IMMUNOLOGICAL ASPECTS OF OCCUPATIONAL EXPOSURE TO VOLCANIC ASH. S.A. Olenchock, and J.C. Mull, Immunology Section, Division of Respiratory Disease Studies, NIOSH, Morgantown, WV.

Occupational exposure to airborne volcanic ash continues for workers in various job categories within the logging industry. During the process of salvaging trees from the high dust fall areas, settled volcanic ash is re-aerosolized. In vitro studies suggest that volcanic ash may exert biological effects when inhaled. We therefore examined the in vivo immunological status of loggers who worked in the ash fall areas in order to assess what effect inhaling volcanic ash has on the immune system. Ash-exposed loggers (N=400) were matched by age, height, smoking history and job tenure with loggers (N=185) who worked in geographically distinct areas where no ash fell. At approximately 6 wk after Mount St. Helens' first eruption, blood was collected, the sera separated, and immediately frozen until analyzed. Approximately one year later, duplicate samples were obtained. Serum levels of IgG, IgA, IgM, C3 and C4 were quantified by fluorimmunometric assay. At both sample periods (1980,1981) the mean levels of serum C3 in the ash-exposed group (89.5,92.2 mg/dl) were significantly lower ($P<0.005$) than in the non-exposed loggers (99.1,106.9 mg/dl). C4 levels were likewise lower ($P<0.005$) in the ash-exposed (24.0,23.8 mg/dl) than in the control group (26.5, 26.0 mg/dl). No significant differences were seen at either time period in serum levels Of IgG, IgA, or IgM. However, the mean IgA levels in the ash-exposed group increased ($P<0.01$) from 1980 (155.9 mg/dl) to 1981 (167.6 mg/dl), a change not observed in the controls (162.6, 162.4 mg/dl). The IgG levels in the ash-exposed loggers decreased ($P<0.005$) from 1980 (931.5 mg/dl) to 1981 (860.5 mg/dl) while the control levels did not change (927.8, 908.7 mg/dl). Finally, the non-exposed group showed an increase ($P<0.01$) in IgM (112.7,125.1 mg/dl) not seen in the ash-exposed loggers (117.6,123.7 mg/dl). These data suggest that occupational exposure to airborne volcanic ash may affect the humoral immune status of loggers. The decreased complement components correlate with the previously reported in vitro consumption of C3 by volcanic ash and the changes in the immunoglobulin levels may reflect a preferential stimulation of the mucosal immune system from inhaling (and swallowing) volcanic ash.

TETRACHLOROPHTHALIC ANHYDRIDE ASTHMA: EVIDENCE FOR SPECIFIC IgE ANTIBODY. K. Venables, *M. Topping, **W. Howe, M. Dally, R. Hawkins, and A. Newman Taylor. Cardiothoracic Institute, London, SW3. **Employment Medical Advisory Service, Darlington, *Occupational Medicine and Hygiene Laboratory, Health and Safety Executive, London NW2.

We have investigated seven women with histories of work-related asthma who worked in a factory making electronic components. They were exposed to the dust of tetrachlorophthalic anhydride (TCPA), the curing agent for an epoxy resin plastic used to coat the manufactured anodes. Inhalation tests were made in four of the seven women. In all four, asthma was provoked by lactose dust containing a) the epoxy resin powder mixture and b) pure TCPA, but not by the lactose vehicle alone. The seven women all had specific IgE antibody, shown by high radio-allergosorbent test scores to TCPA-human serum albumin conjugate (TCPA-HSA); skin prick testing with TCPA-HSA elicited immediate wheal and flare reactions in all seven. Exposed and unexposed control subjects did not show these reactions. Specific IgE antibody and skin prick reactions have been described in those with asthma caused by the related acid anhydrides, phthalic anhydride and trimellitic anhydride but have not previously been found in TCPA asthma. A cross-sectional study is planned to estimate the prevalence and relationships between asthma, specific IgE antibody and skin prick reactions in TCPA workers.

