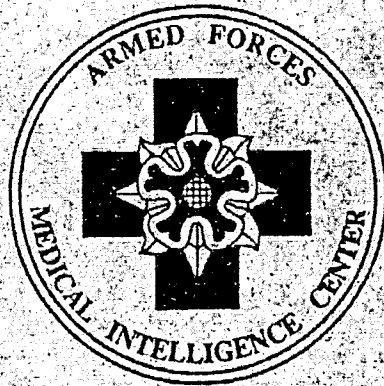


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HEALTH THREATS AND
ASSESSMENTS --
DESERT STORM (U)

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JANUARY 1991
AFMIC-1810R-041-91

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HEALTH THREATS AND ASSESSMENTS
DESERT STORM (U)

AFMIC-1810R-041-91

Information Cutoff Date
15 January 1991

Date of Publication
23 January 1991

This document has processed for CIRC

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PREFACE

~~(CONF)~~ This report presents a medical intelligence package which will serve as a basis for planning US military and civil medical requirements for contingency planning and special operations in the DESERT STORM Area of Operations. It presents elements of information which identify health hazards, including potential chemical threats and environmental and disease threats. Foreign medical capabilities within the area of operations are included. This report has been reviewed by the AFMIC surgeon.

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(U) Each classified paragraph, caption, and title in this report has been properly marked; those unmarked are unclassified.

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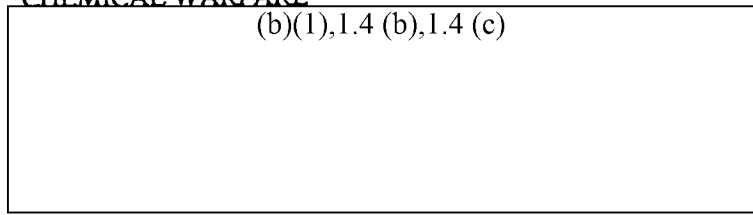
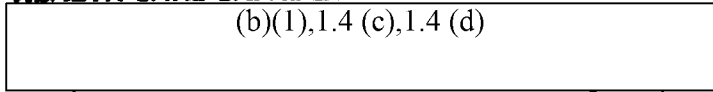
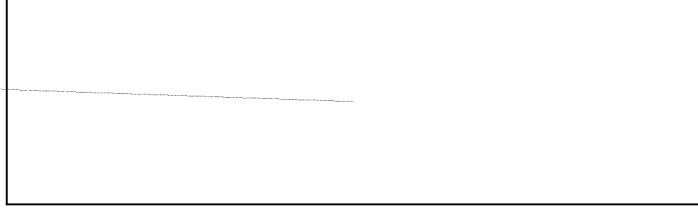
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**SECTION I
DISEASE INFORMATION**

MEDICAL EFFECTS OF WINTER (U)

(U) The following is intended to provide additional information on infectious diseases and general environmental factors during winter months in the DESERT STORM area of operations which may impact operational units and humanitarian medical missions.

General -- (U) Military conflict will weaken existing medical infrastructure, reduce preventive medicine programs, interfere with waste disposal, and compromise personal hygiene. These factors will lead to increased incidence of endemic diseases, and refugee populations will be at elevated risk for these diseases. Additionally, the immigration of nonindigenous persons into some regions may introduce nonendemic diseases and will change the baseline health status of the resident population. (See AFMIC Special Weekly Wires 31-90A, 32-90D, 34-90A, and AFMIC publication AFMIC-1810R-037-90.)

Food- and Waterborne Diseases -- (U) The risk of acute diarrheal diseases from bacterial etiologies generally is greatest from July through September, but these agents will continue to be the primary infectious disease threat to operational forces. Incidence from viral etiologies (primarily rotavirus in children) is elevated from December through March. Risk from hepatitis A is elevated from October through December, and due to the long incubation period (15 to 60 days) and length of deployment, clinical cases may begin to occur in increased frequency in military personnel not protected by immune serum globulin (ISG). Hepatitis A causes approximately 50 percent of the clinical cases (mostly children) of acute viral hepatitis in the indigenous population.

