

DIA SEAL DIA SEAL

UNCLASSIFIED

(U) Environmental Health Risk Assessment: Iraq

April 2003

DI-1816-IRQ-03

Information Cutoff Date: 31 March 2003

Key Judgments

Environmental contamination may present short- and long-term health risks to personnel deployed to Iraq.

The greatest short-term health risks are associated with ingestion of food contaminated with fecal pathogens or water contaminated with raw sewage or runoff containing fecal pathogens. The physical environment in Iraq poses additional short-term health risks from extreme heat, high altitude, and airborne dust and sand.

The greatest long-term health risks are associated with air contamination in industrial and urban areas and from chemical contamination of food or water.

Physical Environment

Topography

Iraq has a land area of 434,854 sq km (167,925 sq mi), slightly larger than California. It consists of broad desert plains, hills, and mountains. The two major rivers, the Euphrates and Tigris, flow southeast across the country into the Shatt al Arab (elevation 8 feet above sea level), which discharges into the Persian Gulf. Most of Iraq's population is concentrated along these rivers.

Iraq can be divided into five geographic regions:

- (1) The Zagros Mountains region is broad, rough and stony, extending along the borders of Iran and Turkey. Numerous peaks exceed 3,281 meters (10,000 feet).
- (2) The Foothills region is hilly and intersected by deep valleys containing mountain streams. Elevation varies from 215 to 1,143 meters (656 to 3,484 feet) above sea level.
- (3) The Al-Jazira Region (Arabic Island) is a plain with some hills and low mountain ranges; elevation is about 160 to 1,570 meters (490 to 4,790 feet) above sea level.
- (4) The Northern and Southern Deserts are bare plains with maximum elevation of about 910 meters (2,780 feet) in the west. A sand dune belt separates the eastern border from the Euphrates River.
- (5) The Lower Mesopotamian Plain region is composed of thick layers of sediment from the Tigris and Euphrates Rivers, and wind blown deposits. Elevation extends to approximately 30 meters (90 feet) above

sea level.

Climate

The extremely hot, dry, nearly cloudless summer months (May through October) produce temperatures that can reach a daily high of 50 C (122 F) and an extreme evening low of 3 C (37 F). Lower temperatures occur in the northeastern highlands.

In winter months (November through April), temperatures can reach a daily high of 43 C (109 F) and an extreme evening low of 4 C (25 F). Lower temperatures occur in the northeastern highlands.

December through February is the wettest period of the year. Precipitation is highest in northeastern Iraq, which receives an average of 381 to 483 mm (15 to 19 in) of rain annually and snow up to 3 months a year. The highest relative humidity occurs during the wet season except in Al Basrah, which has high humidity and low rainfall year-round because of its proximity to the Persian Gulf.

Dust and sandstorms occur year-round, and are most severe between May and October.

BAGHDAD

(33-14-XXN 044-14-XXE; Elevation: 34 meters/112 ft)

Temperature: Mean Daily Maximum/Minimum

MONTH	J	F	M	A	M	J	J	A	S	O	N	D
	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Maximum	14	18	23	28	36	41	43	42	39	33	23	17
Minimum	3	6	10	15	20	23	26	24	21	16	8	6
	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F
Maximum	57	64	73	82	97	106	109	108	102	91	73	63
Minimum	37	43	50	59	68	73	79	75	70	61	46	43

Precipitation: Mean Total

MONTH	J	F	M	A	M	J	J	A	S	O	N	D
Mean, mm	23	23	23	15	10	0	0	0	0	3	20	25
Mean, in	0.9	0.9	0.9	0.6	0.4	0.0	0.0	0.0	0.0	0.1	0.8	1.0

Environmental Contamination

Background

High population growth, internal and external conflict, and United Nations' sanctions have contributed to the degradation of infrastructure and sanitary conditions in Iraq. Although billions of dollars have been designated

for rebuilding, critical deficiencies still exist in water supply and waste management. The rapidly growing population and increased emphasis on industrial diversification and agricultural self-sufficiency also have contributed to a freshwater shortage and increased salinity of existing ground water sources.

