Cholera outbreak response in Pemba, 2006

And

Pertinence of using Oral Cholera Vaccines for control

Mission report Zanzibar
5 -13 July 2006

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Global Task Force on Cholera Control
WHO Geneva, Switzerland
Executive Summary

I. Background information

II. Epidemiology

III. Outbreak response

IV. New tools for cholera control: OCV and rapid diagnostic tests

V. Recommendations

VI. Conclusion

Annexes
Annex 1: Map
Annex 2: References
Annex 3: List of people met
Annex 4: Agenda

Acknowledgment:

We would like to thank all people met during this assessment. Their contribution has been invaluable in understanding the current context with regard to cholera control in Zanzibar. A special thank is addressed to Dr Jiddawi, Principle Secretary, Ministry of Health and Social Welfare, without his commitment and support the mission would not have been possible.
Executive Summary

Zanzibar is affected by recurrent cholera outbreaks; its last episode started in March 2006. The aim of this mission, which took place upon request from the Principle Secretary of the Ministry of Health and Social Welfare (MoHSW) of Zanzibar was to assess the response provided to the recent cholera outbreak on Pemba Island, to identify vulnerable populations living in high risk areas, to analyse the pertinence of using oral cholera vaccines (OCV) as an additional means for control, and to issue recommendations accordingly. Furthermore, the feasibility of validating the rapid immunochromatographic diagnostic test for cholera (CrystalV) was also assessed. The assessment did not account for the cholera situation in Unguja, where the epidemic started one week after it started on Pemba.

The current outbreak started in Jombwe, Mkoani district, on 13 March 2006, from where it spread to Shamani. Later on, the outbreak moved further north, affecting Kojani island, and Kigongoni in Wete district. As of 9 July, a total of 315 cases including 8 deaths (CFR 2.5%) were reported from the cholera treatment centres (CTC) in Pemba (Annex 1). Available figures are most likely an underestimate of the real situation as surveillance activities in Zanzibar remain an important challenge.


For Pemba, the analysis over time of available surveillance data identified four high risk areas along the east coast, affected during each of the outbreaks. They are Jombwe / Shamiani; Kigongoni / Kiwani; Kojani island; and Micheweni / MaziwaNgombe. These areas are characterized by particularly poor latrine coverage as well a limited access to safe water, which make its communities the most vulnerable to cholera outbreaks. Furthermore, fishermen are known for playing an important role in spreading cholera both in Pemba and Unguja.

The response provided to the current outbreak has been efficient and well organized compared to outbreaks before 2002 (see various reports). This is a result of training activities carried out in 2002 as well as the high commitment of the health care staff at all levels. The overall case fatality rate of 2.5% is relatively high; this high average rate is due to the very high weekly CFR registered at the beginning of the outbreak, that reached levels beyond 10%; however, CFRs declined rapidly and no fatalities occurred two weeks after the beginning of the outbreak in any of the areas. Buffer stocks of emergency supplies had been pre-positioned in the primary health care units (PHCU) in the districts at risk and supplies were available to treat cases when they occurred. CTC’s were opened within 24 hours after the first case had been laboratory confirmed in a location. Nonetheless, it is still a challenge to ensure proper surveillance, health education activities, and proper environmental management, such as providing sufficient quantities of safe water and proper excreta disposal. Also, the link between environmental management and health should be reinforced, and requires a more active role of the Water Department in the technical committees. Furthermore, funds are released only once an outbreak has started; they should be made available also for prevention and preparedness activities.

In view of the big challenges of environmental management, in particular the limited access to sufficient quantities of safe water, the use of OCV could be a useful intervention to avert future outbreaks in vulnerable populations. Such a mass vaccination campaign requires pre-emptive strengthening of the surveillance system in order to be able to assess its effectiveness.