Vectorborne Diseases -- (U) In endemic areas (southwest Saudi Arabia, Yemen, and Oman), malaria transmission peaks from November through April (Figure 1). Mosquito populations will be influenced by the amount of rainfall, and vector surveillance will be important for assessing risk in specific areas. Competent malaria vectors are present in areas where malaria transmission has been interrupted (eastern Saudi Arabia, Kuwait, and southern Iraq); with the influx of malaria carriers and reduced vector control measures, resurgence may occur. *Plasmodium vivax*, followed by *P. falciparum*, would be the most likely forms of malaria to be introduced into southern Iraq and Kuwait. Risk from arboviral fevers (sandfly, Crimean-Congo hemorrhagic, West Nile, dengue, and sindbis) is reduced during colder months. Risk from cutaneous and visceral leishmaniasis is low during this period (transmission peaks from April to September); however, due to the long incubation period (1 week to many months) and length of deployment, clinical cases may begin to occur in increased frequency in military personnel (Figure 2). Risk from sandfly fever (and other arboviral fevers) and leishmaniasis will be significantly greater during the spring and summer of 1991. Intestinal and urinary schistosomiasis risk is lower during winter months (transmission occurs year-round with peaks from June through September); however, due to the long incubation period (2 to 6 weeks) and length of deployment, clinical cases may begin to occur in increased frequency in military personnel (Figure 3).

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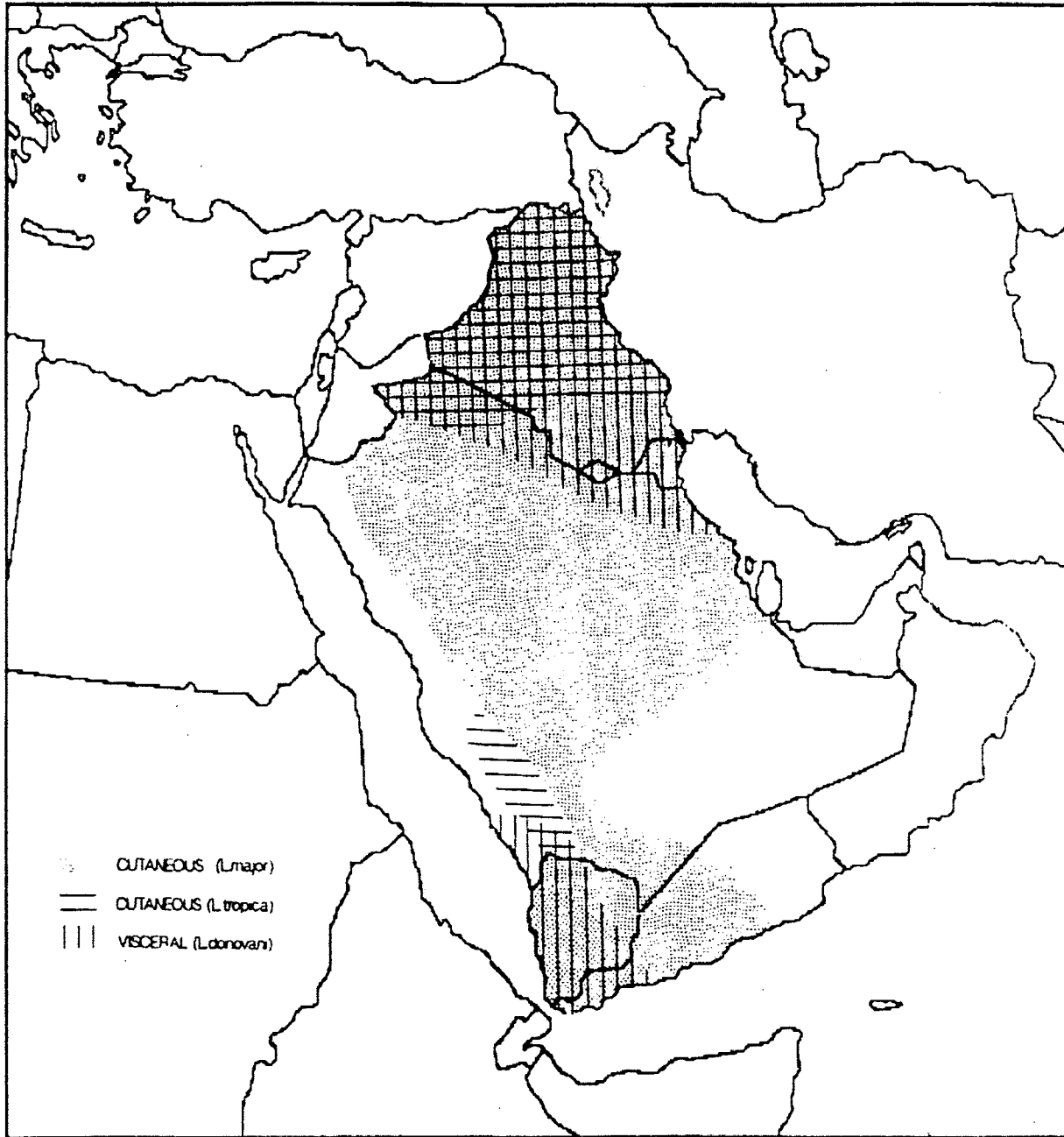


