

**Presentation 3 – Gary Friedman**



**Kuwait Oil Well Fires**

- August 2, 1990 - Iraq invades Kuwait
- January 22, 1991 - Wahfra field ignited
- February 15-17 1991 – Iraqi army ignites major oil fields
- February 24, 1991 – ground offensive begins and fires reach peak
- February 28, 1991 Kuwait City liberated

**Firefighting**

- Assessment for equipment, materials, manpower and water sources began in late February 1991.
- Fire fighting efforts commenced March 11, 1991.
- November 6, 1991 last well capped

**Oil Wells**

- Number 749
- Some burned up to 80,000 barrels of crude per day
- Flares up to 700 feet in height
- Plumes reached 12,000 feet

### **Burning Crude**

- Particulate matter
- Gases – H<sub>2</sub>S, SO<sub>2</sub>, NO<sub>x</sub>, CO, Methane
- Volatile Organics (benzene, toluene, etc)
- Poly Aromatic Hydrocarbons (PAHs)

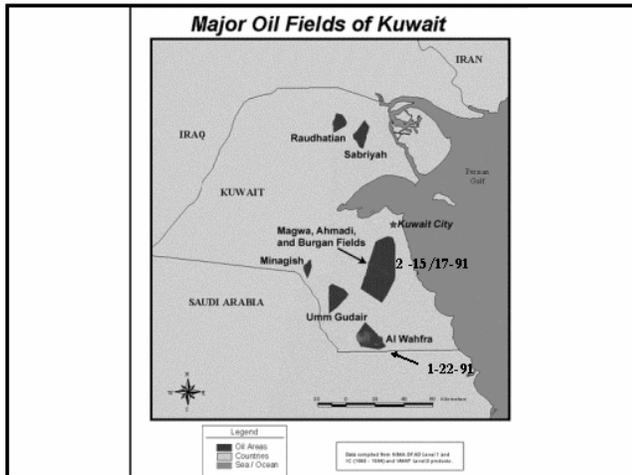
### **Texas Based Oil Well Fire Fighters – Kuwait**

- Adair Company – 39
- Wild Well Control – 38
- Boots and Coots 30

### **Adair Company**

- Most of their activity involved the Burgan, the Magwa and the Ahmadi oil fields located south of Kuwait City.

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### Tours of Duty

- Late February 1991 through 11-8-91
- Work day 10 – 12 hours
- Tour 28 – 40 days alternated with 28 day leave

### Tours of Duty

- Adair – 39 men - avg. 98 days
- Wild Well – 38 men avg. 98 days
- Boots and Coats – 30 men avg 112 days
- Average – 105 days

### Texas Based Oil Well Fighters

- Extinguished the majority of the wells
- The largest oil fields
- High pressure wells with the largest flow of gas and oil and the largest plumes
- Longest exposure times

**U.S. INTERAGENCY AIR ASSESSMENT  
TEAM IN KUWAIT AND SAUDI ARABIA  
METHOD**

**Thirteen locations in Kuwait and Saudi Arabia, U.S. Embassies in Kuwait and Riyadh, 5 oil well fields and at various locations near oil well fields in Kuwait.**

**RESULTS (3/13 – 3/27)**

- The highest levels of VOCs were in the oil fields near oil lakes
- The only significantly elevated finding was particulates

**U.S. INTERAGENCY AIR ASSESSMENT  
TEAM IN KUWAIT AND SAUDI ARABIA  
RESULTS (3/13 – 3/27)**

**“The highest readings were recorded from measurements taken in the smoke plumes in the oil fields.”**

**Volatile Organic Compounds  
Blood Levels**

Dr. R. A. Etzel at CDC studied blood levels of VOCs of forty firefighters two hours after exposure to burning wells and compared them to Army personnel in Kuwait City 20 km from the burning wells. She compared the VOC's to 114 from a reference group in the United States.

R. A. Etzel and D. L. Ashley, "Volatile organic compounds in the blood of persons in Kuwait during the oil fire", *Int. Arch Occup. Environ. Health* (1994), pg 47/1-47/5.

