Environmental pollution makes a sizeable contribution to the burden of cancer worldwide: it is estimated that globally, 5%–10% of all cancers may be caused by environmental exposures. About one-third of these are caused by exposures in the general environment, the remainder by exposures in the workplace [1, 2]. However, heavy pollution may increase the risk of various cancers, particularly when acting in conjunction with other known risk factors, such as smoking and certain dietary habits.

In recent years, much attention has been focussed on countries of Central Europe where a decline in the general health of the population and of life expectancy of males since the mid-1960s [3] has been accompanied by a steady increase in cancer mortality and ever-worsening environmental conditions [4]. In particular, in Hungary, former Czechoslovakia and Poland, middle-aged men have an increasing risk of dying prematurely, mainly because of rapidly escalating mortality from cardiovascular diseases and cancer: in 1990, more than half (52%) of all men in Hungary died in middle age, as opposed to 39% in 1965. These areas now have the highest total cancer mortality rate ever recorded in Europe, and the region is characterized by rapidly increasing rates of tobacco-related cancers, in particular, of the lung, oral cavity, pharynx, and larynx [4]. However, tobacco is unlikely to entirely account for these increases, even when interaction with other factors, such as alcohol consumption, is taken into account. It is plausible that environmental exposures, whether in the workplace or in the ambient environment, contribute to the increased cancer incidence in the region.

Last October, more than 160 researchers and public health professionals from throughout the world came together in Budapest, Hungary, to discuss the role of environmental pollution in carcinogenesis. Carcinogenesis from Environmental Pollution: Assessment of Human Risk and Strategies for Prevention, organized by the American Association for Cancer Research and the International Agency for Research on Cancer in collaboration with the Hungarian Cancer Society, was chaired by Dr. Paul Kleihues (IARC, Lyon, France) and Dr. Frederica Perera (Columbia University School of Public Health, New York, USA). Some 22 invited talks and more than 60 posters were presented on the five main themes: cancer occurrence, aetiology and risk assessment; air, food, soil and water contamination; ambient and occupational exposure; tobacco smoke; and strategies for prevention. One of the high points of the meeting was the lively and stimulating roundtable session, during which priorities for future research and intervention were considered. This brief report focusses on this, the culmination and conclusion of three days of scientific discussion.

A key area identified as a priority for further research was the more accurate assessment of the relative contribution of smoking, air pollution and occupation to cancer incidence, in particular, in Eastern and Central Europe. In certain instances, a link between cancer and environmental pollution has been shown: for example, residents of Upper Silesia in Poland, where the air is polluted by industry and by the combustion products of heating fuels, who are exposed to a high level of air pollution, have about twice the chance of developing lung cancer as residents of less-polluted areas [5]. However, the effect of exposure to low or moderate levels of industrial pollutants is not yet clear [6]. Moreover, although there is firm evidence that ambient pollution, such as second-hand cigarette smoke, causes cancer [7], it is difficult to quantify this effect precisely.

A major difficulty in identifying harmful exposures and their impact lies in obtaining accurate measurements of exposures, and assessing the relative impact of endogenous factors and environmental exposures. The
marriage of laboratory methods and epidemiological techniques and the use of biomarkers of exposure in epidemiological studies to gain more accurate estimates of risk was widely discussed. Although reliable markers of environmental exposure are available, these are mainly short term, reflecting only relatively recent exposures, which jeopardize their use in epidemiological studies of cancer. Large, well-designed international molecular epidemiological studies that incorporate biomarkers are needed. Moreover, to assess the role of environmental pollution, the study of the risk factors and mechanisms involved in cancer in non-smokers is particularly valuable. One difficulty in discriminating between ‘environmental pollution’ and ‘smoking’ as separate risk factors lies in the fact that in many countries, a major source of environmental pollution is second-hand cigarette smoke.

Other areas identified as needing further research were the role of receptor-mediated carcinogenesis – in particular, in the case of exposure to organochloranes – and the levels of particulate matter in ambient air, as particles can act as depositories of other carcinogens.

Diet has been estimated to play a role in about one-third of all cancers [2]. As there has been a decline in the quality of diet in many countries of Eastern and Central Europe, with a reduction in the intake of fresh fruit and vegetables and increased consumption of animal fat and alcohol, the role of diet, and of bioavailability of micronutrients, should also be considered.

The potential offered by the fast-growing new discipline of molecular epidemiology in assessing exposure, risk and outcome was evident. Biomarkers could be used in planning animal, mechanistic and toxicological studies, and to identify high-risk groups. In prevention trials, these markers have applications not only in identifying individuals within populations who are particularly cancer-prone, whether because of an inherited or an acquired cancer susceptibility, but also in measuring compliance and intermediate outcomes, or surrogates. Testing for genotypic susceptibility could also be used to identify those individuals at high risk from certain occupational exposures in the workplace, but poses many ethical challenges as regards the psychological, economic and social implications.

The meeting ended by exploring how current knowledge of cancer risks could best be applied to preventing the disease. Two lines of action seemed be of highest priority: smoking cessation programmes and dietary guidelines. At the level of involuntary exposures, guidelines must be established and enforced.

The role of smoking in cancer incidence in Eastern and Central Europe, and the associated recent increases in lung cancer mortality, was again emphasized. Worldwide, the number of cigarettes produced and sold is still increasing. While consumption is at last falling in certain countries, it is increasing in many parts of the world, in particular in the developing world and in Eastern Europe, as the tobacco companies aggressively explore and exploit new markets.

Over the coming fifteen years, lung cancer mortality rates in Central and Eastern Europe will continue to surpass those in Western Europe. Lung cancer deaths are expected to increase in Hungary, Slovakia and Poland, and to change little in Austria and in the Czech Republic. For women, this increase will be exponential, with the highest rates in Poland and Hungary [8]. Bearing in mind that in 1990, 60% of cancers in middle-aged Hungarian men were already caused by smoking [4], these predictions underline the continuing need for control of tobacco as a priority in cancer prevention.

References


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