

# CURRENT SCIENCE

Volume 85 Number 5

10 September 2003

## EDITORIAL

### Pesticides in the environment

*'The discovery of DDT was made in the course of industrious and certainly sometimes monotonous labour; the real scientist is he who possesses the capacity to understand, interpret and evaluate the meaning of what at first sight may seem to be an unimportant discovery.'*

*Dr Paul Müller . . . Your discovery of the strong contact insecticidal action of dichloro-diphenyl-trichloroethane is of the greatest importance to the field of medicine. Thanks to you, preventive medicine is now able to fight many diseases carried by insects in a way totally different from that employed heretofore. Your discovery furthermore has, throughout the world, stimulated successfully research into newer insecticides.'*

G. Fischer, Presentation Speech:  
Nobel Prize in Physiology or Medicine, 1948

*'Even the mode of action of DDT poisoning in an insect is far from fully explained. . . . The real cause of death is today still unknown. . . .'*

*The field of pest control is immense, and many problems impatiently await a solution. A new territory has opened up for the synthetic chemist, a territory which is still unexplored and difficult, but which holds out the hope that in time further progress will be made.'*

Paul Müller  
Nobel Lecture, 11 December 1948

*'The "control of nature" is a phrase conceived in arrogance, born of the Neanderthal age of biology and philosophy, when it was supposed that nature exists for the convenience of man. The concepts of applied entomology for the most part date from that Stone Age of science. It is our alarming misfortune that so primitive a science has armed itself with the most modern and terrible weapons, and that in turning them against the insects it has also turned them against the earth.'*

Rachel Carson  
*Silent Spring*, Hamish Hamilton, 1962  
Penguin Books, 1965, p. 257

*'From analysis of 36 samples of 12 different brands of soft drink samples it can be concluded that . . . Lindane, DDT and its metabolites, Malathion and Chlorpyrifos*

*were most commonly found in 36 soft drink samples tested. . . . No pesticide residues were detected in the Coca-Cola and Pepsi samples from USA manufactured by the same multinationals.'*

H. B. Mathur, S. Johnson, A. Kumar  
'Analysis of Pesticide Residues in Soft Drinks', Centre for Science and Environment, New Delhi, 5 August 2003

In 1948 the Nobel Committee was exuberant in its recognition of Paul Müller's discovery of DDT, a magical chemical that appeared to eliminate lice, the vector for the transmission of typhus. DDT's enormous potential in the control of mosquitoes, and by extension, malaria, was evident. For all practical purposes, DDT appeared to be non-toxic to man, truly a magic bullet that targeted only the enemy. Fourteen years after Müller received the Nobel Prize, Rachel Carson wrote *Silent Spring*, a book which was to become the catalyst for the environmental movement. Carson marshalled her facts in highlighting the disastrous ecological consequences and hazards of indiscriminate spraying of insecticides. She noted sombrely: 'The crusade to create a chemically sterile, insect-free world seems to have engendered a fanatic zeal on the part of many specialists and so-called control agencies. On every hand there is evidence that those engaged in spraying operations exercise a ruthless power' (*Silent Spring*, p. 29). Carson mounted a major attack on synthetic pesticides, which she labelled as 'elixirs of death'. She pointed out that the pesticide industry 'is a child of the Second World War. In the course of developing agents of chemical warfare, some of the chemicals created in the laboratory were found to be lethal to insects. The discovery did not come by chance: insects were widely used to test chemicals as agents of death for man' (*Silent Spring*, p. 31). Four decades after Carson, pesticide manufacturers are among the most powerful multinationals in the world. These huge conglomerates dump tons of chemicals banned for use in several western countries into the Third World, abetted by regulatory bureaucracies who do not exercise control, when it matters most. The chlorocarbons and the phosphorus-containing pyrethroids are easy to produce and profit margins are enormous. Pests abound in the tropical countries. Pesticide use has grown in India and the developing

world, even if ineffective and counter-productive. Resistant strains of pests, mosquitoes among them, have appeared; a Darwinian response, in which the most resilient of pests have been chosen to multiply and spread their resistance. The dangers posed by pesticides to human health have now been well documented in the scientific literature, but indiscriminate spraying of chemicals continues, despite publicly expressed fears. The suspicions about the connection between the use of endosulfan and the growing evidence for human deformities in Kerala, have been growing. Distressingly, no clear, credible, scientific study has cleared endosulfan, which continues to be used, primarily on the strength of claims made by manufacturers of the chemical.