Sources of industrial contamination include petrochemical plants, petroleum refining, iron and steel manufacturing, cement plants, power generation, textiles production, and food processing plants. The greatest concentrations of industries are in and around the cities of Al Basrah, Baghdad, Kirkuk, and Mosul. The following maps depict the locations of some major industries and oil facilities.

UNCLASSIFIED



Source: CIA's Atlas of the Middle East

UNCLASSIFIED



Major Industries

Source: MCIA

UNCLASSIFIED



Selected oil facilities of Iraq

Source: CIA Global Oil Factbook

Air Contamination

The primary sources of air contamination are petroleum refineries, petrochemical and fertilizer plants, cement production facilities, power plants, and vehicle exhaust. Typical contaminants of concern associated with vehicle exhaust and these industries include lead, particulate matter, oxides of nitrogen, and sulfur dioxide.

Short-term exposure to nitrogen oxides, particulate matter, and sulfur dioxide above established standards presents a risk of transient acute respiratory symptoms such as coughing, wheezing, and reduced lung function, especially in asthmatic individuals.

Short-term exposure to high levels of lead may cause acute health effects including peripheral nerve damage, kidney damage, anemia, male sterility, and hypertension. Long-term exposure to lower levels of lead may cause delayed health effects including central nervous system damage, particularly in children.

Food Contamination

Contamination of food with fecal pathogens may result from use of fertilizers derived from human or animal waste, unsanitary food preparation techniques, and improper handling of prepared food products. Even one-time exposure to fecal contamination of food may cause a variety of acute enteric infections. See the Infectious Disease Risk Assessment for further details.

Chemical contamination of food may result from pesticide and fertilizer misuse in agricultural production, deposition of particulates from industrial activities or traffic exhaust, uptake of persistent chemicals in soil, and improper processing or storage.

Grains may be contaminated with seeds containing pyrrolizidine alkaloids, a natural toxin. For example, in 1994 in Mosul, northern Iraq, consuming wheat products contaminated with toxic pyrrolizidine alkaloids from *Senecio vulgaris* seeds caused varying levels of liver disease resulting in hospitalizations and deaths.

Short-term exposure to very high levels of pyrrolizidine alkaloids may cause acute gastroenteritis or veno-occlusive disease. Chronic exposure to lower levels may also cause liver disease.

Fish, fruits and vegetables may be contaminated with organochlorine and organophosphate pesticides. In most cases, low-level chemical contamination of food is a concern only for long-term exposures.

Short-term exposure to very high levels of organochlorine insecticides may cause acute health effects including central nervous system excitation and seizures, respiratory depression, and gastrointestinal upset, and may be fatal in extreme cases. Long-term exposure to very low levels of organochlorine insecticides presents a minimal risk to human health.

Organophosphorus insecticides have very high acute toxicity. Organophosphorus insecticides primarily affect the nervous system, and short-term exposure to very high levels may cause nausea, abdominal pain, difficulty breathing, coma, and death. Long-term exposure to very low levels of organophosphorus insecticides presents a minimal risk to human health.

Soil Contamination

Specific information on soil contamination is unavailable for Iraq. In general, soil contamination is localized to specific areas surrounding industrial facilities and waste disposal sites. Even in such areas, significant exposure to contaminants in soil is unlikely in the absence of wind-blown dust, active digging, or migration of contaminants from soil into ground water. As a result, soil contamination usually presents a low risk to human health.

Water Contamination

Inadequately treated domestic and industrial liquid and solid waste, deteriorated water treatment and distribution systems, excessive use of fertilizers and pesticides, and improper disposal of waste oils contribute to water contamination in Iraq. Sewage and industrial effluents are commonly discharged untreated into rivers, streams, and the Persian Gulf.

Consumption of water contaminated with raw sewage or runoff containing fecal pathogens may cause a variety of acute enteric infections. See the Infectious Disease Risk Assessment for further details.

