

Malaria Outbreak Among Members of JTF Liberia Consensus Conference Report

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Organizations Represented

- Food and Drug Administration
- Centers for Disease Control and Prevention
- World Health Organization
- Walter Reed Army Institute for Research
- Naval Medical Research Center
- Armed Forces Medical Intelligence Center
- U.S. Air Force Medical Support Agency
- Joint Chiefs of Staff - J4
- Uniformed Services University of the Health Sciences
- Naval Medical Education and Training Command
- DoD Global Emerging Infections System
- Marine Forces, Atlantic
- II Marine Expeditionary Force
- National Naval Medical Center
- Naval Environmental Health Center
- Naval Environmental and Preventive Medicine Unit – Sicily
- Headquarters, Marine Corps, PP&O
- Commander Amphibious Task Force
- Marine Expeditionary Unit 26
- Navy Disease Vector Ecology and Control Center
- Naval Forces Europe
- Joint Task Force - Liberia
- U.S. Army Medical Research and Materiel Command
- U.S. Navy Bureau of Medicine and Surgery
- Headquarters, Marine Corps, Health Services
- U.S. Army Office of the Surgeon General

Historical Experience

- Navy/Marines – 62 cases worldwide from 1997-2000.
- Somalia – 1993 – 106 cases in Marines
 - 127 cases U.S. Army
- Sierra Leone –1996 – 6 cases in Marines
 - 91 cases British Army
- Nigeria - 2001 – 7 cases with 2 deaths,
U.S. Army Special Forces

JTF Liberia Outbreak

- Total of JTF spending any time ashore – 290.
Quick Reaction Force – 225.
157 of MEU surveyed during investigation.
- 80 cases treated:
 - 1 civilian, 1 U.S. Army, 7 U.S. Navy, 2 FAST Marines.
 - 69 Marines of 26th MEU.
- 51 cases by positive smear, 29 by clinical criteria.
- Historical predicted malaria risk: 11-50% for unprotected personnel.
USMC experience:
 - 69/157 (44% attack rate) for 26th MEU members spending nights ashore.
 - 80/290 (28% attack rate) for JTF members spending any time ashore.

Pre-deployment Analyses and Intelligence

- Liberia known to be highest risk area for multiple vector-borne diseases.
- Humanitarian Assistance Survey Team, JUL 03:
 - limited in scope
 - assessed infrastructure, public health, sanitation, and security threats
 - focus on future civilian relief efforts vice deploying forces.
- JTF-L OPORD preventive measures consistent with survey, intelligence and recommendations from AFMIC, CDC and WHO.

1. Was there a problem with the availability of mefloquine?

- Mefloquine dispensed to Marines.
 - Verified by survey.
 - Verified by presence of tablets in Marines' pockets upon arrival at NNMC Bethesda.
 - Verified by presence of mefloquine in serum samples.
- MEU members were taking mefloquine prior to entering Liberia.
 - Verified by mefloquine metabolite levels.
- ANSWER: No. Mefloquine readily available.

2. Was there a problem with generic mefloquine's potency or formulation?

- Mefloquine met all FDA requirements.
 - Tablets removed from Marines' pockets produced predicted blood levels in test subjects.
 - Chemical analysis by FDA within standards.
 - FDA recommends continued use of current generic mefloquine formulation.
- **ANSWER:** No. Mefloquine potency and formulation was adequate.

3. Were Marines taking mefloquine according to requirements?

- Steady-state ratio of mefloquine metabolite (MMQ) present in 93 of 133 indicating past use.
- Protective mefloquine (MQ) levels present in 19 of 133 specimens indicating recent use.
- Only 7 of 133 had both protective MQ and adequate MQ/MMQ ratio.
 - Inadequate levels noted despite the survey indicating 95% of Marines claimed no missed doses.
- **ANSWER:** No. Lab data indicates inadequate compliance with required dosing schedule.

4. Was the malaria parasite resistant to mefloquine?

- Testing at Walter Reed Army Institute for Research did NOT reveal clinically significant resistance.
 - Consensus remains that mefloquine is the drug of choice for Liberia.
- **ANSWER:** No. Resistance not a factor.