### **Volatile Organic Compounds Blood Levels**

**Group I (Kuwait City) – 14 males 20 km from fires. Blood VOC's were lower than or comparable to median concentrations in a reference group in the United States. Only 1 smoker.**

R. A. Etzel and D. L. Ashley, "Volatile organic compounds in the blood of persons in Kuwait during the oil fires", Int Arch Occup Environ Health (1994), pp 47/1-47/5.

### **Volatile Organic Compounds Blood Levels**

**Group II (firefighters) – 38 males and 2 females, median distance from burning wells 10 feet during previous 24 hours, 2 hours elapsed since last exposure. During preceding 24 hours they were within 500 meters for a median of 10 hours. 37% were smokers. VOC's 3 to 4 times reference population.**

R. A. Etzel and D. L. Ashley, "Volatile organic compounds in the blood of persons in Kuwait during the oil fires", Int Arch Occup Environ Health (1994), pp 47/1-47/5.

### **Living Conditions**



### **LIVING CONDITIONS**

**Lived within 2 miles of the burning fields in an abandoned complex between Burqan and Ahmadi Oil fields**

**Initially no running water (trucked in)**

**Smoke filled building**

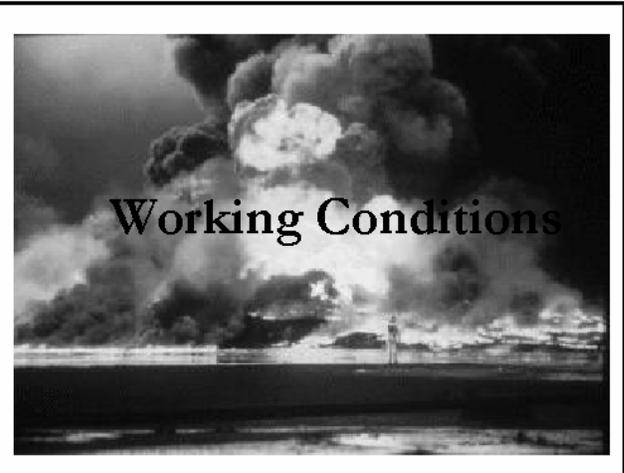
### LIVING CONDITIONS

**Drinking water – bottled**

**Food – imported – brought their own cook**

**Medical – medic on-site with first aid trailer/ambulance**

**Later in campaign – compound established at Ahmadi with 500 -600 inhabitants.**



### FIREFIGHTER PROTECTIVE GEAR

**Nomex underwear**

**Gloves**

**Hard hat**

**Leather boots**

**Work coveralls**

**No respirators**



**Heat**



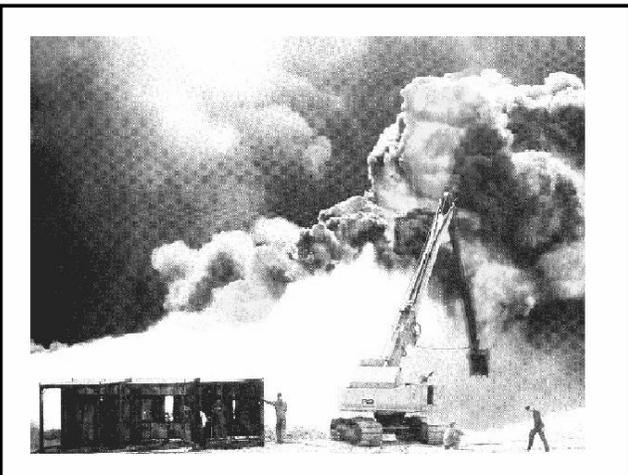
