Pollution and People

Perspectives and priorities

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At the end of a series of articles cataloguing hazards and disasters, it is time to look at pollution in a wider context. Longevity is increasing and death rates are decreasing in most age groups; while among deaths from cancer smoking accounts for as many as a third, according to a recent review of cancer rates in the United States.¹ This is not to say that we need not worry, and in any case cancer rates and death rates are not the only criteria; but this perspective does say something about priorities—there are often much greater hazards to take action on—and it does help to moderate panic. Similarly, the increased monitoring now undertaken and the improved technologies for reducing pollutants are things to set against the “doom and gloom” approach to the subject.²

Some general problems and pitfalls

Pesticides and other chemicals well illustrate some of the general concerns and also confusions surrounding many pollutants. Most prominently, there is the question of low concentrations. Five hundred or so active ingredients are used in the pesticides registered in the United States, of which a substantial number are appreciably toxic or mutagenic and carcinogenic.^{3 15a} As with other substances, sensitive analytical methods show some of them to be ubiquitous in very low concentrations; but does it matter? Usually there is no direct information about safe levels. Extrapolations—in the case of carcinogenicity—can often be made from data on high doses or effects in animals, which may or may not be reassuring; knowledge of biochemical mechanisms may suggest thresholds for, say, neurotoxicity, at least experimentally—but doubts may remain about the effects of a substance in practice, and efforts must be made to limit exposure or find alternatives.⁴ In the case of pesticides, for example, understanding of mechanisms can lead to the design of safer alternatives.⁵

With many pollutants there is a particular lack of information about the possibility of effects on the fetus and infant, who would be expected to be the most vulnerable.^{3 6} In the case of the persistent organochlorine pesticides (which include DDT and dieldrin) and polychlorinated biphenyls (PCBs—industrial pollutants widespread in the environment^{6a}), residues build up in animal and human fatty tissue.⁷ The breast-fed infant, it has been said, is right at the end of the food chain as such residues become concentrated in milk fat⁶; and even less widely used pesticides are found in breast milk. Nevertheless, levels are usually very low and although experimental evidence has proliferated we have nothing really clear cut to go on.

Persistence in the environment is a worry with many pollutants—notably the long-lived radionuclides. The stability that has made halogenated aromatic hydrocarbons such as DDT and PCBs so attractive to agriculture and industry makes them

a menace biologically.⁷ For this reason the use of DDT has ceased in many developed countries, which can afford to do without its economic advantages, and been replaced by others such as organophosphorus compounds (which include malathion); these, though requiring great care, are far less stable and degrade rapidly. DDT residues have diminished in both food and human fat,^{8 9} but pollution by some persistent compounds, such as the PCBs, can be an intractable problem that is discovered too late.⁷

Accidents resulting in disease and death on a large scale have occurred with many pollutants that normally appear to do no harm. Halogenated aromatic hydrocarbons have produced several—notably the outbreak of “yusho” or “oil disease” in Japan in 1968 traced to rice oil contaminated with PCBs and other toxic chemicals; the Michigan milk disaster caused by polybrominated biphenyls accidentally put into cattle feed in 1973; and the explosion that dispersed dioxin at Seveso in 1976.⁷ Such catastrophes are reminders of the devastating effects of powerful toxins when some careless slip is made; but they also help to create an atmosphere of hysteria about the more usual levels of the pollutants to which we are exposed—any effects of which must pale beside the toll taken by smoking and road accidents, for example.

Finally, low-level effects of a pollutant are not clarified by citing sporadic cases of disease or other damage, at least without further evidence, as has often been done (“asbestos” cancers are an example). Among chemicals a topical example is the herbicide 2,4,5-T, which is contaminated with the potent dioxin known as TCDD but at extremely low concentrations, quite unlike those in the notorious “Agent Orange” used as a herbicide in the Vietnam war. Alleged cases of birth defects, abortions, and disease associated with exposure to the herbicide led to suspicions about 2,4,5-T itself and attempts to get it banned; but the examination of the cases, and of other evidence, by the Advisory Committee on Pesticides illustrates the fallacy of arguing cause and effect in this way.¹⁰ Nevertheless, the fact that such substances—and many others that become pollutants—are mishandled, or used and disposed of without sufficient precautions, is something to be concerned about.

