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LETTER TO THE EDITOR

Breast cancer and the environment: why research and preventive action are needed

The Editor
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In the February 2013 issue of *Current Oncology,* Dr. Steven Narod[1] critiqued the 2012 study by Brophy *et al.*[2], which found elevated breast cancer risk among several occupational groups. He also expressed skepticism concerning the role that environmental exposures to industrial chemicals and pollution play in the causation of breast cancer. That skepticism reflects an outdated epidemiologic analysis undertaken 30 years ago[3].

In 2010, the President's Cancer Panel in the United States drew attention to "the unacceptable burden of cancer resulting from environmental and occupational exposures," which it said was "grossly underestimated." The Panel stressed the need "to identify the many existing but unrecognized environmental carcinogens and eliminate those that are known from our workplaces, schools, and homes." In Europe, attention has been drawn to the need to identify "hidden" groups whose occupational exposure to carcinogens is underrepresented in intervention strategies (European Agency for Safety and Health at Work. Workshop on Carcinogens and Work-Related Cancer. 2012).

Workers as a group tend to be more highly exposed to carcinogens, but they have been relatively neglected by epidemiologists. This lack of scientific attention could be characterized as a reflection of sex and class bias. The Brophy *et al.* study was conducted in response to those gaps. This comprehensive case–control study was considerably more than what Dr. Narod characterized as "an interesting pilot." It was a hypothesis-driven study based on findings from two previous studies by the authors. Dr. Narod's critique of the study design was also ill-informed. The authors acknowledge that there were social class differences between the cases and controls, just as there were exposure differences. That was precisely why the analysis carefully controlled for family income and education levels. Given the inevitable exposure misclassification, low-income (and generally more highly exposed) workers might be expected to show more residual excesses not accounted for in the exposure classification scheme used—as was observed. If participation rates were higher among non-cases in the service sector, as suggested by Dr. Narod, there should have been a nonspecific general excess across all manufacturing sectors—which was not observed. Most minor non-plastics sectors had deficits similar to those observed in services (liquor, tobacco, wood, printing, petroleum, glass and ceramic, electrical, jewellery and furniture) and in transportation. Differences in participation rates of controls would not generate higher estimated relative risks when cases are restricted by receptor type or menopausal status, as was observed.

A strength of the Brophy *et al.* study was the compilation of detailed work histories that permitted systematic classification of jobs in broad exposure terms relating to carcinogens and endocrine-disrupting chemicals. Determining which chemicals and related mixtures to study is indeed a challenge, and that is why a study that identifies clear specific excess cancer is so valuable: it narrows the field. The findings point to very specific and practical next steps in exposure assessment, such as retrospectively describing the components of automotive plastics and canning polymers that were in use over the past 40 years in the study area's automotive and food industries.

Despite the paucity of scientific interest in occupational and environmental causes of breast cancer, a growing body of evidence is indicating elevated breast cancer risk associated with exogenous exposures. For example, Health Canada recently contributed to epidemiological research about the relationship of breast cancer with exposures to traffic pollution[4]. Dr. Issac Luginaah and colleagues[5] identified 5 counties in southern Ontario and 2 areas in Toronto with "clusters" of breast cancer. Those findings supported the "hypothesis that breast cancer in southern Ontario may be associated with industrial and environmental

(such as pesticides) pollutants" postulated by the researchers. As documented in the Brophy *et al.* paper, numerous national and international studies have identified occupational associations with breast cancer. Women's occupational exposures to carcinogenic and endocrine-disrupting chemicals have recently been documented in work environments such as automotive plastics manufacturing[6].

Dr. Narod asks "What is left to learn?" Perhaps we need to learn how we should respond to the increasing evidence. In the mid-1960s, during the debates between the tobacco industry and governments about the carcinogenicity of cigarette smoke and lung cancer, the United States Surgeon General and Sir Austin Bradford Hill produced guidelines for inferring causality. By finally applying those guidelines to the evidence concerning breast cancer and environmental exposures, a robust relationship is developing. Public health communities and governments should respond to the breast cancer epidemic by drawing on this growing body of knowledge and adopting bold initiatives at the political level.

More epidemiologic research on environmental causes of breast cancer should be conducted. Dr. Narod correctly points out that much of the information available about mammary carcinogens is derived from animal studies[7]. However, "affixing monitors to the lapels of women" to determine exposures over extended periods of time would not be practical or effective. It would be even less adequate for the study of breast cancer, in which endocrine and reproductive status may be important factors. Given the relative neglect of occupational epidemiology, particularly considering exposures to mixtures, the evidence from animal experimentation becomes vital for worker protection. The International Agency for Research on Cancer accepts that, "in the absence of adequate data on humans, it is biologically plausible and prudent to regard agents for which there is sufficient evidence of carcinogenicity in experimental animals as if they presented a carcinogenic risk to humans"[2].

At the scientific and technical levels, the breast cancer epidemic is a crisis of modernity, with most cases unaccounted for by "known" risk factors. The U.S. Interagency Breast Cancer and Environmental Research Coordinating Committee recently put forward a science policy document on breast cancer, stressing primary prevention through reduction of exposures to chemicals. Equally, the breast cancer epidemic has generated a lack of confidence in our medical and public health institutions. Over the past 30 years, our governance, academic, publishing, and health institutions have become progressively beholden to corporate interests, thereby further undermining worker and consumer trust in the medical and public health authorities[8]. It is long past time that these institutional failings be addressed.

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CONFLICT OF INTEREST DISCLOSURES

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