Figure 2. (U) Distribution of Leishmaniasis in Iraq and the Arabian Peninsula

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Other Operationally Important Diseases -- (U) Risk from influenza is highest from December through February; during the late 1980s, isolates of influenza A(H3N2) predominated over those for A(H1N1) and B. Meningococcal meningitis risk is elevated from November through February and is greatest for personnel having close contact with local nationals, particularly children; Group A predominates, although all groups are reported (reporting of Group W-135 isolates increased during the late 1980s).

Other Diseases Endemic in the Local Population -- (U) Epidemic louse-borne typhus is more prevalent in colder months and commonly is associated with overcrowding, transient populations, impoverished people, and poor sanitary conditions. Stray dog and cat populations usually decline in winter months, decreasing (not eliminating) the risk of animal bites and rabies exposure. Measles is the most significant childhood disease in the region, with a marked seasonal peak in incidence in late winter and early spring (January through April); diphtheria is reported in low numbers, with increases in colder months (November through March).

Cold Weather -- (U) Subfreezing temperatures (into the teens) are more common during the nights in central and northern Saudi Arabia and in the northeast mountains of Iraq. Freezing temperatures in the interior of the Arabian Peninsula have been observed as early as November and as late as March.

Precipitation -- (U) Annual precipitation is concentrated during the winter months, and although the total volume is low, it may occur in the form of violent storms. Flash flooding may fill wadis and disrupt roadbeds. Trafficability over sebbkaks (salt flats) may also be more hazardous following rainy periods as result of increased subsurface water. Flooding is most frequent in winter and spring along the Tigris River in Iraq as result of both heavy precipitation and melting snow in the mountains.

Wind Storms -- (U) Migratory low pressure systems affect Iraq and the northern part of the Arabian Peninsula and are more frequent in November and April than the other winter months. One feature of the migratory systems is the production of sand and dust storms by the accompanying winds sweeping over dry, loosely packed surfaces. Other winter winds include the kaus, the blat, and the foehn. The kaus is a potentially gale force southeasterly wind on the Persian Gulf during the months of December through April that is accompanied by humid, cloudy weather and rain squalls. The blat is a strong dusty (or sandy) northwesterly wind on the south coast of the Arabian Peninsula. The warmth produced in the descending air of the foehn winds is partly responsible for the absence of severely cold weather in Iraq.

Poisonous Snakes -- (U) Some normally nocturnal snakes may be more active during winter daylight hours from December to March; the most notable being the saw-scaled viper (*Echis coloratus* - reported in various dark shades of gray, blue, or silver, dappled with lighter spots and a white underside; head is bell shaped). The saw-scaled viper is an extremely aggressive snake and is responsible for more snakebite deaths worldwide than any other snake. When encountered, it assumes a characteristic figure-8 coil, rubbing its serrated side scales together to produce a buzzing or sizzling noise. The snake inhabits dry sandy areas, rocky outcroppings, rodent burrows, and dry scrub forests of Saudi Arabia, especially in the southwest region of the Kingdom and the environs around Riyadh. The

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saw-scaled viper may also climb into bushes to escape flooding from rains. The viper has not been reported from the northeastern area. A related family member inhabiting the Arabian Peninsula, the carpet viper (reddish brown with white bars on its back with a yellowish colored belly and egg-shaped, speckled head with a trident pointing to the rear) poses a similar threat, but its presence in the area of operations has not been confirmed.