A concrete 3 phase proposal for a new approach for cholera control in Zanzibar is envisaged for Pemba and should be part of a well designed study involving a partnership among the MoHSW, the Ivo de Carneri Foundation, and WHO. The proposal includes improved surveillance for cholera and other epidemic diarrhoeal diseases, validation of the RDT, and a mass vaccination campaign using OCVs (see III). Scaling up of activities in other parts of Zanzibar could occur at a later stage, according to results obtained.
I. Background information

During the World Health Assembly in May 2006, WHO Headquarters received an invitation to visit Zanzibar with the aim to assess the response provided to the currently ongoing cholera outbreak, to identify the vulnerable population living in high risk areas, and to assess the feasibility of using OCV as an additional means to control cholera in Pemba and later in Unguja. Furthermore, the feasibility of validating the rapid diagnostic tests for cholera recently put on the market should also be assessed.

The WHO staff member in charge of the Global Task Force on Cholera Control travelled to Zanzibar from 05 to 13 July 2006 and visited several cholera affected areas on Pemba Island (Annex 4). Meetings with the Principle Secretary of Health, with staff from the MoHSW in Pemba and with representatives from the Public Health Laboratory and the Ivo de Carneri Foundation took place. Field visits to cholera affected areas in Pemba allowed to gain insight into the context in which cholera occurs, as well as the response provided by the public health care system. A debriefing with preliminary recommendations was given before leaving Zanzibar to the Minister of Health, the PS and the WHO liaison officer in Zanzibar, as well as to the WR in Dar Es Salaam.

II. Epidemiology

1. Trends over time

Zanzibar has been regularly affected by cholera outbreaks since 1978. Particularly sever outbreaks occurred both on Unjuga and Pemba islands in 1997/98 and in 2004, with the number of reported cases ranging from 520 to 650 cases per outbreak (Fig 1). During most of these outbreaks index cases were observed among mobile fishermen travelling between the islands and Tanzania main land.

Fig 1. Yearly trends of cholera cases and deaths, Pemba island 1997 - July 2006
In Zanzibar, cholera outbreaks are typically linked to the seasonal rains that occur from March to June and in October/November. Cholera usually starts 3-4 weeks after the rains have started. The outbreaks occurring during the winter rains usually tend to persist for 2-3 months after the end of the rains (Fig 2).

2. CHOLERA OUTBREAK 2006

The outbreak started in South Pemba on 13 March with a case which originated from Jombwe, Mkoani district, from where it moved further south to Shamiani. The outbreak affected also Unguja island one week after the first cases had been registered on Pemba (Fig 3).

The current analysis reviews the Pemba situation only. The total number of cases reported by the seven CTCs as of 9 July 2006 accounts for 315 cases including 8 deaths (CFR 2.5%). The weekly incidence shows three successive peaks in mid-April, mid-May and mid-June respectively (Fig 3). Due to severe limitations in the surveillance and reporting system, figures have to be interpreted with caution. It is very likely that the reported figures are largely underestimated, as they do not account for outpatients diagnosed with cholera. For instance, Shamiani and Abdella Mze Hospital accounted for 365 outpatients for the same period. Kiguyu CTC (Komboni) recorded 12 cholera inpatients and 243 outpatients from 9 June to 9 July. However, inpatients only were notified to the higher level.
Mkoane district accounted for a total of 131 cases including 4 deaths over a period of 10 weeks. For the first two weeks the weekly CFR was 25% and 10% respectively, before declining rapidly to 0% except for week 4, which accounted for a CFR of 3% (Fig 4).

The outbreak reached Wete district 5 weeks after its beginning and accounted for a total of 126 cases including 2 deaths as of 9 July.

Chake district was affected on 8 May and accounted for a total of 36 cases and no deaths as of 9 July 2006.

Mweni district recorded only 14 cases and 2 deaths which occurred from 8-14 May.

As of 10 July, Micheveni district had not registered any cholera cases.

