

# MEDICAL, OCCUPATIONAL, AND ENVIRONMENTAL HEALTH CONSIDERATIONS FOR OIL SPILL RESPONSE PERSONNEL

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**ABSTRACT:** *Oil spill response workers can face a variety of health concerns when a spill occurs in a remote area. Potential food, water, and disease hazards need to be addressed for both fly-in supervisory personnel and local clean-up crews.*

*Pre-spill planning activities should consider a variety of scenarios covering a range of spills in the geographic areas of responsibility. Topics to address should include medical screening of oil spill response team members, vaccination/shots, travel kits, special clothing needs, disease control informational handouts, food and water sources, evaluation of medical personnel and facilities and identification of medical evacuation plans.*

*Activities occurring during the spill-clean-up period might include medical screening of food handlers and local workers, confirming the availability of local medical facilities and evacuation routes, conducting routine clinic operations, checking the sources and handling of food and water, checking housing conditions, implementing a disease vector control program, and providing training related to local environmental hazards.*

*Post-clean-up activities would include safe disposal of medical and other waste, providing post-spill medical exams, and documenting lessons learned during the spill. Successfully controlling health issues during a spill may only be possible if an appropriate level of planning is carried out.*

## **Introduction**

This paper discusses how medical, occupational, and environmental health considerations may affect oil spill clean-up activities. In this instance "medical care" refers to first aid, treatment, referral and follow-up on illnesses and injuries which might be encountered by workers on the site. This work is typically carried out by medics, nurses, primary care physicians and emergency care physicians.

"Occupational Health" refers to the management of all aspects of health impacted by oil spill activities including injury and illness prevention. This work is typically carried out by occupational health nurses and occupational health physicians. "Environmental health" refers to site-specific characteristics (e.g., diseases, special clothing needs, extreme heat/cold, animals) that may impact on oil spill workers by affecting their health, and is typically carried out by industrial hygienists, safety personnel and other health care workers.

The focus of the paper is on non-industrial countries covering the worst case scenarios that should help to identify most of the health factors that can affect workers. This paper will not cover the direct occupational health aspects of an oil spill response activity, such as oil exposure related issues.

Oil spill response sites are sometimes characterized by remote and hostile environments. They may be located in regions or countries where routine infrastructure and services are not readily available. For example, the spill site may not have ready access to potable water, safe supplies of food, and/or there may be endemic diseases such as malaria present. Good medical facilities may not be available locally. Some of the potential health risks are immediately dangerous, some may have long term health effects, and some might be contagious and spread to family and others on return to home. The purpose of this paper is to identify these types of potential concerns, and to present a plan of action which if implemented starting in the planning stages can help ensure a healthy and efficient oil spill work force.

## **Pre-spill planning considerations**

As with other oil spill team functions, the health team should consider a number of different scenarios in the planning process to cover all potentially dangerous situations. These exercises should include several sizes of spills, types of geographic areas, levels of local

infrastructures, etc. Planning to this level of detail will help ensure a healthy and safe work environment.

Health professionals provide a wide variety of services during oil spill clean-up activities. Individual tasks may be assigned to physicians/industrial hygienists/nurses/medics/toxicologists etc., depending on the planning basis and who arrives at the site the fastest. Planning for staffing should include consideration of the estimated health risks and medical infrastructure available in the geographic regions of concern. In high-risk areas, staffing plans might need to be worked to a greater level of detail and back-up plans should be considered. In addition to the activities listed in this paper, industrial hygienists also may have responsibility for training oil spill workers, selecting personal protective equipment, providing decontamination advice, monitoring exposures, coordinating hearing conservation activities, testing confined spaces prior to entry, and assisting with community relations activities. Physicians also may have responsibility for taking care of potential spill-related and routine medical needs that might occur at the site.

**Medical care related aspects.** *Site medical evaluation and evacuation plans.* In remote locations acceptable medical infrastructure may be lacking. During the planning phase, this can be initially evaluated by contacting international medical aid organizations. In areas where infrastructure is lacking, discussions can be held with international medical evacuation contractors to evaluate how their services may meet the oil spill team's needs. Given this information, decisions need to be made in conjunction with the oil spill coordinator regarding the base level of care expected for the various geographic regions and the associated medical facilities and supplies.