OTHER ENDEMIC DISEASES

(U) This article discusses other diseases endemic in the local population that will be important to medical forces in the Middle East because of the likelihood of humanitarian medical assistance for refugees or displaced persons. Diseases are prioritized in descending order of expected impact on humanitarian medical missions. Additionally, because of the length of time in the Area of Operation (AO), these diseases will be increasingly important to operational units. Common or local names for the diseases are in parenthesis. The available statistics on the prevalence and incidence of many of these diseases are incomplete, making reported rates and numbers of cases generally unreliable indicators of true prevalence or endemicity. Transmission factors that are unique or important in this region are discussed. Complete discussions on incubation periods, routes of transmission, and clinical signs and symptoms are available in standard texts and are beyond the purpose of this article.

ACUTE CHILDHOOD DIARRHEA (Eshal)

Disease Agents: In children younger than 5 years suffering from acute diarrhea, the most common enteropathogens isolated, in descending frequency, generally are rotavirus (37-44 percent), *Salmonella*, enteropathogenic *Escherichia coli*, *Shigella*, and *Campylobacter jejuni*. The most common parasite isolated is *Giardia lamblia* (4-7 percent of the cases). Multiple infections are seen in about 1 percent of the children. Cholera is not endemic in the region; imported cases (and outbreaks) occur, but cholera should not be a significant cause of childhood diarrhea in refugee populations.

Distribution/Risk Period: Widespread. Year-round. Seasonal increases in rotaviral diarrheas primarily in cold months (December-March), but also in the hot dry season (July-September). Seasonal increases in bacterial etiologies occur from June to October; protozoal cases peak in August and September.

Remarks: Rotavirus is a leading cause of gastroenteritis in young children (aged less than 5 years) in Kuwait and Saudi Arabia; the incidence is lower in breast-fed than in bottle-fed infants. Rotavirus diarrhea is a major pediatric health problem, with up to 30 percent of the children having concurrent upper respiratory infection. Among the bacterial etiologies, multiple drug resistance is common among *Salmonella* and *Shigella* isolates.

INTESTINAL PARASITES

Intestinal parasitic infections (IPI) are not notifiable diseases; the true prevalence and incidence of these diseases are unknown.

Agents: Most common IPI are amebiasis, giardiasis, ascariasis, trichuriasis, enterobiasis, and hymenolepiasis. Human dicrocoeliasis (*Dicrocoelium dendriticum*) has been reported from Saudi Arabia and is commonly associated with drinking raw milk or eating raw liver (camel, cattle, goat, or sheep). Taeniasis (*Taenia saginata*) and fascioliasis are reported

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from discrete foci. Low levels of *Trichostrongylus columbriformis* and *Strongyloides stercoralis* have been detected in northern Iraq.

Distribution/Risk Period: Widely distributed, but vary geographically and depend on many socioeconomic factors; more common among lower socioeconomic levels than middle and upper levels. In developed regions, roundworms and whipworms are present at low levels. Hookworm (*Ancylostoma duodenale*) infections generally occur in primitive rural communities where promiscuous defecation exists. Enteric protozoal agents (*Giardia lamblia* and *Entamoeba histolytica*) are commonly isolated from all regions. Transmission of most agents occurs year-round, with seasonal increases in the dry season. Human cases of dicrocoeliasis peak in October and November.

Remarks: Highest IPI rates can be anticipated in expatriate workers from less-developed countries and from indigenous people from rural areas. A high rate (63 percent) of intestinal parasite infection was found in a hospital-based study in Kuwait. A similar study in Riyadh revealed that 323 of 3,800 patients examined were infected with potential pathogens -- *Giardia*, *Hymenolepis nana*, *E. histolytica*, and *Ascaris* being the most frequent (in descending order). Similar levels were detected in community-based studies in northern Iraq, where IPI rates reached 18.3 percent; prevalence for roundworms (*Ascaris lumbricoides*) in rural areas near Bagdad and Babylon is estimated to be slightly more than 5 percent. In Saudi Arabia, IPI rates may be highest in rural communities in the Asir province; IPI in children from urban areas are most commonly due to *G. lamblia* (13.5 percent), followed by *Enterobius vermicularis* (4.2 percent) and *H. nana*; the general incidence of other helminthic parasites is low. In a 2-year study of stool samples of 42,022 food handlers from Abu Dhabi, United Arab Emirates, hookworms were found in 13.8 percent of the samples, whipworm 6.9 percent, and roundworms 2.6 percent. Interruption of potable water supplies and sewage disposal and deteriorated sanitary conditions in developed regions will increase the incidence of most of these parasites.

