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with a history of abnormal pap smears) were excluded. These findings support the possibility that long-term use of oral contraceptives may have an adverse effect on the cervical epithelium, but emphasize the need for careful evaluation of confounding influences.

Optimal frequency of screening for cervical cancer: data from a Toronto case-control study. E. Clarke* (Dept. of Preventive Medicine and Biostatistics, U. of Toronto, Toronto, Ontario, Canada M5S 1A8), T. Anderson, and S. Hilditch.

A study of 181 cases and 905 controls conducted in Toronto, Canada, between 1973 and 1976 demonstrated that women who had not had a Papanicolaou smear in the last five years were at three times the risk of developing cervical cancer. The present report draws on this study wherein details and cervical smears obtained from attending physicians for 156 cases and 682 controls were analyzed to assess the optimal frequency of cervical screening. The time between the last normal smear and the date of diagnosis was divided into 12-month intervals. Relative protection was then calculated comparing women who had one or more normal smears with those who were never screened. The results show a significant protective effect of cervical screening in women who had two or more normal smears, the last one being within two years of diagnosis. This trend, although not statistically significant, continued to four years prior to diagnosis, suggesting that screening intervals should not be less than four years. This study illustrates the effectiveness of the case-control approach in the evaluation of screening procedures.

Occupation and Environment I
Chairman: S. Preston-Martin

Formaldehyde-related occupations and cancers of the nasopharynx and sinonasal region. G. Roush,* J. Walrath, L. Stayner, S. Kaplan, and A. Blair (Yale U., New Haven, CT 065101).

Formaldehyde vapor induces cancer of the nasal passages in laboratory animals. In this study, occupational information was obtained for 198 persons with sinonasal cancer and 173 with nasopharyngeal cancers, identified as incident cases by the Connecticut Tumor Registry over 41 years among Connecticut males dying of any cause, and for 605 controls sampled from Connecticut death certificates. City directories and death certificates provided information on job, industry, employer and year of employment for exposure classification. Without knowledge as to case-control status, an industrial hygienist (particularly experienced in epidemiologic studies of formaldehyde) classified each study subject with respect to probability and degree of formaldehyde exposure. Elevated odds ratios observed in the rubber industry, printers, and physicians and dentists were consistent with random variation. No associations for either of these two malignancies were detected in formaldehyde-related occupations in six other industries. There was no overall association of formaldehyde-related occupations with either nasopharyngeal cancers (odds ratio (OR) = 1.1; 95% confidence interval (CI), 0.7–1.9) or with sinonasal cancer (OR = 0.8; 95% CI, 0.5–1.3). No trends in risk were observed with time and age. Risk was not increased among the 10 subjects thought to have had exposure over 1 ppm. In formaldehyde induces nasal cancers in humans, such an effect can not be detected by these methods.

Mesothelioma risk related to occupational or other asbestos exposure: preliminary results from a case-control study. R. Spirtas* (NCI, Bethesda, MD 20205), R. Keehn, W. Wright, A. Stark, G. Beebe, and E. Dickson.

A study has been undertaken to evaluate occupational and other asbestos exposures as to the gradient of relative risk of malignant mesothelioma. It includes telephone-interviews with next-of-kin of cases diagnosed during 1975–1980 and matched controls from Los Angeles County, New York State (exclusive of New York City), and selected Veterans Administration Hospitals. Based upon histopathologic review by an international panel of expert pathologists, responses from next-of-kin of 259 confirmed cases and matched controls have been selected for preliminary analysis. Job and non-job-related activities with known or suspected asbestos exposures have the following odds ratios (and 95% confidence intervals): furnace or boiler installation or repair, 4.5 (2.5–8.2); shipbuilding, ship demolition, or shipyard work, 4.3 (2.5–7.4); insulation, 3.2 (2.1–5.0); elevator installation or repair, 1.9 (0.4–9.8); building demolition, 1.4 (0.7–3.0); plumbing or heating repair, 1.3 (0.9–1.9); production of textiles, 1.3 (0.4–4.9); brake lining installation or repair, 1.0 (0.6–1.6); production of paper products, 0.8 (0.3–1.9). Results are reported by site (pleura, peritoneum), cell type (epithelial, biphasic, mesenchymal) and age at first exposure.

Mutagenic cervical mucus in women smokers. E. Holly,* N. Petrakis, N. Friend, D. Sarles, R. Lee, and L. Flander (U. of California, San Francisco, CA 94143).

A study was conducted to determine whether any relationship existed between mutagenicity of a woman's uterine cervical mucus and her current smoking status. Cervical fluids obtained from 78 premenopausal women seen between July 1983 and March 1984 at the University of California dysplasia and diethylstilbestrol clinic or in a private practice were tested for mutagenicity using the Ames/Salmonella microsomal test. Fourteen of 36 current smokers (39%) had positive tests as compared to five of 42 nonsmokers (12%) (odds ratio (OR) = 4.7; 95% confidence interval (CI), 1.6–14.2). Secretions from 13 of 31 women (42%) who had smoked within the previous six hours were positive on the laboratory test versus one of five women (20%) among those who had smoked seven or more hours before the specimens were obtained (OR = 2.9, 95% CI, 0.30–27.6). Fluids from women with dysplasia or carcinoma in situ were more likely to be mutagenic than were those from other women (OR = 2.0; 95% CI, 0.70–5.9). This relationship between smoking and mutagenic cervical fluids offers biochemical evidence for the association between cervical cancer and cigarette smoking noted in previous epidemiologic studies.

Associations between nine sites of cancer and nine organic dusts: results from a hypothesis-generating

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