Hazardous Animals And Plants

(b)(3):50 USC 3024(i)

Appendix

Scope

(b)(3):10
USC 424

The Environmental Health Risk Assessment (EHRA), which assesses environmental factors capable of adversely affecting the health of operational forces, assists in medical planning and decision-making for contingency operations. Additional country-specific AFMIC products are available on the world wide web at [REDACTED], on SIPRNET at [REDACTED], and on Intelink at [REDACTED]. Requests for additional information should be directed to [REDACTED].

(b)(3):10 USC 424

(b)(3):10
USC 424

Making medical intelligence assessments on the likelihood and severity of adverse health effects from exposure to environmental contaminants is challenging because of the difficulty in obtaining accurate data, and the lack of a standardized assessment methodology. In an attempt to better support DoD's deployment exposure monitoring, health outcome surveillance, and operational risk management programs, the EHRA focuses on select air pollutants and air quality indicators, and levels and trends of contaminants in food, soil, and water.

The Physical Environment section of the EHRA is provided as a general overview for basic planning purposes. Contact your local intelligence officer for more detailed information specific to your area of operation. Within the environmental media sections of the EHRA, information on specific contaminants is presented in order of human health significance, from most to least significant; if no order of significance has been assessed, the information is alphabetized.

Definitions

Extreme cold is defined as an average low temperature of at least -17°C (0°F) for at least three consecutive months.

Extreme heat is defined as an average daily high temperature of at least 32°C (88°F) for at least three consecutive months.

High altitude is defined as any elevation of land at or above 2,400 meters (8,000 feet) above sea level.

Long-term refers to time periods longer than 14 days duration.

Short-term refers to time periods less than or equal to 14 days duration.

PM-10 refers to particulate matter with an aerodynamic diameter of 10 micrometers or less. Particulate matter in this size range may enter and remain within the respiratory system. Particles with a larger aerodynamic diameter are generally not able to enter the respiratory system.

Maximum Contaminant Level (MCL). The highest level of a contaminant that is allowed (by the United States Environmental Protection Agency) in drinking water.

UNCLASSIFIED

Limited Value 1 2 3 4 5 High Value

Name: _____

Email: _____

Organization:

Phone:

Comments:



UNCLASSIFIED

(U) Environmental Health Risk Assessment: Iraq

April 2003

(b)(2)

Information Cutoff Date: 31 March 2003

Key Judgments

Environmental contamination may present short- and long-term health risks to personnel deployed to Iraq.

The greatest short-term health risks are associated with ingestion of food contaminated with fecal pathogens or water contaminated with raw sewage or runoff containing fecal pathogens. The physical environment in Iraq poses additional short-term health risks from extreme heat, high altitude, and airborne dust and sand.

The greatest long-term health risks are associated with air contamination in industrial and urban areas and from chemical contamination of food or water.

Physical Environment



Topography

Iraq has a land area of 434,854 sq km (167,925 sq mi), slightly larger than California. It consists of broad desert plains, hills, and mountains. The two major rivers, the Euphrates and Tigris, flow southeast across the country into the Shatt al Arab (elevation 8 feet above sea level), which discharges into the Persian Gulf. Most of Iraq's population is concentrated along these rivers.

Iraq can be divided into five geographic regions:

- (1) The Zagros Mountains region is broad, rough and stony, extending along the borders of Iran and Turkey. Numerous peaks exceed 3,281 meters (10,000 feet).
- (2) The Foothills region is hilly and intersected by deep valleys containing mountain streams. Elevation varies from 215 to 1,143 meters (656 to 3,484 feet) above sea level.
- (3) The Al-Jazira Region (Arabic Island) is a plain with some hills and low mountain ranges; elevation is about 160 to 1,570 meters (490 to 4,790 feet) above sea level.
- (4) The Northern and Southern Deserts are bare plains with maximum elevation of about 910 meters (2,780 feet) in the west. A sand dune belt separates the eastern border from the Euphrates River.
- (5) The Lower Mesopotamian Plain region is composed of thick layers of sediment from the Tigris and Euphrates Rivers, and wind blown deposits. Elevation extends to approximately 30 meters (90 feet) above sea level.

Climate

The extremely hot, dry, nearly cloudless summer months (May through October) produce temperatures that can reach a daily high of 50 C (122 F) and an extreme evening low of 3 C (37 F). Lower temperatures occur in the northeastern highlands.