TRACHOMA (Ramad)

Transmission: Primarily transmitted by direct contact with ocular and nasopharyngeal discharges on fingers and contaminated materials (face cloths and cosmetic khol sticks used to darken eyelids). Filth flies (primarily *Musca sorbens*, the market or bazaar fly, but also *M. domestica*) contribute to the spread of the disease.

Distribution/Risk Period: Widely distributed and highly endemic, particularly in rural areas with poor hygiene. Year-round.

Remarks: In endemic areas, the highest infection rates are in children. Prevalence of active cases in Oman is an estimated 5 to 15 percent and is 10 percent in Yemen.

Approximately 22 percent of the Saudi population suffer from trachoma and about 6.2 percent have active trachoma; the disease is hyperendemic in the Eastern Province of Saudi Arabia. Control measures reduced incidence in the 1980s, but trachoma is still the most widespread eye disease in this region and the leading cause of preventable blindness.

CHILDHOOD DISEASES (Diphtheria, Measles, Pertussis, Poliomyelitis, and Tetanus)

Distribution: Endemic, but marked regional variations in reported incidence exist. Based on the number of reported cases (data available through 1988-89), more developed countries (Saudi Arabia, Kuwait, Bahrain, Oman, and UAE) have a lower incidence. Generally, Yemen and Iraq have the highest rates.

Vaccination Programs: Expanded programs of immunization (EPI) have improved vaccination coverage and reduced the incidence of targeted diseases in the region since the

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early-1980s. In 1988-89, Saudi Arabia, Kuwait, Oman, UAE, and Bahrain reported that approximately 85 to 90 percent (weighted average) of infants had received a complete vaccination series (OPV, DPT, measles, and BCG). Percent coverage was lower in Iraq and Qatar. Yemen had the poorest coverage, 35 to 45 percent.

Remarks: Refugee populations that have relied on EPI to control childhood diseases will be at increased risk for outbreaks or epidemics when vaccination programs are interrupted.

BRUCELLOSIS (Al-Brosliyat)

Transmission/Reservoir: Over 80 percent of reported human cases are due to consumption of raw dairy products (goat and camel milk and cheeses). Contact with infected material plays a minor role. In human cases not associated with direct animal or product exposure, most appear to have contracted the disease while travelling through areas contaminated with animal fetal tissues. The disease is endemic in natural reservoirs (goats, sheep, camels, and cattle) which principally are infected with *Brucella melitensis*. The prevalence of infection of sheep and goats commonly exceeds 10 percent. *B. abortus* has been isolated from camels, but the clinical significance is unclear.

Distribution/Risk Period: Widespread, but regional variations exist. Human cases caused by *B. melitensis* are widely distributed, in both rural and urban areas. Seasonally distributed, with most cases occurring March to July, peaking in April and May. Peak incidence of cases associated with environmental exposure coincides with the lambing and kidding seasons.

Remarks: One of the most common human infectious diseases in the region; many areas have experienced true increases in incidence, with some outbreaks reaching epidemic proportions. Particularly common among farmers, shepherds, nomadic tribesmen, and their families (10 to 25 percent sero-prevalence has been detected in agricultural workers). Annual incidence increased greatly in Kuwait in the early 1980s, with the incidence reported in 1985 thirty times higher than in 1976. Other neighboring countries have experienced similar increases. In Oman, about 300 human cases are reported annually, with the majority in the Dhofar region, where it occurs in epidemic proportions among the Jebali people. The rise may be partially due to increased clinical awareness and improved diagnostic capabilities, but highly mobile animal herds and uncontrolled importation of live animals have interfered with control efforts. For each case reported an estimated 25 cases are unrecognized or unreported.

TUBERCULOSIS (Al-Sol)

Transmission/Reservoir: Most tuberculosis (TB) is caused by human-to-human transmission of *Mycobacterium tuberculosis*. Zoonotic tuberculosis is of lesser significance.

Distribution/Risk Period: TB is widely distributed throughout the region, however, countries have varying levels of prevalence.