**Occupational Health Related Aspects.** *Medical screening of oil spill response team members.* Medical screening can be a very important component of the oil spill

planning process. A medical review of the oil spill response team's records for pre-existing metabolic diseases, such as diabetes, is vital. Hematological (blood-related) diseases are another area for careful examination. Renal (kidney) conditions can be aggravated by travel-related medicines or dehydration. Some travel-related medications have undesirable side effects, which makes understanding the oil spill teams' allergies important. Gastrointestinal diseases under control at home can be severely aggravated by traveler's diarrhea. A history of asthma can be aggravated by dusty or humid climates. Some skin diseases, such as psoriasis, could have a major flare-up caused by malaria prophylaxis or extremes of temperature.

For these reasons, it is very important to get a complete medical history of the oil spill team members. These histories should be reviewed by an occupational health physician and potential problems discussed with employees. This activity should be updated periodically to identify new risk parameters such as changes in medication or health status.

*Vaccinations / shots.* Ideally, 8 to 12 weeks are needed to acquire full immunization with a majority of the vaccines. Border officials can demand a yellow fever vaccination verification dated at least ten days prior to entry into a country. Some countries also require cholera vaccinations prior to entry. Thus, oil spill workers may be barred from entry into some countries due to insufficient vaccinations.

Oil spill workers who can be called upon to respond to a spill need to receive a set of vaccinations valid for the whole region. Therefore, new members to the oil spill team need to have their vaccination records reviewed as soon as possible. Table 2 presents an overview of the various immunizations and recommendations for the Exxon-defined geographic areas of responsibility.

**Table 2: Regional Vaccination Considerations**

TYPE	VACCINATION	REGIONAL TEAMS
Basic	Tetanus	All
	Diphtheria	All
	Polio	All
	MMR	All
	Measles (born > 1956)	All
Required for Boarder Crossing	Yellow Fever	South America Africa
	Cholera	All
Recommended	Typhoid	All
	Hepatitis A	All
	Hepatitis B	All
	Meningococcus	Africa
	Rabies (pre-exposure)	Asia/Africa
	Japanese B Encephalitis	Rural Asia
		Southeast Asia

*Personal travel kit.* The oil spill response team member should receive a list with necessary supplies, including oral and topical medications. The kit

needs to be checked periodically to ensure none of the expiration dates have elapsed. Two generic travel kit checklists are presented in Table 3

**Table 3: Travel Kit**

**Kit 1: Short-term Travel Trip to Temperate Climate**

***Supplies***

- Extra pair of eyeglasses
- 1. Band-Aids, several sizes
- 1. Disposable thermometer
- I. Disposable syringe and needles in case you need an injection
- I. Alcohol swabs in packets
- I. Swiss Army-type knife
  - Cotton-tipped swabs
- Small scissors and forceps
- Male or female personal hygiene items

***Oral Medications***

- Antihistamine / decongestant for colds or allergies
- 2. Bismuth salicylate or Diasorb for traveler's diarrhea
- 2. Antibiotic for treatment of more serious traveler's diarrhea
- II. Aspirin or acetaminophen for fevers
- II. Antacid / antifatulence tablets or liquid for upset stomach
  - Analgesic / anti-inflammatory (e.g., ibuprofen) for minor injuries
- Laxative (e.g., a senna derivative or bisacodyl) for constipation
- Personal prescription medications

***Topical Medications***

- Povidone-iodine cream, ointment, or pads for cuts and scratches
- 1% cortisone cream for minor rashes

**Kit 2: Short-term Travel to Tropical Climate**

*All of the items included in Kit 1 with the addition of:*

- Sunglasses
- Moleskin
- Preventive antimalarial tablets
- Multivitamins
- Oral rehydration salt (ORS) tablets or sachets
- Antifungal cream (e.g., miconazole)
- High-numbered (25-35) SPF sunscreen (non-perfumed)
- Moisturizing lotion for sunburns
- Insect repellent containing 35% DEET for skin application
- Insect repellent containing 95 - 100% DEET for application to clothes
- Anti-itch lotion (calamine) for insect bites

This list will need to be reviewed and modified by an occupational health professional to ensure it adequately covers all potential needs for the geographic areas of responsibility.