<table>
<thead>
<tr>
<th>District</th>
<th>Date of onset</th>
<th>Date of last case reported</th>
<th>cases</th>
<th>deaths</th>
<th>CFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mkoani/ Pemba South</td>
<td>13.03.06</td>
<td>21.05.06</td>
<td>131</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Wete /Pemba North</td>
<td>17.04.06</td>
<td>Persistent as of 9 July</td>
<td>126</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>Chake</td>
<td>08.05.06</td>
<td>Persistent as of 9 July</td>
<td>36</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mweni /Pemba North</td>
<td>08.05.06</td>
<td>14.05.06</td>
<td>14</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td><strong>PEMBA</strong></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>307</strong></td>
<td><strong>8</strong></td>
<td><strong>2.6</strong></td>
</tr>
</tbody>
</table>
3. VULNERABLE POPULATION AND HIGH RISK AREAS

From the first outbreak in 1978, fishermen have played a critical role in spreading the disease. They are a highly mobile population moving between the islands and Tanzania mainland; their movement are not guided by any seasonal pattern, but depend mainly on the presence of fish and the need to earn money.

The most affected areas are generally those with communities having chronic shortage of safe water and living in a poor sanitary environment with absence of latrines and overcrowding, which is typically the case along the Eastern coast of Pemba (Map 1). This area is geographically and economically distinct from the Western part of the island, and the population depends mainly on fishing, with limited land for cultivation. The community is generally poorer and the area more populated. Furthermore, the geography is more difficult with regard to water supply.

Map 1. High risk areas for cholera, Pemba island

- Micheweni district
  - Micheweni
  - Maziwa Ngombe
- Wete district
  - Kojani island
  - Kigongoni / Mijni Kuuyu
- ChakaChake district
  - Vitongoji
- Mkoani district
  - Shamiani
  - Muwambe

On the Western part of Pemba, communities at high risk live in Makangole (relatives form Micheweni population), on Fundo island (Wete district), in Ngagu (Chakechake district), and on Pangani Islet (Mkoani district).

In summary, high risk areas are located as follows:

- Eastern part of Pemba island, in communities with unsafe water and inadequate sanitation.
- Kojani island, because of its very limited water sources and improper sanitation
- Fishermen, a highly mobile population travelling between islands and Tanzania mainland.
4. **ENVIRONMENTAL RISK**

Climatic conditions impact directly on the risk of cholera, which usually occur shortly after the onset of both the long and short rains (see figure 2). Rains play a critical role in contaminating open wells by inflow of surface water, the reservoir of *Vibrio cholerae* being the blue green algae on the estuaries.

The quality of the water available in Pemba is precarious and is in contrast with the quantities of water, sufficient to supply the whole population of Zanzibar. The majority of the water supplied in Zanzibar is provided by traditional sources such as shallow wells and springs. Water from unprotected wells can easily get contaminated through ropes and buckets. The poor maintenance of the piped water system and leakages are a major source of contamination. There is a clear need to develop human resources to ensure proper maintenance of the water system. In some places where the new water development plan is implemented, people need to pay for water, which generates funds for maintenance of the water system. On Kojani island, 3 out of 5 shallow wells visited during the current assessment were out of use. Furthermore, the two taps that are supposed to provide piped water from the main island two days a week have not been functional for 8 days. Water pipes are left unprotected in the open, leaving them vulnerable for any type of damage.

*Picture 1 and 2. Shallow well, Kojani island*

An assessment of the water quality performed by the University of Milano from March to June 2006 identified *Vibrio cholerae* in 41 out of 50 analyses taken from 14 different sources from three different districts (Fig 6).
Excreta disposal remains a challenge all over Zanzibar. It is estimated that less than 50% of the population has access to a toilet or latrine. In Shamiani, a communal latrine was under construction following an initiative by the sheha which had perceived the need for improved sanitation for her community (Pic 4). In Kojani, the shore and docking place for boats is used as an open defecation area (Pic 3).
In summary, access to safe water and proper sanitation is a challenge all over Pemba:

- Systematic sampling of different water sources in Pemba resulted in 82% of water samples positive for *Vibrio cholerae*.
- The majority of water sources are unprotected springs or shallow wells.
- Pipes for tap water are at the open air and thus easily damageable.
- There is a need to develop human resource to ensure proper maintenance of the water system.
- There is a need for systematic chlorination of water sources as well as monitoring of residual free chlorine levels.
- Latrine coverage is estimated to be less than 50% of the population and when they exist they are poorly maintained.