Remarks: TB is an important disease in the indigenous population. Most of the reported human cases are pulmonary rather than disseminated or extrapulmonary. Tuberculous cervical lymphadenitis represents a significant portion of the extrapulmonary TB in Saudi Arabia (biopsied neck masses are frequently diagnosed as tuberculosis). Based on the estimated level of risk of infection (the proportion of the population which has been infected or reinfected in the course of 1 year), countries in the region can be grouped into three categories of prevalence. Countries with low-prevalence (risk of infection 0.1 to 0.2 percent) are Bahrain and Kuwait. In Bahrain, infection rates in expatriate workers from

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less-developed countries were found to be seven times higher than in Bahrainis. High-prevalence (2.0 to 3.0 percent) is reported from Yemen. All other countries in the region have intermediate level prevalence (0.5 to 1.5 percent). All countries in the region, except Iraq, are known to have incorporated childhood BCG vaccination of children into their Expanded Program of Immunization (EPI). A 21.3 percent prevalence of resistance to primary antituberculous drugs was reported from Riyadh, Saudi Arabia. Primary resistance to INH was 19.4 percent; primary and secondary resistance to rifampicin was 3 percent and 33.7 percent, respectively. Most isolates from patients with acquired resistance to rifampicin also were resistant to INH.

ECHINOCOCCOSIS (Hydatid Disease)

Transmission/Reservoir: Carnivores harboring the adult tapeworms (*Echinococcus granulosus*) become infected by eating viscera of intermediate hosts containing hydatid cysts; the dog-sheep cycle (particularly associated with dogs used for sheep herding) is important in this region. Cattle, goats, and camels are lesser important intermediate hosts. Infection rates in dogs vary by region and locality, with highest rates (67 to 100 percent) reported in Irbil Province of northern Iraq. In 1976, the prevalence in dogs in Kuwait was found to be 23 percent, but levels may have declined. Stray dogs in urban areas commonly are infected by feeding on uncooked offal discarded from slaughter houses; up to 15 percent of stray dogs near Al-Hassa, Saudi Arabia reportedly were infected.

Distribution/Risk Period: Endemic and enzootic, especially in rural agricultural areas where dogs are used to herd grazing animals, particularly sheep. However, human cases also occur in larger urban areas. Widely distributed and highly endemic/enzootic in Iraq. Reportedly, the highest prevalence in Saudi Arabia exists in the southern and western regions followed by the central region. Moderately endemic in Kuwait. Year-round.

Remarks: Important parasitic infection in this region, particularly among groups having intimate contact with dogs (and objects soiled with feces). Islamic teachings stress avoidance of dogs; however, this does not provide complete protection. The highest incidence of human disease generally is in the 31 to 40 year old age group. Human infection rates in Iraq are estimated to be slightly less than 1 percent, accounting for 1 percent of all surgical procedures; in highly endemic areas of Saudi Arabia, it has accounted for 5 percent of all major surgical operations. In Kuwait, the majority of recently reported cases were in non-Kuwaitis.

RABIES (Al-Kalab)

Transmission/Reservoir: Sylvatic and urban rabies are important. Urban rabies, with stray dogs (cats and other animals to a lower extent) serving as the reservoir and main source of human exposure, is reported from cities and villages of most countries. The principal enzootic reservoir for sylvatic rabies is the desert fox, and spill over into stray dog and cat populations frequently occurs. Sheep rabies is reported with low sporadic occurrence.

Distribution/Risk Period: In Saudi Arabia, human cases are very sporadic, usually in the northern or eastern rural areas. Although Oman had been considered to be provisionally free of rabies, the disease is endemic in this region, with recently reported laboratory-confirmed cases in foxes and sheep and a human case. Rabies is present but of low incidence in Qatar and the UAE. Kuwait and Bahrain are considered rabies-free; the last case of animal rabies in Kuwait was reported in October 1987. Year-round transmission

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occurs, but an increased risk in the spring and summer can be expected due to elevated animal populations and increases in animal bites in warmer seasons.

Remarks: Dog and cat bites/scratches will probably be the primary sources of human exposure and reasons for post-exposure prophylaxis. Animal cases are likely to be unrecognized and underreported by the indigenous population. Additionally, the disruption following military conflict may allow reintroduction into previously free areas.