**Environmental Health Aspects.** *Site risk assessment/ disease control information.* The most important health related oil spill planning activity could be identification and assessment of potential diseases and other causes of illness that may be present in the geographic areas of responsibility. Comprehensively planning control methods are key to a successful program. The first page of an example developed for central West Africa is shown in Table 1.

**Table 1. Example Health Risk Analysis**

DISEASE	LOCATION	VECTOR / AGENT INFORMATION	DISEASE RISK	PREVENTION / VECTOR CONTROL	TREATMENT	OVERALL RISK
Malaria	Throughout the region	Anopheles Mosquito / Blood Parasite Mosquito <ul style="list-style-type: none"> <li>• Dusk-Dawn Night-Biter</li> <li>• Can Fly 10 km / day</li> </ul>	////	<ol style="list-style-type: none"> <li>1. Wear long-sleeved clothing treated with permethrin</li> <li>2. Apply DEET insect repellent to exposed skin</li> <li>3. Minimize outdoor night activities</li> <li>4. Use bed nets impregnated with Deltamethrin</li> <li>5. Chloroquine / Paludrine pills</li> </ol>	Chloroquine, Halfan, Quinine-based oral or intravenous medications	//
Tuberculosis	Throughout the region	Bacteria -- spread by coughing / sneezing	//	Minimize exposure to crowds	Effective treatment, but some resistance	//
Hepatitis A / B	Throughout the region	<u>Virus</u> <ol style="list-style-type: none"> <li>1. Fecal contamination of food / water (A)</li> <li>2. Contaminated blood / sexual contact (B)</li> </ol>	////	<ol style="list-style-type: none"> <li>I. Food / water precautions</li> <li>II. Clean needles</li> <li>III. Avoid sexual contact</li> </ol>	None, supportive	A = // B = /
Loiasis	Southern forest areas	Chrysops Flies (= Red / yellow flies, = Deer flies) / Worm <ol style="list-style-type: none"> <li>I. Daytime biter</li> <li>II. Attracted to wood smoke</li> <li>III. Attracted to dark clothes</li> </ol>	///	<ol style="list-style-type: none"> <li>I. Wear light-colored, long-sleeved clothes</li> <li>II. Avoid open fires</li> </ol>	<ul style="list-style-type: none"> <li>- Early diagnosis important</li> <li>- Possible side effects to treatment</li> </ul>	/

The first three columns list disease, location, and useful information regarding the vector or agent. The next column, Disease Risk, estimates the likelihood of oil spill workers coming in contact with the disease, with four marks being the highest probability. The next two columns list prevention / vector control methods and treatment options, respectively. The last column, Overall Risk, reduces the risk of contacting the disease (Disease Risk column) by the estimated effectiveness of the prevention / vector control methods and the medical treatment. Disease control information should also consider sexually transmitted diseases, strategies for taking care of fever and traveler's diarrhea, effects on health by climate extremes and prevention against dangerous animals such as snakes / bears / poisonous spiders / etc. Developing such information during the planning phase is essential for a well-run oil spill clean-up operation.

*Special clothing needs/ supplies.* For areas with harsh winters, planning for sufficiently warm clothing is a necessity. This is complicated by the need for chemical protective clothing for workers who will be contacting the spilled oil, dispersants, or other potentially toxic materials. This may necessitate stockpiling extra large disposable suits. Protective gloves and footwear will need to be evaluated based on the potential severity of the weather.

For many tropical areas, clothing requirements may be dictated by the presence of insect-borne diseases such as malaria. In such situations, the use of long sleeves and pants is a first line of defense. Discussions will be needed with the oil spill supervisor and logistics coordinator regarding any special clothing requirements. For long term spill clean-up operations, treatment of the clothing with non-toxic insecticides in the laundry operations should be considered. In some geographic areas medical preventative measures will be required. Insecticide impregnated bed nets may also be needed.

