Editorial

Chemical pollution, verbal pollution, and paratoxicology

There is no doubt at all that human industrial activity has exacerbated the release of chemicals into the general environment. Mining and metal working were probably the first activities to cause pollution from inorganic compounds on a wide scale, although at the local level considerable nuisance was almost always caused by those who killed animals and processed the various parts of the carcass; it was for this reason that tanneries, for example, were often situated on the outskirts of towns. The release of inorganic compounds on a large scale coincided with the rise of the chemical industry in the past two centuries.

Concern has frequently been expressed about the effects of chemical contamination on animal and plant life, on the aesthetic appeal of our surroundings and—the aspect on which we shall concentrate here—on human health.

There never has been a time when man has not been exposed to chemical compounds, indeed it is the presence of essential elements in food and water that has made life itself possible. Most of what one might call “natural” contact with chemicals is through the gut, and mechanisms have evolved to regulate the uptake of chemical species across the gut wall and their subsequent transport and storage so that plasma concentrations are kept within a range at which symptoms both of deficiency and of excess are avoided. Natural airborne chemical concentrations are low, often orders of magnitude lower than now experienced in urban areas, but some exposure to chemicals in the air (other than atmospheric gases) has also been unavoidable because of their release by such natural forces as the weathering of rocks, volcanic activity, the formation of aerosols from sea water, and forest fires.

It seems a reasonable premise then that natural exposure to chemicals through the gut might be relatively high but controlled whereas exposure through the lung is low but uncontrolled since there are few mechanisms by which the uptake of foreign compounds from the lung may be regulated. Industrial activity has unquestionably increased the natural exposure to chemicals both through the lung and through the gut. The question to be faced is, does this cause harm to health and, if so, at what point do the harmful effects appear?

There are two circumstances under which exposure to chemicals may undoubtedly be dangerous. The first is when a catastrophic release occurs such as might follow an accident at a chemical plant or during the transportation of chemicals. The tragedy at Bhopal is such a case, and no one questions the terrible effect that the release of methyl isocyanate had on the population living close to the site of the accident. Such catastrophes are fortunately relatively rare and are an inevitable concomitant of modern industrial life just as plane crashes will inevitably follow the demand for quick, cheap travel. Neither plane crashes nor accidents at chemical plants are likely ever to be completely eliminated; the most that can be done is to reduce the risk to one that is acceptable to the general public or to governments. The present rate of accidents in the air does not seem to be sufficiently high to deter the public from wishing to fly nor is the risk from accidents that arise during the manufacture and transport of chemicals sufficiently great to cause governments to reduce the scale of manufacture or the public to lessen its demand for the end products of that manufacture.

Dangers to health from exposure to chemicals in the environment may also occur when the exposure is unusually great but not catastrophic. Many episodes of environmental poisoning have been documented over the years, some of the most notorious in recent times involving exposure to mercury. In Japan the release of mercury in factory effluent into Minimata Bay set in train a series of events that culminated in large scale organic mercury poisoning, and epidemics of organic mercury poisoning have also followed the eating of grain treated with mercury dressing. Epidemics of lead poisoning were common in earlier centuries as the result of the accidental or deliberate adulteration of food and drink with lead and its compounds; arsenic poisoning may occur if water contaminated with arsenical pesticides is drunk. Many more examples could be cited and there is no need to prolong a list to which most readers could add. What is important about this type of exposure is that much of it could be prevented if strict controls on emissions from factories and on the disposal of toxic waste were enforced, if the general public were educated properly to understand the risks that are associated with the
handling of potentially hazardous materials, and if the manufacturers were required to label their products appropriately. Even if all these controls were to be implemented, however, some harmful effects would be inevitable and, again, the goal must be to reduce the risk to that which is deemed to be acceptable.