Environmental concerns have been raised by individuals and non-governmental organizations (NGOs) in India, over the last quarter of a century. In recent times, the magazine *Down to Earth*, nurtured for years by the late Anil Aggarwal, has provided a forum for the expression and analysis of concerns over the growing deterioration of our environment. The Centre for Science and Environment (CSE) in Delhi has recently set the cat among the pigeons, by releasing a report on the pesticide content of soft drinks manufactured and marketed by the two most powerful multinationals in the area, Coca Cola and Pepsi Cola. The CSE's report is a well-written document which details the methods and protocols used in a study which concludes that several pesticides are present at concentrations far above norms prescribed in the European Union. Disturbingly, the very same drinks bottled overseas have undetectable levels of these pesticide residues. The study used gas chromatography as the method of analysis, following standard protocols published by the United States Environmental Protection Agency (EPA). The conclusion, of course, was that the manufacturers used contaminated water, not bothering to put in place a clean-up procedure. The companies also appeared to follow quality control procedures which adopted different standards in the West and in India.

In a strange sequel to the episode, the government seemed to rise to the defence of the Cola companies, with two laboratories (including the Central Food Technological Research Institute, CFTRI), apparently providing analytical data, which cast doubt on the CSE report. I was unable to obtain a copy of the report of the government laboratories; an initial response to a request was brushed aside saying that the case was *sub judice*, a phrase that brooks no further appeal. Comparing methods, protocols and analytical data was therefore not possible, but the claims and counter-claims clearly emphasize the need for setting up professional analytical laboratories which can provide credible reports, using the most sensitive modern technologies. Gas chromatography is now complemented by liquid chromatography coupled to mass spectrometry, permitting detection and at times, *de novo* identification of trace chemicals. Application of such methods requires

both expensive instrumentation and trained scientists. While the former is sometimes accessible, the latter are not always in place. In all areas requiring chemical analysis, watchdog regulatory agencies must have under their control, laboratories with the greatest technical competence.

The machinery of government has also grown too ponderous, bureaucratic and non-technical. Multiple ministries are involved in issues raised by the problems of the food and pharmaceutical industries and the environment. In most committees and ministries the dominant quality that one encounters is a disturbing disregard for technical issues. Bureaucratic wrangling takes precedence over matters of science and technology. It is therefore unsurprising that government statements on issues of chemical analysis and toxicity are met with well-founded scepticism. The Cola controversy may remain unresolved and marketing muscle, aided by political influence, may prevail. But, the episode does have a silver lining; it has focused public attention, albeit briefly, on the important problem of growing contamination of depleting water and soil resources by a battery of chemicals, which may have drastic long-term consequences for human health.

The West has long ago put in place elaborate mechanisms for analysing toxic residues and estimating risks due to long-term exposure to chemicals. Much can be learnt from the models that already exist elsewhere. It may be time to consider the need to dramatically upgrade the capabilities in regulatory laboratories and to ensure their proper functioning. Publicly funded institutions must be charged with a specific mandate to address environmental issues and act responsibly in matters that concern the health of the population. Unfortunately, we have a situation where government reacts only when NGO's raise questions of immediate importance. We might remember that those at greatest risk from chemical pollutants are children, who will have the longest exposure to Rachel Carson's 'elixirs of death'.

In considering the problems of controlling pests and pesticides it may be useful to recall Julian Huxley's words in his preface to Carson's book: 'Pest-control is of course necessary and desirable, but it is an ecological matter, and cannot be handed over entirely to the chemists. The present campaign for mass chemical control, besides being fostered by the profit motive, is another example of our exaggeratedly technological and quantitative approach. The ecological approach on the other hand involves aiming at a dynamic balance, an integrated pattern of adjustment between a number of competing factors or even apparently conflicting interests.' The CSE's widely publicized reports on the quality of bottled water and the Colas have highlighted the growing problem of pesticide overuse and misuse. Purposeful action by government bodies is necessary.

P. Balaram