial cells including dust-laden macrophages were also present with the wall changes. These changes were associated with agricultural work history, and were independent of cigarette smoking. Independently-rated mineral dust small airways disease, pneumoconiosis, and lymph node fibrosis predominated in the farmworkers compared to the non-farmworkers; 43% vs. 15%, 19% vs. 5%, and 50% vs. 38%, respectively. Mean total silica concentrations were also significantly greater in those with mineral dust small airways disease (p=0.009), pneumoconiosis (p=0.008), and lymph node fibrosis (p=0.002) than in those without histologic evidence of these diseases. There was also an association between increasing age and dust concentration (total mineral and total silica).
Conclusions: Hispanic males in Central California show early, subclinical histopathological changes consistent with silicosis and mixed-dust pneumoconiosis. Changes were associated with greater severity of dust scores in farmworkers than in non-farmworkers. The natural history and clinical significance of these changes remains to be determined.

48 Mortality study of a cohort of grey iron foundry workers

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Results of a cohort mortality study of workers from a grey iron foundry will be presented. The cohort consists of all 1,072 current and retired workers from a single grey iron foundry who were alive in 1991. The results of the cross-sectional study were reported in 1996 (Am J Epid 1996; *144*: 890-900). Chest X-rays for pneumoconiosis were interpreted by a panel of three "B" readers for 89% of the cohort and information on cigarette smoking was available on 86% of the cohort. Silica exposure was reconstructed and cumulative, average daily and highest daily silica exposure were calculated from the job-exposure matrix for each member of the cohort. In 1992, the average age of the cohort was 59 years, average duration of work in the foundry was 19 years (51% with 20 or more years) and the average latency since beginning to work in the foundry was 28 years. The cohort is 97% men and 58% African-American. The prevalence of radiographic evidence of pneumoconiosis was 6% in 1991. Vital status was ascertained as of 12/31/1996 through the United States National Death Index. Standardized mortality ratios with 95% confidence limits were calculated using the NIOSH Life Table Analysis program. US general population rates were used to calculate expected numbers. There were 140 deaths (SMR 1.07, 95% CI 0.90-1.27) and 48 cancer deaths (SMR 1.27, 95% CI 0.99-1.69). There were 17 deaths from lung cancer (SMR 1.32, 95% 0.77-2.11) and 11 deaths from non-malignant respiratory disease (SMR 1.02, 95% CI 0.51-1.84). Lung cancer mortality was increased with greater cumulative exposure to silica except in the highest silica exposure group (<240 mg-days/m³, SMR 1.47, 95% CI 0.16-2.26; 240-720 mg-days/m³, SMR 1.76, 95% CI 0.64-3.82; >720-2160 mg-days/m³, SMR 1.83, 95% CI 0.64-3.96 and >2160 mg-days/m³, SMR 0.62, 95% CI .12-2.28). All but one lung cancer death occurred in a current or former cigarette smoker. None of the individuals who died of lung cancer had evidence of silica or asbestos related changes on their radiographs. Limitations of the study include a small sample size, with a small number of deaths and the presence of confounding exposures to other workplace carcinogens: asbestos and polyaromatic hydrocarbons. Discussion of further work planned to clarify these results and how these results compare to other studies will be provided.

50 Effects of silica on cultured cells can reflect pathogenic processes of scleroderma-associated fibrosis

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Silica (<5 µm) is able to induce systemic sclerosis (SSc) that is indistinguishable from idiopathic disease. Therefore, silica can serve as a model to investigate initial processes during the pathogenesis of SSc – especially skin fibrosis. We established cell culture models to investigate the effect of silica (DQ12 brand) on gene expression and functional parameters of human cells that are involved in the process of skin fibrosis. Obviously, silica is internalized by all cell types analyzed by electron-microscopic methods. Using simple cultures of purified cell types we could demonstrate enhanced cytokine liberation by monocytes and microvascular endothelial cells (HDMEC), activation and chemokine expression of HDMEC. Dermal fibroblasts heavily depend on interactions with the surrounding matrix: Only in culture systems, consisting of three-dimensional collagen gels silica was able to induce pro-fibrotic responses in cultured fibroblasts: induction of mRNA expression of collagen I(α1), TGFβ1 and MCP-1 found by Realtime-RT-PCR. Furthermore we could show that the effects found in separately cultured cells have consequences for cell-cell- and cell-matrix interactions. Monocytes attach more effectively to silica-treated HDMEC, they are attracted by supernatants of silica-treated HDMEC and fibroblasts are temporarily impaired to contract collagen gels after silica-treatment. Consequently, all in vitro data on silica-mediated cell activation can be included in a model of perivascular fibrosis known from the idiopathic disease. Therefore, *in vitro* analysis of silica-treated cells may be a powerful tool to investigate the pathogenesis of SSc.

51 Role of the lung fibroblast in the fibrotic processes of silicosis

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Fibrosis is a disorder characterised by a quantitative and qualitative alteration of the deposition of extracellular matrix with

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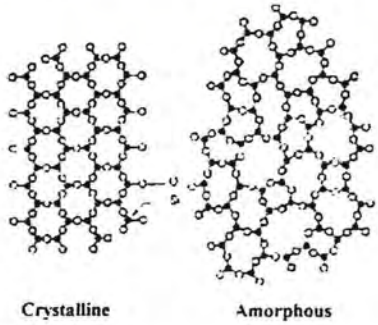

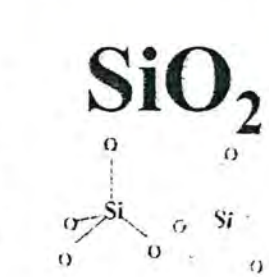

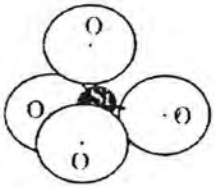

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