Policy brief for the Danida funded project

Operational research to support and enhance lymphatic filariasis control efforts in Eastern and Southern Africa (09-096LIFE)

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Executive summary

The project aimed to support lymphatic filariasis (LF) control efforts in Zambia and Tanzania, through operational research and capacity building. It was carried out in close collaboration with the national LF control programmes, and with locally registered PhD and Master students. Much new insight has been gained on the geographical distribution and epidemiology of LF in Zambia, on epidemiology and transmission of LF in urban environments in Tanzania, on barriers and opportunities for practical LF control implementation through mass drug administration, and about monitoring the changing epidemiology of LF (and its impact on the vectors and on e.g. transmission of malaria) during implementation of LF control. Findings have been documented in numerous scientific papers and conference presentations, and the project has included formal (university) and informal training of South partner staff. An International Symposium on Research for Control of LF in Eastern and Southern Africa was moreover organized for exchange of knowledge among LF researchers and control officers within the region. The project has delivered significant capacity building, scientific output and useful new knowledge to support and enhance successful LF control in the South partner countries and elsewhere.

Background: Lymphatic filariasis and its control

Lymphatic filariasis (LF) is a disabling and disfiguring disease resulting from a mosquito-borne parasitic infection. It is widespread and a major health problem in many developing countries with a warm and humid climate and is one of the most prevalent of the so-called Neglected Tropical Diseases (NTDs). It has high prevalence in remote rural areas and in disfavoured peri-urban and urban locations and is primarily a disease of the poor. Current estimates suggest that more than 1.2 billion people live in endemic areas and are at risk of infection and more than one third of these are in sub-Saharan Africa. The common clinical manifestations of LF (e.g. elephantiasis, hydrocele, acute filarial fever) often cause considerable incapacity to affected individuals, with consequent loss of income and social and psychological stress. Research during recent years has increased knowledge on its extensive geographical distribution and its disabling effect on the victims, and LF has been recognized by the World Health Organization as a leading cause of long-term disability in the world.

Males from Tanga, Tanzania, with leg elephantiasis resulting from lymphatic filariasis
LF is moreover an economic burden to the endemic communities and to the health system in endemic countries. In recent years forces have been united internationally in the fight against LF through the formation of the Global Programme to Eliminate Lymphatic Filariasis (GPELF). The recommended primary measure for control is regular mass treatment with anti-filarial drugs, with the aim to eliminate the parasite larvae from the human blood and thereby to reduce or eliminate transmission. This may be supplemented with vector control, and with morbidity control to alleviate disease in those already affected.

The project and its objectives

By launching a national programme in 2000, Tanzania was one of the first countries in Africa to implement large scale LF control. Other countries in the Eastern and Southern African region have also initiated, or taken steps to initiate, control. Despite these efforts, LF is still a widespread and debilitating disease in large parts of the region. For control efforts to expand further and to succeed there is a need to support and enhance efforts through operational research linked to the programmes. The present project focused specifically on recognized high priority aspects of operational research related to LF control efforts in two endemic countries in Eastern and Southern Africa: Tanzania and Zambia.

The general objective of the project was to investigate barriers in knowledge and new opportunities for LF control in two endemic African countries being in different stages of control, and thereby to contribute to the success of ongoing efforts. The research was carried out as four work-packages each with their own specific objective:

I. To investigate basic determinants of LF epidemiology, transmission and control application in endemic rural communities of Zambia.
II. To investigate the epidemiology and significance of urban LF transmission in Tanzania, as a basis for its control.
III. To investigate barriers and strategies for improving drug coverage in MDA programmes in rural and urban Tanzania.
IV. To assess different approaches for monitoring the effect of the ongoing national LF elimination programme on human infection and transmission in an endemic area of Tanzania.

All work-packages included significant elements of capacity building. In addition to on-the-spot training of involved technical staff, the project included 3 PhD studies, 1 MSc study by Research and 1 MPH study. An International Symposium on Research for Control of LF in Eastern and Southern Africa was moreover organized for exchange of knowledge among LF researchers and control officers within the region.