### III. Outbreak response, Pemba 2006

#### 1. Organization of the Response and Preparedness

The response was activated by the secretary of the cholera technical committee (focal point for outbreak response) as soon as the first case was laboratory confirmed. The first few cases triggered the opening of the first CTC in Muwambe on 22 March where most of the cases had occurred. Criteria for opening a CTC in that location are: one laboratory confirmed case and an increased number of diarrhoea cases. Staff were then shifted from other health care facilities and refresher course organized for one day. Overall, a total of 7 CTCs were opened during the current outbreak. Two were located in Mkwoani district, two in ChakeChake district and three in Wete district. CTCs are usually closed after a period of two weeks without cholera patients, or more precisely, when all stool samples from diarrhoea patients are negative for *Vibrio cholerae* for two consecutive weeks. At the time of assessment, only one CTC was still functional.

**The technical cholera committee** included the Health coordinator and Zonal Medical officer, the secretary of the committee which is also CDD coordinator, the public health environmental officer, the zonal public health officer as well as the head of the Pemba water department. The PHL is not represented in the committee. The committee is activated once an outbreak has been declared and meets on a regular basis but at least once a week during the peak of the outbreak. The committee does not meet during the inter-epidemic period. Communication from affected areas is greatly facilitated through the availability of mobile phones. However, certain locations are hard to reach from a geographical point, needing transportation by boat (Pic 5 and 6).

*Pic. 5 & 6 transport to Shamiani*
Attempts for an integrated multisectoral response were made but need to be strengthened further, particularly with regard to water and sanitation.

The preparedness plan depends upon the knowledge and the commitment of the secretary of the cholera technical committee and the zonal medical officer. No written action plan was available, but it seems that a draft is available at the MoHSW in Stonetown.

Buffer stocks for emergency supplies were available to initiate the response. Further supplies were rapidly made available by emergency funds released by the MoHSW once the emergency was declared.

At the time of the assessment, Micheweni, which is considered a high risk area for cholera, had not reported any cases. However, preparedness activities had been initiated and included pre-positioning of disinfection material and stock solution of chlorine, guidelines for case management, as well as refresher training for health care staff. Furthermore alkaline peptone water was available to ensure proper transportation of stool samples to the PHL.

2. SURVEILLANCE AND EARLY WARNING

Early warning has been functional and laboratory confirmation of the first case has occurred within 24 hours of admission. All samples are sent to the Public health laboratory (PHL) in ChakeChake, which has the capacity to diagnose *Vibrio cholerae*. Laboratory confirmation is performed for few cases only at the beginning and at the end of the outbreak. It usually takes 2-3 days to get the results from the PHL at district level where cases had occurred.

The recording of patients occurs through line listing in the health centres registry books and information on the location, age and sex of the patient are recorded. However, number of cases is not reported on special forms and data is not analysed.

The reporting to the district level occurs by telephone and triggers a close follow-up by the secretary of the cholera technical committee. However, it takes several weeks for the data to be reported to the national level. Furthermore, the total number of cases does not include the number of deaths, and therefore provides misleading information. Also, outpatients are not registered as cholera patients even if they are considered as such.

Overall, surveillance activities remain a big challenge. Integrated disease surveillance is planned to be introduced shortly in Zanzibar, which should contribute to strengthening epidemic surveillance, preparedness and response for cholera.

3. CASE MANAGEMENT AND CTCs

Most of the deaths occurred at the beginning of the outbreak, when the health care staff were not yet familiarized with proper case management. For the first two weeks of the outbreak, CFRs reached 25% and 10% respectively, which is a clear indication for inappropriate case management. This reversed rapidly under the impulse of the technical committee which provided refresher training for proper case management. An example of adopting an efficient rehydration therapy is the case of a young man we met during the assessment who fully recovered from a sever cholera. He had been three days in coma, and received 75 litres of IV fluid over one week (Pic 7). Treatment guidelines were available in two of the health care facilities visited. One centre had the plan for rehydration posted on the wall for easy reference.
Each health care facility located in cholera prone area had a cholera kit propositioned allowing for treatment of first cases. The opening of CTC in locations where cases had occurred have also contributed to diminishing the CFR ensuring proper treatment timely where needed.