5. Was DEET available for use?

- 290 personnel surveyed.
- DEET use:
 - Possession of DEET was a repeated inspection item.
 - 79/290 (27%) used some type of repellent at least once.
 - Only 19 of these used 12-hour DoD-issued DEET formulation.
 - Majority used less-effective non-DoD supplied or non-DEET repellent.
- ANSWER: Yes. Long-acting DEET was available. However it was not routinely used. Other DEET formulations were more commonly used though less effective as repellents.

6. Were permethrin-treated uniforms available for wear?

- 290 surveyed. 36 (12%) wore permethrin-treated utility uniforms ashore.
 - Unable to obtain bulk permethrin for treatment, only aerosol available aboard ship.
 - Only desert utilities were treated by aerosol prior to deployment.
 - Woodland utilities worn ashore, appropriate to local environment.
- Aerosol spray can is the least effective method available for treatment.
- ANSWER: No. Few adequately treated uniforms available for use ashore in Liberia.

7. Were bed nets used?

- Bed nets not carried ashore due to:
 - Weight restrictions
 - No cots to hold poles.
 - Sleeping on paved/hard surface precluding pole use.
 - Assumed short stay with minimal exposure.
- Current issue bed net system requires soft surface for poles or cot to effectively deploy.
- ANSWER: No. Not used due to net design and mission requirements.

8. Was local insect control adequate?

- Requirements to analyze and implement insect control exceeded ARG/MEU capabilities.
 - Minimal mosquito abatement equipment routinely carried with ARG/MEU
 - No mosquito abatement expertise routinely included in ARG/MEU T/O
- Analysis requires:
 - Traps and microscope
 - Expertise to count and speciate
- Site survey following outbreak revealed:
 - Mosquito risk widely and equally spread across region
 - Large local human reservoir of malaria
 - Highly mobile mosquito species, travel > 1 mile.
- **ANSWER:** No. Local control for malaria vectors not feasible given broad distribution, and limited ARG/MEU capabilities.

9. Was the medical staff adequately trained in diagnosis and management of malaria?

- Recent formal training for one physician, who established initial diagnosis and implemented treatment.
- No laboratory technicians had recent formal training.
- No formal pre-deployment refresher training received.
 - Early diagnosis and treatment decreases morbidity and mortality in malaria.
 - Treatment requires medications not used for prophylaxis and not routinely included in AMAL.
- **ANSWER:** No. Routine pre-deployment training does not include infectious disease refresher for physicians or lab techs.

10. Can U.S. Forces deploy to highly malarious areas, without suffering similar malaria outbreaks?

- Current policy and procedures for personal protective measures effective.
- Current chemo-prophylaxis effective.
- Currently complex regimen makes implementation difficult.
- ANSWER: Yes. Present policies and measures, if routinely applied to each individual ground force combatant, are adequate to prevent malaria in Liberia and other malarious areas.

Recommendations: Near Term

- Provide USMC-wide guidance requiring:
 - Permethrin treatment for all uniforms and bed nets prior to deployment using best available techniques.
 - Use only DoD sustained-release DEET or DEET/Sunscreen formulations.
- Provide routine tropical medicine refresher training to MEU medical staff during pre-deployment work-ups.
- Add Malarone and oral quinine medications to AMAL.
- Operational planners and chain of command emphasize awareness/assessment of infectious disease threat.
- Improve training and equipment of ARG/MEU Preventive Medicine technicians to enhance insect control capability.

Recommendations: Long-term

- Permethrin treat uniforms at the factory during procurement.
- Procure and distribute improved mosquito net system as USMC standard issue.
- When OPLANS indicate potential for entry into high malaria-risk area, obtain and assure ARG/MEU capability for continuous onsite assessment and abatement of health threats.

Medical Continuing Efforts

- Malaria antibody testing of blood samples.
- Continue ongoing monitoring for emerging permethrin resistance in mosquitos.
- Continue evaluation of these malaria parasites for mefloquine resistance.

Medical Research and Development

- Field-use malaria test kit.
- “Fire-and-forget” solutions to reduce complexity:
 - Support malaria vaccine research.
 - Support malaria medication research.