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Box 5.3 Adaptation and Transfer of Molecular Techniques for Application to Public Health Programmes in Developing Countries

The work of Eva Harris and her colleagues at the Sustainable Sciences Institute (SSI, San Francisco, CA, USA) has demonstrated how the techniques of modern molecular biology may be readily transferred and adapted to local conditions in developing countries and harnessed to address local priorities for improving public health.

Professor Harris and her collaborators initiated the Applied Molecular Biology/ Appropriate Technology Transfer (AMB/ATT) programme in the early 1990s — multi-stage on-site training workshops that introduced the techniques of molecular biology, epidemiology and scientific writing to researchers in developing Latin American countries, in order to enhance their capacity to initiate independent research. The workshops focused on the adaptation of molecular biomedical techniques to local research priorities and conditions. AMB/ATT aimed to help the countries build the scientific capability to undertake locally relevant research — an essential prerequisite for the development of public health programmes. It addressed some of the major barriers faced — including limited access to technologies, scientific isolation, a lack of information and the absence of technical training programmes.

In 1998, Professor Harris and her collaborators established the Sustainable Sciences Institute (SSI), a not-for-profit non-governmental organization to further these technology transfer programmes. SSI has continued the AMB/ATT programmes. Workshops have been held in Nicaragua, Ecuador, Guatemala, Bolivia, Cuba, Venezuela, Paraguay and the USA and have to date trained over 400 scientists and health professionals in 19 developing countries, sparking collaborative projects, locally funded proposals and scientific publications.

In addition, SSI has developed a small grants programme to provide research support to scientists in developing countries, a database of voluntary consultants offering expert advice for technology transfer activities, and a material aid programme to facilitate the transfer of scientific equipment and supplies from biotech companies and university laboratories in developed countries to laboratories in developing countries. Above all, the SSI is committed to fostering the long-term stable partnerships between technology donors and recipients upon which successful technology transfer depends, and supporting the ongoing guidance that recipients require.

These programmes have demonstrated conclusively that molecular technologies can be adapted to local conditions and disease priorities in developing countries to be more rapid, versatile and sensitive than alternative methods. Furthermore, they can be cost-effective in low-budget situations. It has been shown for example that PCR protocols can be introduced at as little as one-hundredth of the cost of commercially-available assays through a myriad of inventive approaches including simplification of protocols, bulk preparation of reagents from crude ingredients, and recycling.

Through holding training workshops on-site, local scientists begin to learn how the technologies may be adapted to local conditions. In many cases, these scientists have then used their ingenuity to refine the technologies further. Importantly, the knowledge-based approach that presents both the advantages and limitations of new technologies allows local scientists to make a well-informed decision about their utility on a case-by-case basis.

The adoption of the technologies introduced through these workshops has already been implemented to enhance public health programmes in Latin America. PCR has been

Box 5.3 (continued)

adopted as a routine diagnostic procedure for leishmaniasis by the Nicaraguan Ministry of Health, having proved to be simpler and more sensitive than existing techniques. PCR has also improved detection methods for dengue in Nicaragua and Paraguay. It was used in 1995 to rule out dengue as the cause of an outbreak of hemorrhagic fever in northern Nicaragua, which led to the identification of leptospirosis as the culprit and its recognition worldwide as a major emerging disease. In Paraguay, timely use of recently-implemented molecular typing methods enabled containment of a dengue outbreak in the capital Asunción in 2001.

References

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there is a more immediate application of this technology which may be of considerable economic importance for many developing countries.

There have already been successes in defining some of the genes that are responsible for drug resistance in important pathogens, including those responsible for tuberculosis, HIV/AIDS and malaria. For example, mutations in the chloroquine resistance transporter of *Plasmodium falciparum*, encoded by the gene *pfcrt*, confer chloroquine resistance in laboratory strains of the parasite. Recent studies in Mali showed that there is a stable relationship between rates of the chloroquine-resistant genotype and *in-vivo* chloroquine resistance at sites where there are different population sizes, ethnic compositions and levels of drug resistance and malaria transmission (Djimdé et al., 2001). This approach appears to have the potential to be of considerable value for public health surveillance of antimalarial resistance and may permit comprehensive mapping of resistance at country and regional levels without the need to carry out numerous repeated longitudinal efficacy studies, particularly in central and west Africa where chloroquine use remains widespread.

The increasing ability to monitor rapidly large samples of organisms for drug resistance, and to maintain regular surveillance of the emergence of resistant strains, is likely to be an important addition to the public