It is not likely that there would be much disagreement about the potential for harm following the first two categories of exposure, but concerning the effects of exposure to chemicals at levels which are normally—or usually—present in the environment, there is often bitter and acrimonious debate. It is in this area that the practitioners of paratoxicology abound. The paratoxicologist operates outside the bounds of conventional toxicology but seeks solutions to human ailments solely in terms of exposure to chemical (or physical) hazards. For example, he may note the presence of a potentially toxic substance in the environment and the harmful effects that follow from unusually high exposure and then extrapolate these effects down to explain some untoward phenomenon in the general population. One of the most recent entrants into this arena at the time of writing is the notion that mercury in dental amalgam is capable of inducing profound adverse effects on health. The author of The Toxic Time Bomb notes that exposure to mercury may produce a number of relatively non-specific symptoms; he also observes that a substantial proportion of the (American) population admits to the presence of many non-specific symptoms; most of the population has mercury in their dental fillings which may slowly be leached out; ergo, they are suffering from micromercurialism. Many references are cited in support of this hypothesis but none can show that the release of mercury from dental fillings is sufficient to cause any of the symptoms that seem to be a concomitant of modern life. The author himself is content to admit that scientific proof for his ideas is lacking but refers the reader to a series of anecdotes which he considers are sufficiently weighty to overcome this objection. His contention is that it is not safe to wait for formal scientific proof but that we should insist on having our fillings removed without delay before things get any worse.

The message in this book, like others, has the effect of frightening where it should inform and will therefore almost certainly enjoy a good measure of popular support. There is almost nothing that the general public likes more than bad news; to be told that lead in petrol is damaging the brains of a whole generation seems to be infinitely more satisfying than repeated assurances that this is not really the case. And there is the added bonus in the knowledge that one’s state of health is determined by external rather than internal factors. How much better to know that one’s child’s behaviour, one’s lassitude, breathlessness, angina, or depression are due to the pollution of the environment with lead, cadmium, mercury, pesticides, or food additives rather than to defective genes, impoverished upbringing, or to overeating, overdrinking, underexercising, or smoking. Paratoxicologists are skilful in their exploitation of people’s natural reluctance to accept a full measure of personal responsibility for their own health, and they also tend to reject conventional scientific or medical wisdom. “How much more suffering must we allow before the scientists (doctors) make up their minds?”—or something like it—is a cry heard not infrequently from their lips in an attempt to distract attention from the fact that their case all too often rests on anecdote or, at best, on evidence of the most equivocal kind. Evidence that does not support their view is often disregarded, or when considered, held to be tainted because of prejudice against them or because the research stems from or has been supported by organisations said to have an interest in maintaining the status quo.

What is often lacking from the paratoxicologists’ case is some historical perspective. In Britain, for example, the adulteration of food and drink was widespread during the eighteenth and nineteenth centuries and in many cases was undoubtedly associated with harmful effects on health. This is no longer the case and there is little reason to doubt that the food and drink we now consume is less contaminated with overtly toxic chemicals than at any time in the recent past. Air pollution is also better controlled than in the past, certainly with respect to the products of the combustion of coal. There also seems little point in attempting to deny that general standards of health—as judged by conventional indices such as expectation of life or infant mortality rates, for example—have shown a consistent improvement during the past two centuries. There has certainly been a change in the pattern of disease and in the causes of death so that, in the developed countries at least, infectious disease is no longer a major cause of death compared with cardiovascular and malignant disease. It is unlikely, however, that a significant proportion of these deaths can be ascribed to chemical pollution, nor does it seem likely that chemicals in the environment determine behaviour or produce non-specific effects to a greater extent than social factors such as poor housing, inadequate education, or dreary, unfulfilling work. There are, of course, ways in which life may be made more tolerable and healthy, although nothing can be done to eliminate the ultimate fact of life, which is death, even if we can to some degree determine its cause. The main contributors to ill health in developing countries are, as McKeown has pointed out, largely determined by personal behaviour and,
one might also add, by social factors. Any account of the supposed ill effects of chemical pollution must take into consideration the improvements which have taken place in the general state of the environment, that food and drink are far less adulterated than in the past, and that on most measures, the general state of health is better than ever.

By perpetuating tales of gloom that he is unable to substantiate, the paratoxicologist does not perform a service since at best he engenders unnecessary alarm and at worst, he deflects attention (and resources) away from areas in which activity might produce real benefits to health. To deride a scientific approach to the issue of chemical pollution is a sign of the weakness of many of the cases advanced. If the effects of pollution really are as harmful as is sometimes stated the evidence will readily accrue. It is only if they are marginal or so weak as to be insignificant that the results of scientific studies will be equivocal.

In an Editorial discussing systems of alternative medicine the British Medical Journal calls on its practitioners to recognise the merits of the scientific method. “Those who reject that approach” [it states] “cannot expect either respect or cooperation from the medical profession.” Exactly the same may be said to the practitioners of paratoxicology otherwise they too will be guilty of calling up “a false phoenix.”

References

Correspondence and editorials

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