manufacturing exposed to inorganic fine particulates (e.g. free silica, silicon carbide, or aluminium oxide). Information about their longitudinal lung function change is relatively limited.
Method Forty five workers involved in grinding task of grinding wheel manufacturing were enrolled. Their lung function test results in the past three years (2010 ~ 2012) were collected. Particulate matters with aerodynamic diameter less than 2.5 (PM2.5) and 10 (PM10) μm in their workplace were measured using real-time monitor. Controls (n = 175) were health care workers, who had regular lung function examination for more than three times. Linear regression was used to calculate the rate of individual lung function decline and the standard error. Multiple linear regression for individual decline rate was adjusted for age, gender, and smoking status, and was weighted by the inverse of square standard error.
Results The average concentration of PM2.5 and PM10 in the grinding room were 60 and 186 μg/m3, respectively. Mean decline rates of forced expiratory volume in 1 second among non-smokers and smokers were 33.2 and 108.1 ml/year in grinding workers, and 13.1 and 52.7 ml/year, respectively, in controls. After adjustment, age ($\beta = -0.95$, $p = 0.0001$), grinding work ($\beta = -42.6$, $p = 0.002$), and current smoking ($\beta = -33.0$, $p = 0.014$) were associated with lung function decline rate. The interaction term between grinding and smoking is not statistically significant.
Discussion The rate of longitudinal lung function decline is increased in grinding workers of grinding wheel manufacturing. Improvement in dust control and personal protective equipment usage are needed, as well as the further lung function monitoring annually.

Oral Session 41 – Cancer II

041-1 IS BERYLLIUM-INDUCED LUNG CANCER CAUSED ONLY BY SOLUBLE FORMS AND HIGH EXPOSURE LEVELS?

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The International Agency for Research on Cancer has deemed beryllium a Group 1 lung carcinogen, based in part on findings from a pooled cohort of U.S. beryllium processing workers. The U.S. Occupational Safety and Health Administration (OSHA) recently proposed a tenfold-decreased permissible exposure limit for beryllium, based partly on estimates of lung cancer risk from recent follow-up of this pooled cohort (the only cohort available with quantitative exposure information). Criticisms in the literature and public comments hypothesise that workers hired after 1954 (when exposures were lower) or exposed only to insoluble forms of beryllium do not exhibit increased risk of lung cancer. We evaluated this hypothesis by conducting Cox proportional hazards regression analyses in age-based risk sets within two (of three) plants in the pooled cohort. 98% of workers at these plants were hired 1955–1969. We used categorical and power models to evaluate exposure-response patterns for mean and cumulative beryllium exposure in the two-plant cohort, comparing findings to published estimates from the full pooled cohort. We also evaluated the distribution of exposure-years in each cohort by solubility class (soluble, insoluble, mixed). Mean beryllium exposure averaged <2 μg/m³ and the predominant form was insoluble, among the two-plant cohort. We observed 75 lung cancer cases (through 2005). Adjusting for confounders related to smoking and the healthy worker effect, we observed a monotonic increase in lung cancer mortality across exposure categories. The exposure-response coefficients (per unit of exposure) were 0.242 ($p = 0.087$) for mean exposure and 0.151 ($p = 0.049$) for cumulative exposure, compared to 0.155 and 0.094 (respectively) in the full cohort. The low exposure levels at these two plants and the predominance of insoluble beryllium suggest that the overall pooled cohort findings upon which OSHA's lung cancer risk assessment is based are highly relevant for current workers exposed to all forms of beryllium.

041-2 LUNG CANCER, INCLUDING HISTOLOGICAL SUBTYPES, AND AGRICULTURAL CROP-RELATED EXPOSURES: RESULTS OF THE AGRICULTURE AND CANCER COHORT

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Introduction Epidemiologic studies have found lower risks of lung cancer (LC), partly due to a lower prevalence of smoking, and with increasing evidence of potential protection in some animal farmers. However, farmers are also exposed to some hazardous air contaminants (pesticides, diesel exhaust, mineral dust). In the prospective cohort AGRICAN, we assessed associations between several crop-related activities and tasks and LC risk, including adenocarcinomas (ADC), squamous cell carcinomas (SqCC) and small cell carcinomas (SmCC).
Methods AGRICAN includes French individuals affiliated to the agricultural health insurance scheme. Incident LC were identified by linkage with cancer registries from enrolment (2005–2007) to 2011. Data on crop exposure during lifetime (13 crops and from 2 to 5 specific tasks) were obtained from the enrolment questionnaire. Analyses were performed using a Cox model, with attained age as time scale, adjusted for gender, smoking history and exposure to potential protective activities – cattle and horses.
Results Among the 148,046 subjects, 487 incident LC were identified. Higher risks were observed in pea growers, especially in those who harvested, (harvesting: HR = 1.43[0.99–2.06], with a significant relationship with duration of exposure (p-trend for duration = 0.06)), for all subtypes except ADC. Increased risks were also observed among (i) farmers growing vegetables (HR = 1.26[0.93–1.72]), (ii) vine-growers (ADC: HR = 1.37 [0.97–1.93]), especially in those performing re-entry tasks (ADC: HR 1.40 [0.96–2.04]) and harvesting (ADC: HR = 1.37[0.95–1.95]); (iii) pesticide users on beets (SqCC: HR = 1.88[1.13–3.11]) and (iv) farmers who treated rape seeds (SqCC: HR = 2.55[1.17–5.53]). No significant relationship was observed with duration for any of these activities and tasks.
Conclusions We found positive associations between LC risk and several crop-related tasks including pesticide exposure

O41-1 Is beryllium-induced lung cancer caused only by soluble forms and high exposure levels?

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Notes