*Food and water considerations.* Numerous diseases and toxic agents that can potentially incapacitate major segments of the oil spill workforce can be spread through food ingestion. Frequently, diseases are spread due to disregard of fundamental sanitation principles. They may be caused by foods contaminated with bacteria (e.g. Salmonella and Clostridium) or their toxins, fungal toxins (e.g., aflatoxins), parasites (e.g., tapeworms, roundworms), or chemical toxins such as DDT and other pesticides.

Symptoms of food borne illness include diarrhea, vomiting, nausea, and fever. These symptoms may appear within minutes, hours or even several days later. The time to onset of symptoms is dependent upon the type and quantity of the contaminant ingested, and the susceptibility and resistance of the individual involved. A primary concern of any food related illness is the potential for dehydration due to loss of body fluids. This is particularly true in hot climates.

Water is a necessity of life; however, contaminated water can also quickly disable an oil spill response

team. In addition to potential diseases such as giardiasis and dracunculiasis, local water sources can be contaminated with chemical and /or radiation hazards. On a lesser scale, "non-toxic" organisms present in local water sources can result in gastrointestinal problems in fly-in personnel because their systems are not accustomed to the local biota.

If the purity of local water is in question, identifying suitable substitutes will be of primary importance. Other sources may include bottled water, drilling a well, or even importing a safe supply of potable water. Where water contaminants are known, an appropriately designed water purification system can be considered. In addition to identifying a safe source of water, long-term camps will need to consider chlorination since toxic organisms can grow in "safe" water that has been stored for a length of time.

For planning purposes, importing a few days supply of food (frozen food in tray-form is recommended) and water should be considered. Depending on the geographic area of responsibility and the degree of infrastructure available, importing additional food and / or water may be advisable. Multinational companies located in the area can be the source of valuable information, particularly fast food companies and soda manufacturers. In potentially high-risk geographic areas, a visit to remote areas (in conjunction with gathering other information listed in this section) would provide invaluable planning information. Once food and water needs have been determined, the information should be discussed with the oil spill logistics group to determine feasibility.

## Activities during the cleanup

**Medical Care Related Aspects.** *Confirm local medical facilities and evacuation plans* At the spill site, the first activity will be to check the arrival of the medical supplies identified during the planning stage and setting up a temporary clinic. The second course of action may be to verify and evaluate the level of medical infrastructure available and make arrangements for transportation and care for cases that can not be handled by the site clinic.

- *Clinic operations.* During the clean-up phase, the medical clinic can be considered a gauge of the effectiveness of the occupational health planning and preparation. In addition to injuries, illnesses will become an increasingly important parameter to track in the more remote locations. Early identification of unexpectedly high disease rates can lead to rapid enlistment of additional medical supplies and personnel, and an increase in the level of training, thus minimizing health impacts on the clean-up operation.

Monitoring of recovering patients and maintenance of health records should also be overseen.

**Occupational Health Related Aspects.** *Medical screening of food handlers.* An outbreak of food poisoning among oil spill responders can bring the

entire operation to a halt. Good personal hygiene and health are imperative in the food-handlers. Medical screening of the food handlers will depend on the location of the oil spill and the level of expertise of the food-catering contractor. Food-borne illness may be transmitted in a number of ways:

- Incomplete cooking of contaminated meat or poultry
- Contamination by a food handler of a product which will not be cooked again.
- Cross contamination from one product to another via incorrectly cleaned surfaces or utensils, and incorrect operating procedures
- Incorrect storage and refrigeration
- Poor standards of personnel hygiene

If the food-catering contractor uses local workers, they should be medically screened before employment. The screening should include a detailed medical history specifically aimed at revealing a positive or doubtful history of disease transmissible by food or drink, checking for skin problems and nasal drips, and examination of stools for parasites. After acceptance for employment, instruction in good food-handling techniques and personal hygiene should be given. Antibacterial hand-washing creams and gloves should be available for use by food-handling staff, and the kitchen should be regularly inspected (see checklist in Appendix 1).