In winter months (November through April), temperatures can reach a daily high of 43 C (109 F) and an extreme evening low of 4 C (25 F). Lower temperatures occur in the northeastern highlands.

December through February is the wettest period of the year. Precipitation is highest in northeastern Iraq, which receives an average of 381 to 483 mm (15 to 19 in) of rain annually and snow up to 3 months a year. The highest relative humidity occurs during the wet season except in Al Basrah, which has high humidity and low rainfall year-round because of its proximity to the Persian Gulf.

Dust and sandstorms occur year-round, and are most severe between May and October.

BAGHDAD

(33-14-XXN 044-14-XXE; Elevation: 34 meters/112 ft)

Temperature: Mean Daily Maximum/Minimum

MONTH	J	F	M	A	M	J	J	A	S	O	N	D
	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Maximum	14	18	23	28	36	41	43	42	39	33	23	17
Minimum	3	6	10	15	20	23	26	24	21	16	8	6
	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F
Maximum	57	64	73	82	97	106	109	108	102	91	73	63
Minimum	37	43	50	59	68	73	79	75	70	61	46	43

Precipitation: Mean Total

MONTH	J	F	M	A	M	J	J	A	S	O	N	D
Mean, mm	23	23	23	15	10	0	0	0	0	3	20	25
Mean, in	0.9	0.9	0.9	0.6	0.4	0.0	0.0	0.0	0.0	0.1	0.8	1.0

Environmental Contamination

Background

High population growth, internal and external conflict, and United Nations' sanctions have contributed to the degradation of infrastructure and sanitary conditions in Iraq. Although billions of dollars have been designated for rebuilding, critical deficiencies still exist in water supply and waste management. The rapidly growing population and increased emphasis on industrial diversification and agricultural self-sufficiency also have contributed to a freshwater shortage and increased salinity of existing ground water sources.

Sources of industrial contamination include petrochemical plants, petroleum refining, iron and steel manufacturing, cement plants, power generation, textiles production, and food processing plants. The greatest concentrations of industries are in and around the cities of Al Basrah, Baghdad, Kirkuk, and Mosul. The following maps depict the locations of some major industries and oil facilities.

UNCLASSIFIED



Source: CIA's Atlas of the Middle East

UNCLASSIFIED



Major Industries

Source: MCI

UNCLASSIFIED



Selected oil facilities of Iraq

Source: CIA Global Oil Factbook

Air Contamination

The primary sources of air contamination are petroleum refineries, petrochemical and fertilizer plants, cement production facilities, power plants, and vehicle exhaust. Typical contaminants of concern associated with vehicle exhaust and these industries include lead, particulate matter, oxides of nitrogen, and sulfur dioxide.

Short-term exposure to nitrogen oxides, particulate matter, and sulfur dioxide above established standards presents a risk of transient acute respiratory symptoms such as coughing, wheezing, and reduced lung function, especially in asthmatic individuals.

Short-term exposure to high levels of lead may cause acute health effects including peripheral nerve damage, kidney damage, anemia, male sterility, and hypertension. Long-term exposure to lower levels of lead may cause delayed health effects including central nervous system damage, particularly in children.

Food Contamination

Contamination of food with fecal pathogens may result from use of fertilizers derived from human or animal waste, unsanitary food preparation techniques, and improper handling of prepared food products. Even one-time exposure to fecal contamination of food may cause a variety of acute enteric infections. See the Infectious Disease Risk Assessment for further details.

Chemical contamination of food may result from pesticide and fertilizer misuse in agricultural production, deposition of particulates from industrial activities or traffic exhaust, uptake of persistent chemicals in soil, and improper processing or storage.

Grains may be contaminated with seeds containing pyrrolizidine alkaloids, a natural toxin. For example, in 1994 in Mosul, northern Iraq, consuming wheat products contaminated with toxic pyrrolizidine alkaloids from *Senecio vulgaris* seeds caused varying levels of liver disease resulting in hospitalizations and deaths.