Cancer rates and environmental carcinogens

Trends in cancer rates and their relation to the environment are a current subject of controversy.^{1 11–14} Epstein has argued that cancer rates in the United States are increasing and reflect the increasing production of a wide range of chemicals, to which both the workforce and the general population are exposed.¹¹ Doll and Peto, however, show that in middle age (when data are more reliable than for the elderly and when rates say more about fairly recent conditions) the death rate from non-respiratory cancers is falling.¹ The only major increases in mortality and incidence have been in lung cancer, and this they show is largely due to smoking; stomach cancer and cancer of the cervix have greatly diminished. The common cancers, moreover, have been common for a long time.

This review suggests a token figure of 2% as the proportion of all cancers in the United States due to pollution—chiefly accounted for by the uncertain effect of the combustion products of fossil fuels in urban air—with an arbitrary upper limit of 5%. But it mentions the possible future hazard of chlorofluorocarbons used as aerosol propellants and refrigerants, since if these eventually reach the stratosphere and reduce the concentration of ozone this would expose us to more ultraviolet radiation, with a greater risk of melanoma and other skin cancers.

On pesticides, Doll and Peto point out that no direct evidence of carcinogenicity has been found in man despite heavy exposure in some occupational groups; and that there has been no general increase in liver cancer in developed countries (it accounts for only 1% of all tumours) since long-lasting pesticides were introduced, even though this is the main cancer they induce in animals.¹ In 1968-78 in the United States there was a non-significant increase in deaths from liver cancer in middle-aged women and a non-significant decrease in middle-aged men. Their conclusion is that pesticides as dietary pollutants are unimportant with regard to current cancer mortality, though we should avoid exposure to them whenever this can be done without great cost—for instance, by changing or limiting the use of particular pesticides or by using alternative methods of control.

Protection and policy

We sometimes reassure ourselves with the thought that life cannot be free from risk, that in many spheres of life people accept the chances of disease and accident with nonchalance—and without even wondering what the risks are. Why is it so different for many environmental pollutants, even when the hazards seem to be minuscule or speculative? Risk, of course, is more properly accepted for oneself than for others (by the individual climber than by the mountain guide), and in public health matters the people “at risk” have little choice and little knowledge. “The authorities” have to make the scientific and policy decisions on their behalf.

Thus many aspects of pollution have become deeply political issues—political in a bad sense, in that opposing “sides” may emerge, with considerable acrimony, and individual cases of possible or alleged ill effect may be bandied about with little regard to science; but political also in the good sense that individuals matter and must be protected from harm and exploitation. Though the risks from pollutants are insignificant beside the huge risks of smoking *any* cases of cancer, say, caused by a pollutant are an offence in human terms—and it is often the more deprived who are more exposed to pollution, the privileged who escape. But as we do not have the best of all possible worlds and resources are limited we cannot usually—in the short term—eliminate one possible risk without neglecting or introducing another: greatly reducing pollution from various forms of energy production, it is sometimes said, would make electricity too expensive for some people and so increase risks of hypothermia (besides making public services, and much else, more costly); while banning pesticides would make food less plentiful and more expensive.

In each case therefore the cost-benefit relationship has to be considered and compared with others, which means trying to quantify the “costs.”¹⁵ Clearly, however, at low levels of many pollutants risk assessments are to say the least uncertain—and the health benefits of further reducing or removing them may seem slight, while the expense may be considerable. But because whole populations may be exposed to them for a lifetime and a small percentage—many individuals in total—may be specially sensitive we cannot be complacent about low concentrations of powerful carcinogens and toxins. In some cases knowledge of a toxin’s biochemistry and mechanisms of action will absolve it from suspicion at low concentrations; but many carcinogens—and potential carcinogens picked up in

animal and laboratory tests—cannot be absolved beyond all doubt. “When in doubt cut it out” is a good principle but the costs of doing this, or the benefits of not doing it, have to be considered too. A recent American report on pesticide regulation recommends an approach that has a wider validity: assessments should cover not only the risks to public health and the environment from using a particular pesticide but the effects of alternative regulations on those risks, and also the social and economic benefits produced by its use and the changes in these that would result from alternative regulations—but numerical estimates should not be given unless reliable data are available.^{15a}

To short-list our worries from a few thousand to a few dozen pollutants, when quantitative risk assessment is not possible, Doll and Peto propose the approach of “priority setting.”¹ Multiplying the potency of various chemicals as judged by each type of laboratory test by a rough estimate of the extent of human exposure to them is likely to result in a clear ranking, with a few chemicals standing out beyond the rest. A few restrictions of such extremes (and of any more moderate exposures that can be cheaply controlled), they suggest, might be nearly as effective in reducing the total of human cancers as restricting all active chemicals, however minor. It would at least produce a practical and socially acceptable basis for action rather than complete paralysis.

