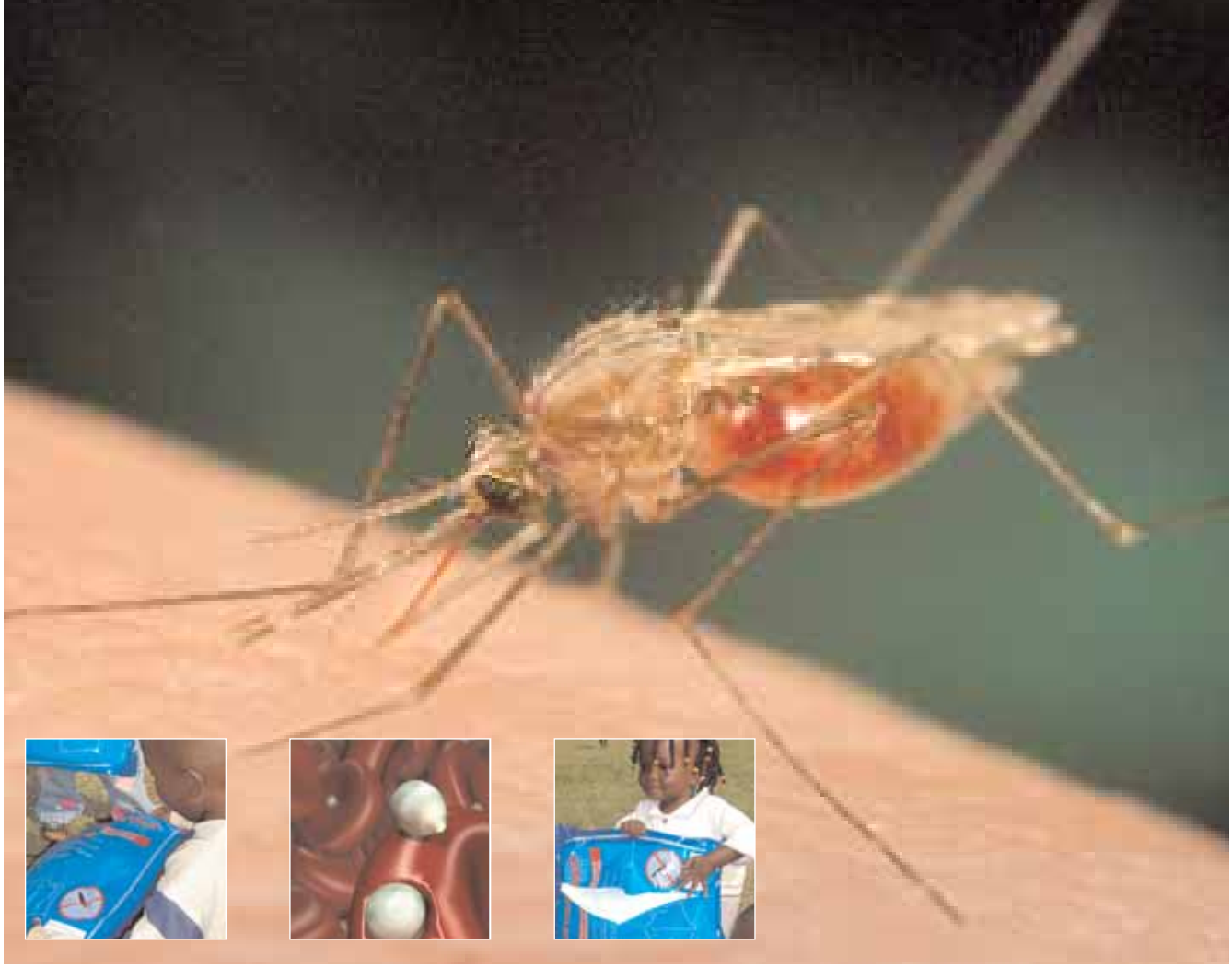

Study of Siguiri mosquitoes to inform malaria programme

Professor Richard Hunt of the University of the Witwatersrand's Department of Entomology recently undertook a survey at Siguiri mine in Guinea to identify the malaria vector (carrier) mosquito in the region, and determine insecticide sensiticities. This department produces internationally recognised scientific research on the major malaria vector mosquitoes in Africa and elsewhere in the world. Professor Hunt has undertaken similar surveys at the company's mines in Ghana, Mali and Tanzania. (See Report to Society 2006 and 2005). These surveys have provided a critical scientific base for the malaria control progammes at these sites.

Survey area

The survey concentrated on Kofilani village which is situated between the Koron camp site (the mine camp site) and the mine offices. Professor Hunt found that the village is close to a slow flowing river where he noted informal alluvial mining activities with numerous ponds, pools and rivulets. The roads had many water-filled ruts, many with large numbers of mosquito larvae. There were also several polluted water bodies which form ideal breeding sites for mosquitoes.

Four other villages – Boukaria, Kintinia, Fatoya and Balato – were visited during the 10-day research programme.

The survey

Most of the houses visited in Kofilani during the survey contained malaria vector mosquitoes in small numbers, usually one or two per bedroom, although two houses yielded about 30 mosquitoes each. Professor Hunt pointed out that the variation in the number of mosquitoes per household was not unusual. It was caused by the proximity of some houses to mosquito breeding places and the use of informal mosquito control agents such as coils and bed nets rather than a systematic spraying programme.