**Pic. 7. Nahoma, 19 years old recovered from a severe cholera after 3 days in coma and 75 litres of IV fluid over 1 week.**

4. **HEALTH EDUCATION**

Limited funds were available for health education and no leaflet nor any posters were found in the health care facilities, except in Kojani island where some old posters from 2002 had survived behind stacks of boxes. Nevertheless, health education plays a critical role in limiting the spread of an outbreak. Messages to the community, such as rehydrating with ORS already at home and seeking treatment early, can make a difference. Furthermore, health education should focus on simple messages to prevent the disease at individual level, such as: *wash your hands before preparing food or eating*. Funds need to be made available for enhancing community involvement before an outbreak starts.

5. **WATER AND SANITATION**

Water supply and sanitation are a huge challenge and contribute to the occurrence of cholera in Zanzibar. Water quality monitoring of 13 water points located in 3 districts during the outbreak identified contamination by *Vibrio cholerae* in 41 out of 50 samples (Fig 6). In areas where cholera occurred, health care staff used to chlorinate shallow wells at night. However, no monitoring of free chlorine levels was performed. During outbreaks, boiling water at household level is also encouraged. The possibility to encourage the water chlorination at household level should be explored. It is very likely that this might be an attractive option to ensure improved water quality for the population which is scared of cholera.

6. **FUNERAL PRACTICES**

Funerals of all cholera patients are attended by a public health officer to ensure proper handing of the corpses. Corpses are washed with a 2% chlorine solution. Furthermore no meals are allowed during the funeral.

<table>
<thead>
<tr>
<th>In summary, key challenges identified for the response to the outbreak were as follows:</th>
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<tbody>
<tr>
<td>• The cholera technical committee is very active to provide support and guidance for outbreak response. However, it needs to meet also during the inter-epidemic period, in order to improve preparedness; furthermore it needs to include representatives form the education sector as well as from the PHL.</td>
</tr>
<tr>
<td>• No preparedness plan is available and the response relies upon 2-3 key individuals which need to move all over the island to provide technical support to the areas which</td>
</tr>
</tbody>
</table>
are affected. This might be improved by identifying a focal point in each of the districts and areas at risk, these focal points should benefit from pre-emptive training for preparedness and response.

- The EWARN was efficient and lead to a rapid response. However, surveillance remains one of the key challenges and needs improvement, particularly with regard to reporting and analysis of data to guide interventions accordingly.
- Case management needs to improve particularly at the beginning of an outbreak; training sessions for refreshing of knowledge for case management should be organized twice per year before each rainy season.
- Health education needs to be strengthened seriously, but requests funds to be made available.
- Water in Pemba is not safe, in spite of huge efforts which have been done recently by the Government to improve water quality.
- There is an urgent need to improve the maintenance of the water system, that requests building of technical capacities.
- The link between water and health needs to be encouraged in order to improve prevention and response. Furthermore, the possibility should be explored for introducing chlorination at household level.

### IV. New tools for cholera control: OCV and rapid diagnostic tests

Cholera is a recurrent problem in Zanzibar and particularly in Pemba. Risk factors for cholera outbreaks, in particular environmental management, remain a big challenge in spite of many recent efforts to improve water quality as described above (II.4.). There is a clear underestimation of cases due to limitation in the surveillance system (III.2.) and the burden of disease is based on the recognition of clinical cases which are then laboratory confirmed in the PHL in Pemba.