Q. FEVER

Transmission/Reservoir: Commonly transmitted by airborne dissemination of rickettsia (*Coxiella burnetii*) and secondarily by direct contact with infected animals and from consumption of raw milk. Domestic animals, rodents, and ticks (primarily *Hyalomma dromedarii*) serve as natural reservoirs.

Distribution/Risk Period: Widely distributed throughout the region; serological studies suggest that it is highly endemic in eastern Saudi Arabia, and it may be endemic in other areas at similar levels. Enzootic in livestock. Year-round.

Remarks: Sporadic cases have been reported areawide, but incidence is suspected to be greater than reported due to limited diagnostic capabilities. Serology from indigenous personnel in rural areas indicates that subclinical infection develops in childhood and virtually all young adults have had sensitizing contact (inducing acquired immunity).

PLAGUE (Taa'on)

Transmission/Reservoir: Primarily transmitted by the bite of an infective flea (primarily *Xenopsylla cheopis*, the oriental rat flea, but also *Pulex irritans*, the human flea). Reservoirs for sylvatic plague in the region include gerbils (*Meriones* spp. and *Gerbillus gerbillus*) and desert voles. *Rattus rattus* may serve as a reservoir around dwellings in endemic areas.

Distribution/Risk Period: Occurs areawide. Natural occurring enzootic foci of plague historically have existed between the Tigris and Euphrates Rivers and adjacent territories extending from Syria to the Persian Gulf, possibly including Kuwait. In Iraq, the highlands near the border with Syria historically have been an enzootic focus. Although plague is considered eradicated in Saudi Arabia (last reported outbreak occurred in 1969 along the Yemen border in the Khawlan district), sylvatic (wild rodent) plague should be considered focally enzootic in the Asir upland plains in the southwestern portion of the Arabian Peninsula. Year-round, but especially during hot, dry months.

Remarks: Underreported.

ANTHRAX (Al-Jamra)

Transmission/Reservoir: Enzootic, primarily in sheep and goats. Infections in these animals serve as the primary method of environmental and product contamination with spores. Many of the reported human cases are unable to identify the true source of their infection.

Distribution/Risk Period: Widely distributed, but focally endemic. Occurs sporadically in rural areas during summer months.

Remarks: Cutaneous cases predominate, followed by gastrointestinal and pulmonary forms. Cases and outbreaks are most likely in nomadic populations, farmers, and shepherds and in people handling infected animal products (wool, hides, meats). In Iraq, 200 to 269 human cases were officially reported annually from 1976 to 1980.

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TYPHUS, LOUSE-BORNE (Epidemic Typhus)

Transmission/Reservoir: By rubbing crushed body lice (*Pediculus humanus*) or their feces into the bite site or abrasions; lice defecate rickettsiae (*Rickettsia prowazeki*) while feeding. Man is the reservoir and maintains the infection during inter-epidemic periods.

Distribution/Risk Period: Thought to be present, but prevalence is unknown. Endemic foci are present in Iraq. Northern Saudi Arabia and Kuwait are at the southern limits of the distribution belt in the Middle East. The disease may be present in the southwest regions of the Arabian Peninsula (Asir Province of Saudi Arabia and Yemen). Seasonal, usually more prevalent in colder months.

Remarks: Louse-borne typhus is commonly associated with overcrowding, transient populations, impoverished people, and poor sanitary conditions; refugee populations would be at increased risk. In 1977, 19 cases were reported from Iraq, with most cases from July to September. An outbreak was reported among nomadic tribes in northern Saudi Arabia in 1961 resulting in 49 cases and 2 deaths.

TYPHUS, MURINE (Endemic Typhus)

Transmission/Reservoir: Primary vectors are infective fleas, usually *Xenopsylla cheopis* (oriental rat flea) and potentially *Ctenocephalides felis* (cat flea). The disease is maintained in nature by a rat-flea-rat cycle; large rodent populations contribute to the spread of murine typhus.

Distribution/Risk Period: Thought to be present areawide, but prevalence is unknown. In Saudi Arabia, human cases occur along the Red Sea coast, the northern province, and along the Persian Gulf coast. Year-round, but peaks during the summer months.

Remarks: Sporadic cases are reported. An outbreak occurred in Kuwait in 1978 with 254 clinical cases detected; the highest attack rates were among people in lower socioeconomic levels. Deteriorated sanitary conditions in Kuwait will elevate rodent populations which will contribute to increased incidence of murine typhus.