Major findings

The research carried out in the various parts of the project have provided a massive wealth of new information of high relevance for LF control in the involved as well as in other LF endemic countries. Major findings are summarized below.

Work-package I: The study for the first time provided a detailed investigation of LF epidemiology in Zambia, and provided essential basic knowledge on LF infection, morbidity and transmission from selected endemic areas of the country (PhD study and ref. 1). Modelling of LF infection data collected by the Zambian partner during a 10 year period (from about 10,000 individuals from 108 sites throughout Zambia), in combination with environmental data from the collection sites (incl. satellite data), were used to analyse the environmental determinants for its distribution, to produce countrywide continuous maps showing the LF distribution, and to assess the magnitude of the problem in different parts of
the country (ref. 2). Smaller studies looked into the possible occurrence of *Mansonella perstans* filariasis in Zambia, and on the transmission of filarial infections in dogs in Lusaka. Overall, this information will be valuable for planning and implementation of future LF control in Zambia.

**Work-package II:** An in depth study of Urban LF in two cities in Tanzania (Dar es Salaam and Tanga) provided the first solid information about occurrence and transmission of LF in urban environments in sub-Saharan Africa, which is not only of local but also of global interest (PhD study and ref. 3, 4, 5, 6). The studies included surveys for schistosomiasis and soil transmitted helminthiasis in the same populations. In addition to document special epidemiological patterns of LF and other neglected tropical diseases in urban areas, the gathered information will be of value by informing control planners and implementers where and how to focus control efforts. The studies also gave a good indication of the effect of past interventions, and where to improve.

**Work-package III:** An in depth study of the process of mass drug administration (MDA) for LF control provided much new and useful information on barriers and opportunities for improvement (PhD and MPH study, and ref. 7, 8). In particular, the study indicated that major reasons for the observed low drug uptake during MDA campaigns were lack of access to the tablets (distributors did not come, or people not at home when they came), poor information to and communication with the target population, and lack of adherence to the officially applied "Community Directed Treatment" approach. Similar problems appear to be faced by many other ongoing LF control programmes, and the lessons learned and recommendations given are therefore of general global interest to this kind of disease control programmes.

**Work-package IV:** A longitudinal study monitoring the progress and effect of the LF control programme in Tanga Region started in 2003 (with different funding) and was taken over by the present project in 2010. This 11-year-study is the longest and most detailed carried out in sub-Saharan Africa on MDA for control of LF. Ample data have been gathered on the effect of MDA on LF transmission, infection and disease in the study populations (ref. 9, 10, 11, 12), and the findings comprise an important source of information for making decisions on the future of the control programme, in Tanzania as well as in other parts of Africa where the same drug regimen is used. The project also serves as a model for monitoring this kind of programmes. The unique data obtained from the longitudinal monitoring of LF vector mosquitoes have furthermore contributed important knowledge regarding dynamics of vector mosquito populations in the study area, which not only affects the transmission of LF but also the epidemiology of malaria. Thus, it is clear from the data that there has been considerable change in mosquito species composition in recent years (ref. 13). Elucidation of the background for this is an important public health issue in relation to transmission of both LF and malaria, and with our Tanga partners additional studies were carried out to understand this change (ref. 14, 15). Most recently, a study assessing the effect of ivermectin treatment on blood feeding mosquitoes suggest that ongoing MDA against LF could be a cause for the considerable decrease in *Anopheles* mosquitoes observed in the area (ref. 16), which thus would be an unexpected environmental side effect of the MDA.

**Conclusion**

The project has contributed significantly to increase the knowledge on operational issues and challenges faced by ongoing programmes for control of LF (and other neglected tropical diseases). It has moreover contributed with important capacity building and regional knowledge exchange. The implementation of the project in collaboration with national control programmes in endemic countries has assured immediate dissemination of findings to relevant stakeholders in these countries. In addition, a broader dissemination of findings to the
international LF control community has been undertaken through a high number of publications in international scientific journals and through conference presentations. Through these activities, it is envisaged that the project has made important contributions which will benefit LF control activities in the South partner countries as well as elsewhere.

**Key references**


