Lung Cancer and Multiple Exposures

To the Editor:

We would like to thank Moolgavkar *et al*[1] for their provocative and informative article on lung cancer and its relation to radon exposure and cigarette smoke. Their observations supporting a two-mutation model for both tobacco and radon may help to explain some of the confusing observations regarding respirable crystalline silica, tobacco smoke, and the development of pulmonary neoplasia.

Some epidemiologic studies observed no association between lung cancer and the inhalation of crystalline silica,[2,3] but others provide strong evidence of increased risk of lung cancer among miners and other occupationally exposed individuals.[4–7] Some studies indicate synergistic action between tobacco smoke and respirable crystalline silica,[7] whereas others state more emphatically that a multiplicative relation exists.[5] The interaction from simultaneous tobacco smoke and respirable crystalline silica has been discussed,[8] but as yet it is difficult to describe explicitly; whether the relation is additive, multiplicative, or supra-additive, similar to the radon-cigarette smoke interaction as observed by Moolgavkar *et al*, is undetermined.

Most of the occupational exposure studies of crystalline silica and lung cancer do not include industrial hygiene measures of radon, polycyclic aromatic hydrocarbons, or other possible covariates or confounders of lung cancer; some do mention these factors in their discussion.[5,6] Analogously, as elucidated by Abelson,[9] many of the studies of uranium miners have focused on radon and tobacco smoke exposure and have neglected dust or respirable particulates and crystalline silica as possible covariates or confounders. Does crystalline silica need to be included in the lung cancer model for all underground miners, regardless of the ore type?

Similar to the inverse relation between exposure levels and lifetime tumor probability observed by Moolgavkar *et al*,[1] experimental animal studies of inhaled crystalline silica have demonstrated lower rates of cancer at higher doses and/or longer fractional lifetime exposures.[10–13] One epidemiologic study observed higher odds ratios for the development of lung cancer at lower cumulative silica dust exposures.[2] As proposed for radon and tobacco smoke, can we similarly postulate a two-mutation model for respirable crystalline silica?

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The Pooling Project

To the Editor:

Friedenreich's article[1] on pooled analyses of epidemiologic studies is a thoughtful and valuable contri-

bution. It is unfortunate, however, that no mention was made of the "Pooling Project."[2] This project considered eight longitudinal studies of cardiovascular disease and finally decided to use data from only five (Albany civil servants, Chicago Peoples Gas Company, Chicago Western Electric Company, Framingham community, and Tecumseh community). The Pooling Project was initiated by the Council on Epidemiology of the American Heart Association in 1964. The final report was not published until 1978, an indication of the tremendous amount of work involved in getting comparable data on 7,066 male subjects, age 40–59 years on entry, followed for 10 years in five different centers.

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Hypothesis Generating Machine—Occupation and Mortality

To the Editor:

In his commentary article, "The Hypothesis Generating Machine,"[1] Cole credits me with an early version of this "machine." He was referring to my 1983 publication, "Occupational Mortality in Washington State."[2] If, as he claimed, Cole had reviewed the literature, he would have discovered that, in 1841, William Farr published his first death record-based analysis of the influences of occupation on mortality, and that the Registrar General for England and Wales has published a similar analysis on every census since 1851.[3] The 1983 monograph cited by Cole was an update of the original monograph in this series published by the National Institute for Occupational Safety and Health (NIOSH) in 1976.[4] Cole may be happy to learn that the final volume in this series will be published by NIOSH this year covering the years 1950–1989 for 588,090 male deaths and the years 1974–1989 for 88,071 female deaths (exclusive of housewives).

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Past Intrauterine Device Use and Risk of Tubal Pregnancy

To the Editor:

The recent article by Rossing *et al*[1] identifies an increased risk of tubal pregnancy among past users of intrauterine devices (IUDs). This risk increased with increasing duration of past use. In this study, the control group consisted of sexually active women of reproductive age with relevant exclusions.

Cases of ectopic pregnancy are often women who wish to conceive and who, therefore, are past rather than present contraceptors. Among women who have used an IUD, the desire to conceive is an increasingly prevalent reason for discontinuation as the duration of use increases.[2] Among sexually active women of reproductive age, most do not wish to conceive at present, and they are therefore more likely to be current rather than past users of contraception. Of course, current contraceptors can still be past users of other types of contraception. This possible underlying difference between cases and controls is supported by data presented in the accompanying article by Rossing *et al*,[3] which describes tubal pregnancy risk by current contraceptive use in the same study population. Among these subjects, 64% of cases, but only 14% of controls, were currently nonusers of contraception (from Table 2). Thus, it is possible that, in this study, cases were more likely to be past users of all kinds of contraception.