Considering the positive results of the recent mass vaccination campaign in Beira, Mozambique, the use of Oral Cholera Vaccines (OCV) might play a critical role in averting future cholera outbreaks in vulnerable populations in Zanzibar. Due to its island setting and the relatively small distances to reach any location on the island a mass vaccination campaign could be envisaged to prevent the occurrence of cholera in the high risk population.

Furthermore, immunochromatographic rapid diagnostic tests (RDT) are now available on the market for use at the patients bedside. They will greatly facilitate cholera surveillance activities in the field and enhance early warning and rapid response, once these tests will be introduced. WHO is planning to validate these tests in order to issue global recommendations accordingly. Pemba with its regular occurrence of cholera and its reference public health laboratory would be an ideal site for such a validation.

A project proposal can be envisaged as follows:

**Aim:**
To limit the occurrence of cholera in Pemba using OCV and to gain evidence for scaling up intervention in Unguja Island as well as in other cholera endemic areas.

**Specific objectives:**

**Phase 1:**
1. Strengthening surveillance for cholera as well as for other enteric pathogens, in order to gain accurate estimates on cholera and enteric disease incidence in Pemba.
2. Validating the commercial version of the chromatographic rapid diagnostic test for cholera
3. Preparing and implementing a pilot mass vaccination in Kojani island, off the island of Pemba where outbreaks occur yearly.
4. Improving environmental management in particular water and sanitation, as well as strengthening health education.

Phase 2:
5. Scaling up mass vaccination according to findings in phase 1.

Phase 3:
6. Three year follow up to explore the effect of the mass vaccination campaign on the transmission of cholera.
7. Planning for a booster dose, once breakthrough cases are recorded and gain evidence on its role in prolonging protective efficacy.

The project is planned to be implemented in three successive phases and will involve a partnership between the MoHSW, the Ivo de Carneri Foundation and WHO.

Next steps involve getting the commitment and support from the MoHSW as well as from all the other partners, developing a project protocol and submitting it to the different ethical review committees, fundraising with potential donors, and planning and preparation for the project to start shortly.

V. Recommendations

Efforts for improved preparedness and response to cholera outbreaks have greatly improved compared to previous years and several of the recommendations from the WHO assessment of 2002 have been initiated (Reference 2). Efforts need to be continued, in particular:

1) Surveillance
   a) needs to be strengthened in order to guide intervention activities accordingly;
   b) data recording and analysis need to be standardized and should already occur at peripheral level
   c) communication of data to the national and international level should occur more timely; this requires training of health care staff at district level.
   d) Integrated disease surveillance should be introduced in Zanzibar; this would foster performance of disease surveillance overall including cholera.

2) Rapid diagnostic tests (RDT):
   a) It’s introduction would greatly facilitate surveillance activities including EWARN and rapid response. Introduction of these RDT need to be part of a project on operational research which will aim at validating these tests for wider introduction in Zanzibar as well as at global level.

3) Preparedness plan:
   a) a national plan of action including a cholera preparedness plan needs to be developed and made available at all levels.
   b) The cholera technical committee needs to include representatives form the educational sector as well as from the PHL.
   c) The committee needs to meet also during the inter-epidemic period to ensure proper follow-up and timely preparedness such as pre-emptive training for case management to avert unnecessary deaths at the beginning of the outbreaks.

4) Health education:
   a) Emphasize needs to be put for strengthening health education such as developing and disseminating simple messages for prevention at individual level.
   b) Funds should be made available for printing and dissemination of pamphlets and posters.
5) Community participation:
   a) community participation for cholera control should be encouraged. eg explore possibilities for chlorination at house hold level;

6) Water and sanitation:
   a) Improve safety of water supply by improving maintenance of waste system
   b) Build capacities for technical maintenance of water system
   c) Maintain chlorination of shallow wells and introduce monitoring of free chlorine levels.

7) Encourage links between the health sector and the water sector for improved prevention and response.

8) Allocate funds for preparedness activities including health education, while maintaining the budget line for emergency response.

9) Engage into the proposed project proposal for OCV use in high vulnerable groups, which includes improved surveillance activities for cholera and other epidemic diarrhoea disease (III).

