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**Management of chemical incidents**

Sirs,

We agree with Dr Bakhshi that public health practitioners have a central role in the management of chemical incidents.\(^1\) This role embraces emergency planning, surveillance of chemical incidents and associated health effects, chemical incident risk management, including community hazard identification, risk assessment and risk reduction, planning for treatment, rehabilitation and follow-up.

Because many health authorities recognize that they do not have sufficient expertise to respond effectively to a chemical incident, they have contracted with a specialist Regional Service Provider Unit (RSPU) to give support. There are currently five such specialist service providers in the United Kingdom, namely: (1) Scottish Centre for Infection and Environmental Health, Glasgow; (2) Centre for Chemical Incidents, Birmingham; (3) Department of Environmental and Occupational Medicine, Newcastle; (4) Chemical Incident Response Service, London; (5) Chemical Incident Management Support Unit, Cardiff.

These RSPUs are able to provide medical, toxicological and public health advice both during an incident and for investigations following an incident. They are also able to assist with emergency planning and training of public health practitioners.

The National Focus for work on response to chemical incidents and surveillance of health effects of environmental chemicals was established in February 1997 and is the 'centralized unit' to which Dr Bakhshi refers. The National Focus is the third tier in the system for co-ordination of chemical incident planning, response and surveillance, and should be notified by health authorities of chemical incidents presenting unusual features in terms of scale, complexity or potential threat to the health of the population. The National Focus can activate additional sources of expertise (for example, the Health Advisory Group on Chemical Contamination Incidents) and ensures liaison with other agencies (for example, the Health and Safety Executive).

Dr Bakhshi highlights the importance of public health practitioners being 'prepared to supply timely and needed information on chemical incidents to public service providers'. The National Focus is working with the RSPUs and other national sources of information on chemical incidents such as the Ambulance Service Association and the National Chemical Emergency Centre to undertake national surveillance of chemical incidents and associated health effects. Surveillance information disseminated to all participating organizations and UK government departments will be useful for policy making, emergency planning and operational management, as well as triggering the need for epidemiological investigations.

**Reference**


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**Pilot studies on the possible effects on malaria of small-scale irrigation dams in Tigray regional state, Ethiopia**

Sirs,

The possibility that irrigation schemes and dams within development programmes may increase malaria transmission is not new. Large-scale water development projects have been shown to have this effect.\(^1\)–\(^3\) However, the presence of newly created water bodies does not necessarily lead to increased transmission, depending on climatic and other factors,\(^4\)\(^,\)\(^5\) despite larger numbers of mosquitoes. Urbanization and associated development activities may also exacerbate the problem.\(^6\) There is thus a need to identify the risks associated with water development in a range of ecological settings.

In the Tigray Region of Ethiopia, dam building is under way within a major rural development programme called Sustainable Agriculture and Environmental Rehabilitation in Tigray (SAERT). The reservoirs thus created vary in size from 50000
to 2 000 000 m$^3$. Several hundred such dams are planned for the region. Many of these are, or will be, sited within 2 km of rural communities, well within the flying range of the predominant malaria vector in this area, *Anopheles gambiae s.l.*.

The population of Tigray is around 3.2 million, predominantly rural. It is estimated that 75 per cent of the population are at risk of malaria, with a range of risk dependent on local ecology, climate and altitude. Malaria infections are predominantly due to *P. falciparum* and *P. vivax*, with the former 2—4 times more prevalent than the latter, and with *P. malariae* only rarely present.

A community-based malaria control programme has been in place since 1992, with an extensive network of volunteer community health workers (CHWs) administering chloroquine on a symptomatic basis, as previously described.

Concern has arisen about the possible effects on malaria transmission of the increased presence of standing water in and around the dam sites here, as has been postulated in other contexts. This led to some pilot studies of parasitaemia, as a starting point in understanding possible effects of the dams and as a basis for planning more extensive studies.

This pilot study was conducted in six villages, three of which were within 30 minutes walk of existing dam sites, and three within a similar distance of future dam sites, during October and November 1995, respectively, a time of peak transmission. Each household in the selected villages was visited, and a blood film prepared from each consenting household member present. Questions were also asked about fever in the past 24 hours, during the past 14 days, and health care utilization.

A total of 3200 persons were registered in the house-to-house survey, and blood films collected from 82 per cent of these. The overall prevalence of any type of malaria infection was 2.6 per cent, with 81 per cent of infections caused by *P. falciparum* and 19 per cent by *P. vivax*. Prevalence varied widely between villages with dams and those without (Table 1). A comparison between the three villages close to dams (65/1567 slides positive) and the others (5/1058) shows a highly significant difference ($\chi^2 = 31.5, p < 0.0001$).