Short-term exposure to very high levels of pyrrolizidine alkaloids may cause acute gastroenteritis or veno-occlusive disease. Chronic exposure to lower levels may also cause liver disease.

Fish, fruits and vegetables may be contaminated with organochlorine and organophosphate pesticides. In most cases,

low-level chemical contamination of food is a concern only for long-term exposures.

Short-term exposure to very high levels of organochlorine insecticides may cause acute health effects including central nervous system excitation and seizures, respiratory depression, and gastrointestinal upset, and may be fatal in extreme cases. Long-term exposure to very low levels of organochlorine insecticides presents a minimal risk to human health.

Organophosphorus insecticides have very high acute toxicity. Organophosphorus insecticides primarily affect the nervous system, and short-term exposure to very high levels may cause nausea, abdominal pain, difficulty breathing, coma, and death. Long-term exposure to very low levels of organophosphorus insecticides presents a minimal risk to human health.

Soil Contamination

Specific information on soil contamination is unavailable for Iraq. In general, soil contamination is localized to specific areas surrounding industrial facilities and waste disposal sites. Even in such areas, significant exposure to contaminants in soil is unlikely in the absence of wind-blown dust, active digging, or migration of contaminants from soil into ground water. As a result, soil contamination usually presents a low risk to human health.

Water Contamination

Inadequately treated domestic and industrial liquid and solid waste, deteriorated water treatment and distribution systems, excessive use of fertilizers and pesticides, and improper disposal of waste oils contribute to water contamination in Iraq. Sewage and industrial effluents are commonly discharged untreated into rivers, streams, and the Persian Gulf.

Consumption of water contaminated with raw sewage or runoff containing fecal pathogens may cause a variety of acute enteric infections. See the Infectious Disease Risk Assessment for further details.

Hazardous Animals And Plants

Information on Hazardous Animals and Plants is now contained in the Living Hazards Database maintained by the Defense Pest Management Information Analysis Center (DPMIAC). The database is available on the 2001 MEDIC CD-ROM, or contact DPMIAC at Commercial: (301) 295-7476; DSN: 295-; Fax: -7482.

Appendix

Scope

The Environmental Health Risk Assessment (EHRA), which assesses environmental factors capable of adversely affecting the health of operational forces, assists in medical planning and decision-making for contingency operations. Additional country-specific AFMIC products are available on the world wide web at (b)(2) on SIPRNET at (b)(2) and on Intelink at (b)(2). Requests for additional information should be directed to (b)(2).

Making medical intelligence assessments on the likelihood and severity of adverse health effects from exposure to environmental contaminants is challenging because of the difficulty in obtaining accurate data, and the lack of a standardized assessment methodology. In an attempt to better support DoD's deployment exposure monitoring, health outcome surveillance, and operational risk management programs, the EHRA focuses on select air pollutants and air quality indicators, and levels and trends of contaminants in food, soil, and water.

The Physical Environment section of the EHRA is provided as a general overview for basic planning purposes. Contact your local intelligence officer for more detailed information specific to your area of operation. Within the environmental media sections of the EHRA, information on specific contaminants is presented in order of human health significance, from most to least significant; if no order of significance has been assessed, the information is alphabetized.

Definitions

Extreme cold is defined as an average low temperature of at least -17°C (0°F) for at least three consecutive months.

Extreme heat is defined as an average daily high temperature of at least 32°C (88°F) for at least three consecutive months.

High altitude is defined as any elevation of land at or above 2,400 meters (8,000 feet) above sea level.

Long-term refers to time periods longer than 14 days duration.

Short-term refers to time periods less than or equal to 14 days duration.

PM-10 refers to particulate matter with an aerodynamic diameter of 10 micrometers or less. Particulate matter in this size range may enter and remain within the respiratory system. Particles with a larger aerodynamic diameter are generally not able to enter the respiratory system.

Maximum Contaminant Level (MCL). The highest level of a contaminant that is allowed (by the United States Environmental Protection Agency) in drinking water.

UNCLASSIFIED



Limited Value ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 High Value

Name:

Email:

Organization:

Phone:

Comments: