

1991 Gulf War Health Issues

Infectious Disease Risks

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Background - Chronology

- Iraq invades Kuwait August 2, 1990
- U.S. troops deploy August 8, 1990
- Air war begins January 16, 1991
- 4-day ground war begins February 24, 1991
- Redeployment March-June 1991

Background - Personnel

Over 40 Coalition countries deployed troops

- United States 697,000
 - **Varied geographic locations**
 - Ground forces in Arabian Gulf
 - Shipboard personnel
 - Red Sea and Turkey
 - **7% women troops**
 - **17% Reserve/National Guard**
- United Kingdom 53,000
- Canada 4,500
- Australia 1,700

Background – Summary

- *There were about 3/4 million Coalition ground troops and about 1 million civilians in northern Saudi Arabia & Kuwait during war*
- *Most foreign troops had returned home just 9 months after Iraq invaded Kuwait*
- *It has been more than 14 years since the end of hostilities in Gulf War I*

Health Threats During Deployment -- Infectious Diseases

Navy Forward Laboratory

Location: Primarily located in Al Jubail, Saudi Arabia

Assigned: 4 microbiologists, 2 ID doctors, 2 technicians

Capability: State of the art at the time

Mission: Clinical diagnoses

Threat Assessment

Detect BW agents

Public health assistance after war

Infectious Diseases

Acute Gastroenteritis

- 432 stool samples evaluated in Operation Desert Shield
 - 29% ETEC (also identified in samples of lettuce)
 - 26% *Shigella*, nearly all *S. sonnei*
 - Most resistant to TMP/SMX, ampicillin, and tetracycline; none to quinolones
 - No identification of *S. typhi* or cholera
- Outbreaks of Norwalk virus infection beginning in November

Analysis of 422 stool samples just after deployment

- 9 (2%) had *Giardia lamblia* cysts
- No amebiasis, ascariasis, strongyloidiasis

Infectious Diseases

Acute Febrile Illness

- **Evaluation of 37 febrile patients during Operations Desert Shield/Storm**
 - One case of West Nile fever identified
 - No evidence of Sandfly fever, Crimean-Congo Hemorrhagic fever, Rift Valley fever, Sindbis, dengue, hepatitis A, Typhus, or Q fever
- **883 paired serum samples evaluated pre/post deployment**
 - No evidence of arboviral or rickettsial infections

Infectious Diseases

Acute Upper Respiratory Complaints

- Evaluation of upper respiratory samples from 68 patients found common pathogens:
 - Influenza A and B
 - Adenovirus
 - *S. pyogenes*
 - *S. pneumoniae*
 - *H. influenzae*

Infectious Diseases

Epidemiological surveys

- **Diarrheal Disease Survey**
 - 2022 questionnaires administered Oct-Dec 1990
 - Mean length of deployment of 55 days
 - 57% complained of at least one episode of acute diarrhea
 - **Associated:** Drinking from a canteen
Negatively with eating in local restaurant
- **Preventive medicine surveillance of 40,000 US Marines**
 - Precipitous drop in rates of outpatient visits for acute diarrhea with elimination of fresh fruits and vegetables from diet

Infectious Diseases

Epidemiological surveys

- **Respiratory Complaints survey**
 - 2598 questionnaires administered Nov-Jan 1991
 - Mean length of deployment 102 days
 - Complaints of sore throat (34%), cough (43%), rhinorrhea (15%), inability to perform duties (2%)
 - **Associated:** 1) smoking, 2) history of respiratory disease, 3) billeting in an air conditioned building
- **Surveillance of 40,000 US Marines**
 - Increased rates of outpatient visits for upper respiratory complaints during periods of crowded deployment and staging

Infectious Diseases

Epidemiological surveys

- **Shipboard survey (USNS Mercy -- 1000 bed hospital ship)**

722 crew members surveyed, December 1990 to January 1991

– Acute Diarrhea

- 46% reported at least one episode
- 6% temporarily unable to perform duties
- increased rates associated with eating in restaurant

– Upper Respiratory Complaints

- 28% reported common cold-like symptoms with feverishness
- 7% temporarily unable to perform duties
- increased rates among women

Infectious Diseases

Epidemiological studies

- **Cohort Study of 900 marines**
 - 5 month deployment from Dec. 1990 - May 1991
 - Pre/post deployment health questionnaire & serum sample
 - 59% had diarrhea, 25% respiratory complaints, 12% fever
 - Seroconversion: *Shigella* (18%); Norwalk virus (6%)
 - No evidence of arboviral or rickettsial infections

Infectious Diseases

Other infectious disease threats – literature review

- *Q fever* *3 reported cases*
- *Malaria* *7 cases reported*
- *STD's* *relatively few noted*
- *Viral hepatitis* *relatively few*
- *Brucella* *none reported*

Infectious Diseases

Leishmaniasis (sand fly-transmitted infection)

- **Cutaneous**

- 20 cases of *L. major*
- Important problem in current Iraq deployment

- **Viscerotropic**

- 12 *L. tropica* in U.S. troops; none in other Coalition troops
- last case diagnosed in 1993, less than 2 years after return
- not previously reported in this geographic region
- viscerotropic -- comparatively mild form of visceral disease
 - 11 of 12 had objective signs of disease
 - presented with fever, lymphadenopathy, hepatosplenomegaly

Infectious Diseases

Biological Warfare (BW)

- No casualties or laboratory findings consistent with BW exposure were reported
 - Medical personnel were alert to this possibility
 - Both rapid detection and traditional laboratory tests were available in-theater, with backup testing available in the US and UK

Post-war health issues

Immunizations

- Individual vaccines
 - Botulinum toxoid (IND): 8,000 U.S. troops received
 - Anthrax (FDA licensed): 150,000 troops
 - Plague and pertussis vaccines used by the U.K.
 - Various other routine immunizations were used, particularly flu vaccine and booster vaccinations
- Multiple vaccinations
- Autoimmunity from postulated squalene adjuvant
- IOM reviewed and found insufficient evidence of chronic adverse health effects among veterans

Post-war health issues

Chronic low level bacterial infection

- *Mycoplasma* sp.
 - Natural infection, vaccine contaminant, BW agent?
 - No increase in infection rates among Gulf War veterans
 - 12 million dollar doxycycline treatment trial was negative
- Gram-positive coccal infection
 - Cocci and shells of dead cocci (explodeds) observed in urine sediments of CFS patients and Gulf War veterans
 - 3 million dollars for antibiotic treatment trial mandated by law with unknown results

Post-war health issues

Low level bacterial infection

“The group is well defined, and in our view the symptomatology suggests, not primary cardiac mischief, but disturbances of function resulting from toxic absorption or actual infection. We have systematically examined eleven patients from the this point of view, and in ten of them have found the streptococci (in two cases, staphylococci) are present in urine... We take the view that we are dealing with an infection of the blood with organisms of a low grade of virulence and that these are filtered out in the urine, for the urine contains no pus cells, and, in a number of patients, the organism has been recovered from the blood itself.”

A note on the “Irritable Heart” of Soldiers. Thomas Cotton,
Thomas Lewis, F.H. Thiele. BMJ 1915;1:722

Additional Data -- Clinical Registries

- Over 100,000 veterans have received a systematic examination in the VA, DoD, British, and Canadian self-referred, clinical registries
- Veterans have been found to be manifestly ill with a wide range of illnesses -- most often:
 - Numerous medical disorders, with musculoskeletal conditions most common
 - Mental disorders
 - Somatic symptoms: reported by ~20% of veterans
 - Usually began after the war
 - No characteristic clinical signs or laboratory abnormalities
 - Not associated with specific deployment locations
- ***No characteristic infectious disease identified***

Morbidity and Mortality

During the deployment

- **Morbidity:** Disease non-battle injury (DNBI) rate lower than in prior major conflicts, with ~ 6% of ground troops treated each week for illness/injury
- **Mortality:**
 - 147 U.S. combat deaths
 - 225 non-combat, mainly car and training accidents
 - 30 due to disease (mainly cardiovascular)
 - 1 infection (meningococcal meningitis)

Morbidity and Mortality

After the war

- **Morbidity:**
 - No overall increase in hospitalizations
 - No overall increase in birth defects
- **Mortality:**
 - No increase in deaths due to medical causes, including infectious diseases, but increased rate of accidental deaths $X \sim 5$ years, as after prior wars
 - Mortality rate less than one-half that of civilian population

Research Effort

Over 250 million dollars has been allocated in the USA for this effort, which involves over 190 projects

- **Clinical investigations**
 - Neurological and immunological studies
 - Unexplained symptoms
- **Epidemiological studies**
 - Hospitalization & mortality studies based on medical records
 - Self-reported surveys
 - VA National Health Survey
- **More recent research initiatives**
 - 12 million dollar study of cognitive behavioral therapy
 - VA Secretary recently committed 15 million dollars in new research funding to address remaining Gulf War health questions

Research Limitations

- Clinical registries
 - Referral bias
 - No comparison group
 - Minimally symptomatic disease could be missed
- Epidemiological studies
 - Retrospective
 - Exposure data usually not available during wartime conditions
 - Recall and reporting bias
 - Chance findings from multiple comparisons

Infectious Diseases in 1991 Gulf War

Conclusions

- Acute gastrointestinal and upper respiratory infections were common among Gulf War troops, as expected from previous deployments
- The risk of arthropod-borne infections was not as great as anticipated from experience in WWII-- *Why?*
- Leishmaniasis was the major chronic infectious disease risk