Of all the blood films read, 4.8 per cent (127) were associated with a report of fever during the previous 24 hours, and 15.9 per cent (414) with fever during the past 14 days. A significantly higher percentage of positive blood films was found in those with a history of fever in the past 14 days ($\chi^2 = 6.5, p = 0.01$), although the sensitivity of such a history for a positive blood film was only 27.5 per cent. Of those with a history of fever in the past 14 days, 21.2 per cent (88/414) had sought treatment for malaria in that same period, compared with 1.6 per cent (36/2211) of those with no history of fever, a highly significant difference ($\chi^2 = 294, p < 0.0001$). Only 10.2 per cent (9/88) of those who had been treated still had a positive blood film. Of those with a history of fever and access to a CHW, 11.2 per cent (30/267) had sought care from the CHW, whereas 43.8 per cent (117/267) had sought care at a nearby clinic. In this group, 30.3 per cent (81/267) had received treatment for malaria in the past 14 days.

Great care needs to be taken in interpreting apparently gross differences in malaria prevalence between the villages with and without dams. Superficially it appears that the parasite rates are highly dependent on the presence of a dam in the vicinity, but there are other factors that need to be taken into account. The overall altitude of the future dam site villages was slightly greater, although the ranges of altitude in Wokar-Duba and Adi Kunaba, the two villages with the greatest difference in prevalence, were very similar (Table 1). The villages with existing dams were surveyed slightly earlier, in mid-October compared with mid-November, although both months historically have been shown to be within the period of maximum seasonal transmission. The availability of chloroquine was, however, greater in the villages with dams, because of the presence of CHWs. If the 79 people with a history of fever and treatment, almost all of whom came from villages with dams, had not been treated, then the parasite rates in those villages could have been twice as high, and the association between history of fever and positive blood films correspondingly stronger.

The environment of Tigray, particularly in relation to the combinations of climate and altitude encountered, is in many

### Table 1 Prevalence of malaria by age group, sex and village based on a community survey of 2625 blood films taken in Tigray Region, Ethiopia

<table>
<thead>
<tr>
<th>Village</th>
<th>Dam</th>
<th>Altitude range (m)</th>
<th>Blood films read</th>
<th>Prevalence (%)</th>
<th>&lt;5 years</th>
<th>5-9 years</th>
<th>10-14 years</th>
<th>15 years and over</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enda-Mariam</td>
<td>yes</td>
<td>1800-1900</td>
<td>710</td>
<td>4.1</td>
<td>10.3</td>
<td>3.4</td>
<td>4.3</td>
<td>2.5</td>
<td>5.3</td>
<td>3.0</td>
</tr>
<tr>
<td>Terrer</td>
<td>yes</td>
<td>1850-1950</td>
<td>586</td>
<td>3.4</td>
<td>3.5</td>
<td>4.4</td>
<td>4.1</td>
<td>2.8</td>
<td>4.1</td>
<td>2.8</td>
</tr>
<tr>
<td>Wokar-Duba</td>
<td>yes</td>
<td>1950-1975</td>
<td>271</td>
<td>5.5</td>
<td>2.8</td>
<td>6.8</td>
<td>5.3</td>
<td>5.9</td>
<td>7.9</td>
<td>3.0</td>
</tr>
<tr>
<td>Adi Kunaba</td>
<td>no</td>
<td>1960-2000</td>
<td>89</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Hidmo</td>
<td>no</td>
<td>2050-2070</td>
<td>518</td>
<td>1.0</td>
<td>1.2</td>
<td>—</td>
<td>1.2</td>
<td>1.1</td>
<td>0.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Belasat</td>
<td>no</td>
<td>2070-2150</td>
<td>451</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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</tr>
</tbody>
</table>
ways dissimilar to many other regions in sub-Saharan Africa. For example, the combination of high temperature and low humidity encountered around Gambian rice fields in the dry season,\(^4\) which effectively interrupted malaria transmission despite the presence of water, would not pertain in much of Tigray. Furthermore, as the natural intensity of transmission in many areas of Tigray is low, the immune status within many communities is also low. This is a factor of enormous public health importance in contemplating possible increases in transmission as a result of new dams; more intense transmission among such communities could lead to extensive morbidity and mortality from an intense epidemic pattern of infection. In addition, the possible extension of the existing season of higher transmission, normally between September and December, in communities close to dams, could result in a cumulative increase in cases over time.

Thus, although there are a number of reasons why the actual dam effect could be either weaker or stronger than these results suggest, it is certainly not obvious from these figures that the question of the possible effect of the dams on local malaria epidemiology should be lightly dismissed in this environment. Accordingly, plans are now in place for a more carefully controlled longitudinal study of incidence in communities close to dams, compared with similar villages at a distance from the dam outside the normal flight range of the mosquito.

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**References**


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