NONVENEREAL ENDEMIC SYPHILIS (Bejel)

Distribution/Risk Period: Moderately endemic. Widely distributed, particularly in remote rural areas where the standard of hygiene is low and access to health services is limited. Year-round.

Remarks: Primarily confined to nomadic and semi-nomadic tribesmen (Bedouins), where the prevalence may reach 20 percent; the majority of clinical cases are between 15 and 35 years old. The majority of cases acquire the infection in childhood. The seropositivity rate is higher among females. The social consequences of mistaking bejel for venereal syphilis in a conservative Islamic culture must be recognized.

LEPROSY (Al-Jotham)

Distribution/Risk Period: Indigenous transmission occurs at low levels. Distributed throughout the region, with regional variations expected. Generally associated with areas of crowding, poverty, poor sanitation, and substandard living conditions. Year-round.

Remarks: Prevalence remains low. Increased incidence was reported in Kuwait prior to 1985, attributed to the increased immigration of expatriate workers from endemic areas; from 1983 to 1988, over 95 percent of the patients were immigrants. In 1979, cases were reported from throughout Saudi Arabia, but a foci existed in the southwest region. In 1986, the prevalence in Saudis was 4.1 per 100,000, and in non-Saudis was 126.5 (most non-Saudis were from endemic areas). Tuberculoid leprosy was significantly more common in

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Saudi than non-Saudi patients; the prevalence of the other types of leprosy was the same for both groups.

ONCHOCERCIASIS (Sowda)

Transmission/Reservoir: The black fly (*Simulium damnosum* complex) is the primary vector species in the region.

Distribution/Risk Period: Confined to the southwest Arabian Peninsula (Saudi Arabia and Yemen) in focally endemic areas. Cases have been reported in the Asir region of southwest Saudi Arabia (in villages around Khamis Mushayt). In Yemen, it is endemic in all westward flowing permanent streams (wadis) between the northern Wadi Surdud and the southern Wadi Ghayl at elevations of 300 to 1,200 meters; cases have been reported from Hodeida to Taiz (most occurred in Al Barh between Mokha and Taiz). Although not reported, the disease probably occurs throughout the length of Yemen, in Wadis flowing into the Gulf of Aden and the Red Sea. Seasonal, when blackflies are present.

Remarks: Reporting has been limited, making prevalence and incidence estimates unreliable. An estimated 60,000 people are at risk in endemic areas in southwest Yemen. Dermatologic manifestations of onchocerciasis (sowda) predominate in Yemen; ocular manifestations (river blindness) were common in the cases reported from Saudi Arabia.

TOXOPLASMOSIS

Transmission/Reservoir: Human infection is primarily acquired through contact with cat feces or food contaminated with oocysts or through consumption of raw meat containing bradyzoites, principally from sheep and goats. Raw goat and sheep milk containing tachyzoites possibly may be a source of infection. Domestic and wild felines are the only definitive hosts; cat feces is the source of environmental contamination with oocysts. Numerous mammalian intermediate hosts exist; rodents are important sources of infection for felines. The prevalence of infection in sheep and goats is related to the abundance of felines in pasture lands.

Distribution/Risk Period: Widely distributed. Year-round.

Remarks: Seroprevalence is high. Human prevalence in Saudi Arabia is an estimated 33 percent; 58 to 95 percent prevalence was found in Kuwait. Serosurveys indicate that infection may be more prevalent in nomads (Bedouins).

LEPTOSPIROSIS

Transmission/Reservoir: All domestic animals as well as many wild animals, especially rodents, may serve as reservoirs of infection. Many serotypes have been reported from the region, but the predominant serotype(s) in an area is dependent on specific ecologic conditions.

Distribution/Risk Period: Leptospire require a slightly alkaline and strictly fresh water environment, which may restrict their presence in eastern Saudi Arabia or in the salt marshes of southern Iraq (south of Basrah). Conditions in oases are favorable for leptospire survival. The disease can be expected to be focally distributed. Primarily a risk during warm months of the year (June to September).

Remarks: Limited reports suggest a very low endemicity. Cases are sporadically reported from the region; the risk of acquiring the disease and the number of expected cases in indigenous people are low. Leptospirosis generally is occupationally related. Elevated rodent populations may contribute to increased transmission.