VI. Conclusion

There is a clear improvement in the response to cholera outbreaks in Zanzibar when compared to previous outbreaks. However, this is draining a lot of efforts and resources from other public health priorities. Also, the response relies solely on the commitment of 1-2 key individuals, a situation not sustainable over time. Furthermore, improving environmental management remains a huge challenge and requires enormous resources that will not be made available in the near future. As well, the emphasize should be put on improving health education, a key element in prevention and preparedness through enhanced community involvement. In view of these remaining challenges, Zanzibar could therefore benefit from new public health tools such as rapid diagnostic tests to improve surveillance as well as oral cholera vaccines to prevent the occurrence of the disease and to limit the transmission of cholera in vulnerable populations. This new interventions should be linked to well designed intervention studies in order to gain evidence on it's pertinence for wider application in Zanzibar as such as well as in other cholera prone countries.
Annex 1: Map of Pemba and Unguja islands, Zanzibar
Annex 2: References

Annex 3: List of people met

**Ministry of Health**
Dr Sultan Mohamed Mugheiry, Minister of Health and Social Welfare, Zanzibar
Dr Mohammed Jiddawy, Principle Secretary, MoHSW Zanzibar
Dr Mkasha Hija Mkasha; Health coordinator MoHSW and Zonal Medical Officer, Pemba
Mrs Siti Makame, CDD & IMCI coordinator and secretary cholera technical committee, Pemba
Mr Shaha Alfani, Public Health Environment Officer, Pemba
Mr Shoka Yakoub Mohamed, EPI Coordinator and Zonal Public Health Officer, Pemba
Mr Rachid, DMO Micheweni
Staff from PHCU in Maziwa Ngombe, CTC in Mchangani

Public Health Laboratory, Pemba
Dr Hamadi Juma, Director PHL
Dr Paolo Chiodini, Deputy Director PHL

**Department of Water Development, Pemba**
Mr Mohamed Abdoulla Mohamed, Head of Water Department
Mr Mohamed Ali Salah, Water technician

**Ivo de Carneri Foundation**
Mr Yaha, Resident Representative, ChakeChake
Dr Marco Albionico, Scientific Secretary, Torino, Italy
Miss Deborah Cocorullo, Project Manager, Milano
Dr Nathalie Pellissier, Food technology; ISF Trento delegate, Italy (safe water project)
Dr Alesandro Vigano, PhD, Hygiene Institute, University of Milano, Italy (safe water project)

**WHO**
Dr E. Manganu, WHO Representative, Dar Es Salaam, Tanzania
Dr M. Amri, DPC WHO office, Dar Es Salaam, Tanzania
Dr I Noormohamad, WHO liaison officer, Zanzibar
Annex 4: Agenda

Thursday 6 July 2006
Meeting with Dr Noormahomed, WHO Zanzibar
Meeting Dr Jiddawy, Principle Secretary MoHSW, Zanzibar

Friday 7 July 2006
Travel to ChakeChake, Pemba
Meeting with Management group PHL and Ivo de Carneri Foundation

Saturday 8 July 2006
Presentation on OCV use to management group PHL and key public health staff
Field visit to Mkoani district: Shaniani, Muwambe and Jombwe

Sunday 9 July 2006
Field visit to Micheweni district: Micheveni and Maziwa Ngombe;
Visit to Wete district: Kojani island
Visit of CTC Kigo

Monday 10 July 2006
Visit PHL
Meeting with representatives from Department of Water Development
Lecture on cholera control to students attending the course on Tropical Disease and Public Health priorities

Tuesday 11 July 2006
Travel to Unjuga Island;
Meeting and debriefing with Dr Jiddawi, Principle Secretary, MoHSW

Wednesday 12 July 2006
Meeting with the Minster of Health and the Principle Secretary, Zanzibar
Debriefing with Dr Noormahomed, WHO office Zanzibar
Travel to Dar Es Salaam
Debriefing with Dr Manganu WR Tanzania and Dr Amri WHO office DarEsSalaam
Departure for GVA