In the wider world, of course, as distinct from the laboratory, pollutants do not act in isolation—people are exposed to many simultaneously and some agents interact with others and with other external or internal factors¹⁶ (several air pollutants may be present at the same time; smoking increases lung cancer caused by ionising radiation and asbestos among other things; possibly aflatoxin interacts with hepatitis B virus and dietary factors). A pollutant may or may not be harmful on its own (it may, for instance, act as a cancer promoter rather than initiator), and it may either add to or multiply the effects of other factors. This means that hazards may be greater in practice than at first appears; but it also means that altering only one factor in a complex may reduce the hazard. This is where epidemiology is so valuable for the real world—it starts, for example, not with the vast number of chemicals polluting a particular city but with the actual deaths in that city, attempting to identify their major causes.¹ But monitoring particular pollutants in man and the environment remains important, and may need extending in suspected “hot spots” and possibly vulnerable people.

Pollution, wellbeing, and the total environment

“Health is a state of complete physical, mental and social well-being,” the World Health Organisation has said, “and not merely an absence of disease or infirmity”; and indeed to concentrate only on death and dire disease is to take too narrow a view of pollution. The WHO definition is quoted in a report on noise¹⁷; and certainly noise, from that point of view, is one of the most certainly damaging environmental pollutants—whatever scientific dispute there is about its physiological effects at moderate levels it affects the wellbeing, sometimes seriously, of many people.

Our wellbeing, too, is bound up with the total environment, which undoubtedly has suffered from chemical pollution; and indeed in controlling a pollutant the whole ecosystem should be considered.² At the beginning of *Silent Spring* Rachel Carson quotes Keats—“. . . the sedge is wither’d from the lake, / And no birds sing”—and Albert Schweitzer—“Man has lost the capacity to foresee and to forestall. He will end by destroying the earth.” Even when we are satisfied that a pollutant has no damaging effect on man we should not necessarily be happy to leave it in the environment; and we do need, for example, more efforts to find biological methods of pest control. But activities and products that at present necessarily give rise to pollutants are often sources of great good in the world and we need a

perspective to take in all these things. I would like to adapt to this context Blake's marvellous but menacing "Lions of flaming fire raging around and melting the metals into living fluids . . ." and "unnam'd forms, which cast the metals into the expanse"¹⁷—an image illustrating both the richness of the world and of our making and the need to protect man and the earth from dangerous processes.

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Dealing with the Disadvantaged

Amputees

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one with a congenital handicap or one acquired earlier in life. Amputees are therefore often adjusting to recent loss and learning to cope with the psychological and practical implications.

Practical considerations

Hardly any special allowance need be made for ambulant leg amputees or for arm amputees. A few points are, however, worth mentioning.

- (1) For leg amputees non-slip floor surfaces and reasonably high, stable chairs with armrests are desirable.
- (2) Many arm and leg amputees will not know what "prosthesis" means, so use the term "artificial limb," "artificial arm," or "artificial leg" instead.
- (3) Loss of one or both legs may make it difficult for a patient to visit the surgery, particularly in wet or icy conditions, and especially if the patient is elderly. The sprightly, determined old

lady progressing well on her new limbs in September may be virtually housebound if it snows later. Similarly, no matter how determined the patient, when a stump hurts badly he or she can be almost completely robbed of mobility, unless crutches or a wheelchair are available. Those who do not have a car may be particularly restricted.

(4) Advice given at the limb centre may be misunderstood or forgotten, or certain topics may not be discussed, so do not neglect an opportunity to make sure that the patient is as comfortable as possible. The following advice may help.

(a) Soft-soled shoes may make walking more comfortable, but crepe soles are slippery on wet pavements.

(b) Nylon sheaths obtainable from the limb centre reduce the skin damage brought on by perspiration in hot weather, though some patients do not like wearing nylon next to the skin.

(c) It is wise to have a pair of crutches or, in some cases, a wheelchair in reserve at home, even if their regular use has been discontinued.

(d) Men wearing thigh corset attachments may find that the leather corset rubs the scrotum painfully in hot weather; underpants which give better support are the solution.

(e) With the thigh corset leg, rubbing of the buttock may be a problem if stump socks are too short to protect this region. One solution is to cut off about 25 cm from the top of an old stump sock to wear at the top of the thigh.

Psychological considerations

Several common reactions and attitudes to amputation may be seen, and, though the general practitioner is probably aware of most of these, the following observations may help.

- (1) The reaction to the acquirement of a handicap varies a

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