OBITUARY

Christopher Curtis (1939–2008)

Medical entomologist and a humanitarian campaigner.

With the death of Chris Curtis on 13 May, the world has lost a leading researcher of insect-borne diseases. A respected theoretical scientist, he was also a pioneer of research into genetic control of disease-carrying insects. But Curtis will probably be best remembered for his innovative contributions to the control of the *Anopheles* mosquito, the vector for the malaria parasite.

He was born in Surrey, UK, and studied at the universities of Oxford and Edinburgh. Early in his research career, he became interested in genetic control of infectious diseases. An example is his seminal work on tsetse flies, the vectors of parasitic African trypanosomes, which, among other diseases, cause sleeping sickness. Curtis used mutation by chromosomal translocation to sterilize these insects, with the idea that they could outcompete the wild, infectious population without the need for radiation or chemical agents. His interest in genetic approaches continued when he moved to India to work for the World Heath Organization (WHO), and he was part of the team that developed sterile male *Culex* and *Aedes* mosquitoes.

Curtis returned to England in 1976 to take a post in the London School of Hygiene and Tropical Medicine, where he found the ambience for research and teaching so ideal that he stayed until his retirement. By the 1980s, he began to realize that genetic approaches were not immediately applicable, and so he focused on practical technologies that would benefit the health of people in developing countries.

In Zanzibar, for example, he demonstrated a low-cost way to control *Culex* mosquitoes, which transmit the parasitic worms responsible for the disfiguring disease filariasis, and the viruses causing West Nile fever and Japanese encephalitis. These mosquitoes survive in pit latrines and soakage pits even after spraying with insecticides. Curtis and colleagues showed that expanded polystyrene beads can form a self-sealing layer on the surface of the water that suffocates the *Culex* larvae, and that a single application of these beads to a pit prevents mosquito breeding for more than seven years. Later, this simple method was used effectively for mosquito control in India, where soakage pits are common sites for mosquito breeding.

Curtis was also an influential figure in the field of malaria management, and the various methods he developed are now considered routine for both intervention and evaluation of *Anopheles* control. In his opinion, the available knowledge in the 1990s of the biology of malaria vectors was sufficient to craft new

A. KOERBER/LONDON SCHOOL OF HYGIENE & TROPICAL MEDICINE

and affordable malaria control technologies for developing countries, where annual public health budgets were and may still be as meagre as the US$10 per person estimated in 2000.

He was a strong proponent of the use of insecticide-treated nets (ITNs) to cover beds for malaria control, as *Anopheles* mosquitoes bite mainly at night. In collaboration with the National Institute for Medical Research Tanzania, he demonstrated that ITNs are as effective as indoor insecticide sprays for preventing malaria, making these nets central to global malaria control. He also promoted the idea that there can be a 'mass effect' on the mosquito population when everyone in a village — rather than just the vulnerable groups such as pregnant women and children — uses bednets, and that extensive use of ITNs will lead to substantial community protection.

His studies influenced donors and governments. Together with two other campaigners, Awash Teklehaimanot and Jeffrey Sachs, Curtis made a call this year for mass distribution of free, long-lasting ITNs — rather than their allocation through social marketing, whereby each net is sold for US$1–2 — to reduce the burden of malaria. They calculated that an investment of US$3 billion per year, combined with sound public-health measures, would achieve comprehensive malaria control in Africa by 2010. Another important public health lesson was learnt when Curtis and his colleagues suggested that infections can be spread by mosquitoes carried from 'malaria zones' by aeroplanes, thus emphasizing the need for 'disinsection' of air transport.

Curtis continued to investigate genetic approaches to control mosquito populations, but was concerned that the time taken to overcome the hurdles associated with introducing genetically modified insects into the environment would lead to loss of more lives. Indeed, he argued that the current excitement in genomics must be de-emphasized, as far as practical ends are concerned, and that the choice of a molecular method "should be dictated by its being the best way to solve an existing problem" and not by its being the most modern approach. Genetically engineered *Anopheles* strains that cannot transmit malaria would require extremely reliable systems to drive the transgene through the wild population, and that is aside from overcoming objections from society. His other concern was that the better drugs and insecticides designed through genomic approaches would be patent-protected and so too expensive for the poorer nations.

The influence exercised by Curtis, and his achievements, were the result of sound science and meticulous data acquisition. Even in his hobbies he showed that one can have fun while applying scientific rigour. For example, primrose populations were thought to consist of equal numbers of two morphs, but in 1940 the botanist J. Crosby identified a third, self-pollinating, morph — the homostyle — in a Somerset wood and predicted that it would increase over time. Along with his wife Jill, Curtis painstakingly identified and counted primroses of every morph in Somerset to see whether there was a variation in their numbers and distribution over 40 years; they published their findings in the journal *Heredity*.

Chris Curtis will be equally remembered as an inspirational and tireless educator. He was generous as a reviewer of scientific manuscripts, providing extensive suggestions for improving the clarity of manuscripts written by those less skilful in their use of English. An iconic figure for those implementing low-cost vector-control measures, he influenced generations of MSc and PhD students from many countries who now occupy prominent positions. His "So what?" test for new developments and "Don't get it right, get it written!" — his cure for writer's block — became universal lessons for young researchers.

Even though he retired five years ago, he continued teaching and was conducting a five-week vector-control course when he fell ill. He leaves behind his wife Jill and a large community of students and colleagues around the world. My memory is of him in his London laboratory, writing with one hand and providing a blood feed to a beaker full of mosquitoes with the other.

Indira Nath
Indira Nath is in the LEPRA – Blue Peter Research Centre, Cherlapally, Hyderabad 501301, India.
e-mail: indiranath@bprcleprasociety.org