*Medical screening of local workers.* If contractor occupational health personnel are to be hired for site work, they will need to be evaluated to determine their level of fitness regarding the position they are being hired for. In addition, health assessments for potential exposures to chemical and physical agents should be considered.

**Environmental Health Related Aspects.** Once operations begin, more detailed information can be gathered regarding local diseases, food, water, snakes, etc.

*Food and water sources/handling.* Identifying "safe" sources of food and water will be a key activity. Obtaining sufficient supplies of bottled water from reputable companies is an essential task. Alternative methods of obtaining safe water can be very costly. In remote locations food supplies may be limited to local outdoor markets. If these conditions are unacceptable, consideration will have to be given to obtaining supplies from more distant locations.

For long term spill clean-up operations, a contractor will be hired to supply and prepare the food. Inspections of the kitchen and cafeteria should be conducted periodically to minimize outbreaks of disease among the clean-up workers. An example of a food inspection checklist is provided in Appendix 1.

*Housing conditions.* In addition to general living conditions, housing should be periodically inspected to ensure health considerations are being met. For example, in mosquito-borne disease areas, inspections should include whether screening is intact, and there are no means for mosquitoes to gain access to living quarters, the cafeteria, shower

facilities, recreation areas, etc. During spill clean-up operations, maintenance activities may leave holes in a trailer that are inviting to mosquitoes. Checking to ensure that the facilities are rat proof may also be important. Periodic inspections of garbage and sewage treatment facilities are also needed to ensure healthy living conditions.

*Training/education.* In addition to spill-related training needs, site related conditions would warrant additional training. Preventive measures against insect borne diseases (received before the actual spill activities) need to be reinforced upon arrival and periodically thereafter. In northern geographic areas cold stress control measures might need to be addressed. When workers need to wear disposable work suits in hot climates, heat stress becomes an additional occupational health concern. Providing heat stress training to workers and supervisors, and supplying plenty of fluids should minimize associated health concerns.

## Post-spill activities

**Medical Care and Occupational Health Related Aspects.** There are a variety of post-spill medical activities that should be considered. Some oil-spill response team members will seek medical attention due to specific symptoms. Others who lack symptoms will request screening investigations to reveal latent infections that might give rise to symptoms later in life. A third group will ask for help with a retrospective diagnosis of illnesses suffered during the clean-up activity. In some locations, contact with a disease vector may make distribution of medication on leaving the area a desired course of action (e.g., onchocerciasis (river blindness)).

It is also important to offer to all members a post-spill health education package that addresses the particular symptoms an oil spill response team member should be aware of after his return. Travel health clinics should be identified in the countries of origin of the team members, and although medical examination of a healthy person after traveling abroad is rarely warranted, a screening package for the asymptomatic team member who requests a screening, should be developed.

**Environmental Health Related Aspects.** *Waste disposal.* Occupational health concerns after a spill will include ensuring the proper disposal of waste. Various types of waste (e.g., medical, contaminated personal protective equipment, sewage, and garbage) will need to be considered. Local regulations will need to be followed in determining appropriate waste disposal.

**Lessons Learned and Findings.** As with all multi-disciplinary emergency activities, conducting a post-activity review and officially recording strengths, weaknesses, and lessons learned is a key part of the overall process. It is important to recognize these factors for both intradisciplinary and interdisciplinary activities. Occupational health professionals are doing their tasks correctly when they do not become an "issue" that the oil spill coordinator has to deal with. A good and efficient program can only be

accomplished through proper pre-spill planning and active intragroup communication during the spill.

## Conclusions

The key to a successful health program during an oil spill clean up in remote locations is thorough and detailed planning. Improperly planned programs can result in downtime for significant numbers of workers. Proper planning, covering the items discussed in the planning section of this paper, should result in a relatively smooth implementation of an occupational health program in the event of a spill. Post-spill activities should include a review of the program to identify strengths and weaknesses, which can be used to improve future efforts.

## Biography

Evan C. Thayer has a M. S. degree in Industrial Hygiene and Air Pollution Control from Harvard University. He has been responsible for numerous industrial hygiene programs/activities including Asia and Africa operations and international shipping.