OCCUPATIONALLY RELATED HYPERSENSITIVITY LUNG DISEASE IN ISRAELI VETERINARIANS. G.L.Baum, I. Lutsky, H.Teichatahl, A. Mazar, D. Toshner, S. Bar-Sela. Pulmonary Division, Chaim Sheba Medical Center, Tel Hashomer, Dept. of Comparative Medicine and Allergy Unit, Hebrew University Hadassah Medical School, Jerusalem Israel.

200 veterinarians (V) were studied to identify a relationship between occupational exposure to animals and the presence of clinical hypersensitivity. History of respiratory symptoms and animal exposure was elicited from each subject. Prick skin testing was performed using common inhalant antigens and a broad screen of animal antigens. Blood was assayed for total and specific IgE and for precipitating antibodies to fungal and animal antigens. Simple pulmonary function testing (PFT) was done. A control group of 100 subjects (C) with no occupational animal exposure was similarly studied. 43/198(V) were positive on skin testing of which 25 (12.6%) reacted to animal antigens. For (C) 17/100 reacted of which 9/100 reacted to animal antigens. 45/200 (V) had allergic respiratory and/or eye symptoms in 23 of which (11.5%) these symptoms were animal related. Among 100 (C) 20 had allergic respiratory and/or eye symptoms in 4 of which animal relationship was clear. A total of 18 (V) out of 79 tested had abnormal PFT (13 restrictive pattern, 5 obstructive), while 15 (C) of 99 tested had abnormal PFT (13 restrictive pattern, 2 obstructive). It appears as if professional exposure to animals in the group of Israeli veterinarians tested (approximately 2/3 of the entire professional group) is not associated with the development of excess allergic respiratory disease. Although (V) and (C) were similar in age and smoking habits more abnormalities of pulmonary function were found in (V). The reasons for these findings are not clear.

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EFFECTS OF EXERCISE WITH INDUSTRIAL RESPIRATORS. Philip Harber, R.J. Tamimie, A. Bhattacharya, J. Emory, Department of Environmental Health, University of Cincinnati, Cincinnati, OH.

Although OSHA(1910.134) requires physicians to determine health conditions which disqualify a worker from respirator use, there is little to guide such decisions. We used forced choice interviews of 16 workers to document that subjective dyspnea does occur (e.g., 3/16 reported dyspnea with heavy work). Physiologic effects were assessed in 10 normal volunteers. Each was tested at rest and at loads of 200 and 400 kgm/min on an ergometer; after a rest period, this was repeated with a respirator cartridge as inspiratory resistance (IR) and 300 ml dead space added. This was followed by maximal exercise with IR+DS. Analysis was by paired t-test between loaded and unloaded breathing at each exercise level and between submaximal and maximal exercise with DS+IR loading. There were no significant differences between loaded and unloaded breathing for heart rate (HR), respiratory rate (RR), minute volume (MV) or O_2 consumption (OC) and minor tidal volume (TV) changes. Respiratory timing variables showed significant effects: Inspiratory time (TI) was prolonged at rest and all levels of exercise, while expiratory time (TE) showed smaller, statistically insignificant changes (e.g., at the 200 load, mean TI increased 0.32 seconds while mean TE fell 0.08 seconds). The TI:TE ratio (IE) and TI:total time (IT) ratio were different at all exercise levels. Peak mouth pressure (PP) was different and rose with increasing exercise level as did external inspiratory respiratory work (RW) and peak inspiratory respiratory work rate (PW). Peak inspiratory flow rates decreased due to IR+DS loading. Comparison of maximal and submaximal periods showed significant differences for RR, TV, MV, TE, PP, IE, IT, PF, HR, OC, RW, and PW. These results suggest: 1., Although a significant proportion of workers have respiratory symptoms due to respirators, it is not due to limitation of OC or ventilatory capacity during submaximal exercise. 2., Normal persons adjust to the DS and IR loads of respirators by changing their respiratory pattern to limit peak pressures generated, prolonging inspiration. 3., Maximum compression of TE does not occur during submaximal exercise with respirator use. 4., The IR effect appears to dominate over the DS effect. 5., A demonstrable change in HR or RR due to respirator use is abnormal.

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