Forty mosquitoes were found in one small house in Boukaria and additional collections were conducted in this village.

The mosquitoes collected belonged to two groups – *Anopheles gambiae* and *Anopheles funestus*, groups which contain the three most important vectors of malaria in Africa.

Tests and results

The mosquitoes collected were used in insecticide susceptibility tests, approximately 25 in each test, which exposed them to four different classes of insecticides approved by the World Health Organization for malaria vector control. These are as follows: Pyrethroids – Deltamethrin; Organophosphates – Malathion; Carbamates – Bendiocarb; Organochlorines – DDT

The results of the exposures are given in the accompanying table.

Insecticide	Dead	Alive	Total	% mortality
Anopheles gambiae group				
Deltamethrin	99	4	103	96.0
Malathion	100	1	101	99.0
Bendiocarb	20	46	66	30.3
DDT	48	62	110	43.6
Anopheles funestus group				
Deltamethrin	27	0	27	100
Malathion	16	0	16	100
Untreated control	0	42	42	0

Because of the small number of mosquitoes belonging to the Anopheles funestus group that were collected, only the most promising insecticides were tested on this species. The results demonstrated that Bendiocarb and DDT must be excluded from any spray programme because of the high levels of resistance.

Observations

Discussions were held by Professor Hunt with members of the operation's environmental team and with the resident doctor, Dr Balde Abdoulaye, to discuss the incidence of malaria on the mine. These meetings revealed that although the dry climatic conditions from November to March appear unfavourable for mosquito breeding, the number of cases only drops in May. The probable cause is that two types of mosquitoes present in the area have different breeding

Study of Siguiri mosquitoes to inform malaria programme continued

patterns. While the *Anopheles gambiae* group uses small temporary rain pools for breeding, the *Anopheles funestus* species only breeds in permanent water bodies such as ponds, swamps and the vegetated edges of slow-moving streams. He concluded that it was probable that *Anopheles funestus* would be the predominant species during the dry season and contribute to a greater proportion of the malaria transmission during this time. In the rainy season the *Anopheles gambiae* predominates as demonstrated by the survey – carried out in August, in the middle of this period – when 434 mosquitoes of this species were collected compared with only 43 mosquitoes belonging to the Anopheles funestus group.

Recommendations

The research showed that there is a need to control mosquitoes throughout the year. In his report, Professor Hunt recommended using a long-lived Pyrethroid insecticide followed by a short-lived organophosphate insecticide. He pointed out that this strategy would give protection for the whole year and would limit the build-up of resistance genes in the mosquito population.

Since most of the mine employees live in the villages surrounding the mine, Professor Hunt advised that all villages be included in the spray programme. He commented that the vector control on the mine and in surrounding villages was not well structured. Although he found there was some degree of house spraying on the mine, this was not popular with staff, probably because of the choice of Pyrethroid which can cause skin and respiratory irritation. In the villages anti-mosquito measures were left up to the individual households. Many were using mosquito coils while bed nets, both treated and untreated, were fairly common.

Professor Hunt suggested that a similar programme to that in place at Obuasi mine in Ghana be introduced and that the personnel (spraymen, supervisors and so forth) be trained by Obuasi. He noted that the spray equipment on site was unsuitable for spraying houses and said it should be replaced with a pump of an international standard.

He concluded: “A malaria vector control programme is only effective if virtually every human habitation is treated with residual insecticide.”

Recent events

Following the survey and, at the invitation of the Managing Director of Siguiri, Obuasi’s Malaria Control Manager, Steve Knowles and Obuasi’s Operations Superintendent, Eric Buetey, visited the mine in November 2007. A presentation on the Obuasi programme and its dramatic success in reducing malaria in the community, was shown to the executive committee. A mandate was then given to the team to tour the area and, using Professor Hunt’s results, to put together a plan for a malaria control programme based on Indoor Residual Spraying (IRS). The group was told that the programme should include all the surrounding villages as well as the mine camp and infrastructure.

“It’s fortunate that most of the community is housed in these five villages. It’s a major problem when members of the community are scattered across a wide area because of the difficulties of reaching dwellings and, of course, it adds to the costs of the programme,” Steve said.

The Siguiri Malaria Control programme has the following components:

Vector control

- *Indoor Residual Spraying (IRS)* of the following areas: (no spraying of outside walls) Koron, Balato, Fatoyo, Boukaria, Kofilani, Kintinia, Sitikia, AMCo camp, military camp, CIP offices, security checkpoints, buses
- *Larviciding* of selected waterbodies to prevent breeding
- *Distribution of insecticide treated nets* – to a limited extent

Community liaison

Regular meetings will be held with village leaders, regional officials and government agencies to discuss updates to the programme updates and changes.

Information, education, communication

Presentations will be given to villages, schools, social gatherings and other groups on the subjects of malaria/mosquito awareness, lifestyle changes and environmental management. The malaria supervisor and/or environmental manager and representatives from the mine's public relations unit will play a key role in these sessions.

Surveillance and monitoring

This involves quality control and the assessment of the effectiveness/impact of the programme. The Malaria Information System (MIS) will be improved and a small Insectary will be established.

Diagnosis and treatment

All cases will be diagnosed in a laboratory. Local medical institutions will be advised on and assisted with these tasks.

Equipment

The correct pumps, personal protective equipment and clothing plus insecticide will be ordered.

Training

Spray operators are to be recruited from the communities and will be trained in February 2008 by the training team from Obuasi.