His duties currently include coordinating occupational health activities for Exxon's oil spill research group.

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## QUALITY

- \_\_\_\_\_ 1. Original container or otherwise safe source, no spoilage.
- \_\_\_\_\_ 2. Safe source of meat and poultry supplies.
- \_\_\_\_\_ 3. Delivery containers properly cleaned between use.

## PROTECTION

- \_\_\_\_\_ 1. Potentially hazardous foods kept at correct temperature during transport, storage, preparation, and service.
  - \_\_\_\_\_ Refrigeration kept at 7°C (45°F) or below.
  - \_\_\_\_\_ Hot storage at 60°C (140°F) or above.
  - \_\_\_\_\_ Frozen foods kept at - 18°C (0°F).
  - \_\_\_\_\_ Poultry and stuffed meats cooked at 74°C (165°F) or above - all parts.
  - \_\_\_\_\_ Other foods requiring cooking to be rapidly cooked to heat all parts to at least 60°C (140°F).
  - \_\_\_\_\_ Food kept properly warmed / cooled if delayed in serving by more than 30 minutes.
  - \_\_\_\_\_ Potentially hazardous foods properly thawed in refrigerator or under water of 21°C (70°F) or less.
- \_\_\_\_\_ 2. Accurate thermometers in use / visible.
- \_\_\_\_\_ 3. Field foods properly selected and prepared.
  - \_\_\_\_\_ Avoid using meats that may spoil.
  - \_\_\_\_\_ Cheeses / non-spoiling protein sources used.
  - \_\_\_\_\_ Milk / creamed dishes not sent.
  - \_\_\_\_\_ Transport in sanitized containers.
  - \_\_\_\_\_ Sanitize containers prior to each use.

**PERSONNEL**

- \_\_\_\_\_ 1. Hands washed and cleaned, good hygienic practices, clean clothes.
- \_\_\_\_\_ 2. Personnel with infections restricted from food contact areas / jobs.
  
- \_\_\_\_\_ 3. Food preparation personnel careful when crossover from raw to cooked Foods, maintain good hygienic practices.
- \_\_\_\_\_ 4. Food not picked up by fingers during preparation / serving unless absolutely necessary and plastic gloves used.
  
- \_\_\_\_\_ 5. First aid facilities / materials available.

**FOOD EQUIPMENT / UTENSILS**

- \_\_\_\_\_ 1. Properly designed, able to be properly cleaned / sanitized.
- \_\_\_\_\_ 2. Thoroughly cleaned after use and between use when handling raw foods to use for cooked foods (crossover use).
  - \_\_\_\_\_ Pre-flushed, scraped, soaked.
  - \_\_\_\_\_ Washed, rinsed, sanitized at proper temperatures.
- \_\_\_\_\_ 3. Sanitizing of all food contact surfaces after cleaning by:
  - \_\_\_\_\_ Either immersion for at least 30 seconds in water heated to 77°C (170°F) or,
  - \_\_\_\_\_ In dishwasher machine with a 10 - 15 second spray of water heated to 82°C (180°F), or
  - \_\_\_\_\_ By immersion in a chemical treated final rinse (several chemical sanitizers available).
- \_\_\_\_\_ 4. Single-use utensils properly stored, not reused.
- \_\_\_\_\_ 5. Accurate thermometers in use / visible.
- \_\_\_\_\_ 6. Food cutting (butchery) surfaces in good condition? / cleaned.

**OTHER**

- \_\_\_\_\_ 1. Water sources safe.
- \_\_\_\_\_ 2. Hot and cold water available.
- \_\_\_\_\_ 3. Sewage and wastewater properly disposed.
- \_\_\_\_\_ 4. Garbage / refuse containers / receptacles:
  - \_\_\_\_\_ Kept covered between use
  - \_\_\_\_\_ Insect / rodent proof
  - \_\_\_\_\_ Cleaned frequently
- \_\_\_\_\_ 5. Toxic items properly stored, labeled, used.
- \_\_\_\_\_ 6. Premises maintained free of litter and other unnecessary articles.
- \_\_\_\_\_ 7. Complete separation from living / sleeping quarters.