**Smoke**



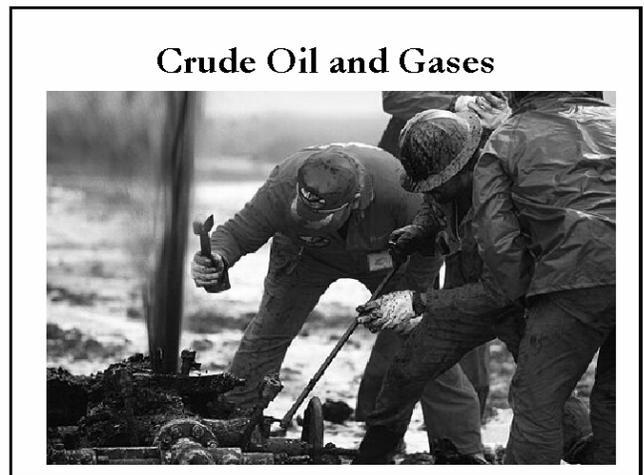
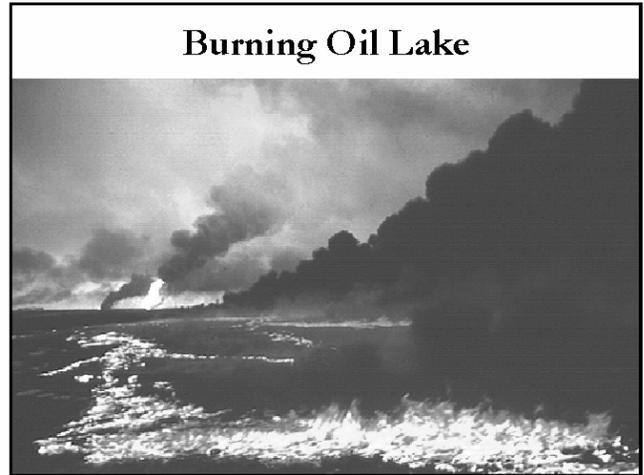
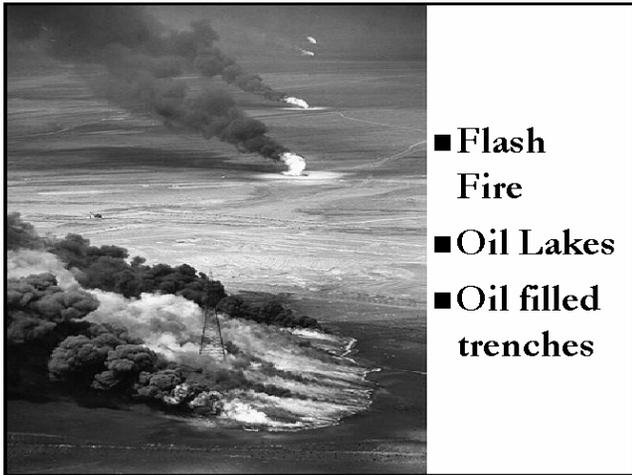
### Heat and Smoke



### Fumes and Gases



Gases and oil lake  
Risk of explosion  
And Fire



### Mines



### Canary In A Cage



### MEDICAL SURVEILLANCE

- Complete history and physical – physician Board Certified in Occupational Medicine and Internal Medicine
- CBC
- SMA-20 (glucose, BUN, Creatinine, Liver enzymes, etc.)
- Urinalysis

**MEDICAL SURVEILLANCE**

- **Pulmonary function testing (spirometry)**
- **Chest x-ray**
- **EKG**
- **Stool for O&P (as available or indicated)**

**MEDICAL SURVEILLANCE**

- Firefighters were re-evaluated during leaves between their tours of duty
- A follow up in 1994 with each of the 3 Houston based companies revealed no claims for medical problems arising from service in Kuwait.

**RESULTS From All 3 Companies**

- No objective evidence of disease**
- No reports of lost time due to illness**
- No reports of symptoms resembling "Desert Storm Syndrome"**
- No subsequent reports of any illness of delayed onset**
- No claims filed seeking compensation for any type of illness**

**Current Status**

**After Kuwait the Adair Company was sold and many of the former employees are currently employed by oil well firefighters Boots and Coots in Houston.**

### **Current Status 9-14-05**

Telephone conference with both Boots and Coots and Wild Well Control reveals no reports of Gulf War Syndrome-type illness or other chronic illness or injury arising from the Kuwait experience. Firefighters have been sent to Iraq during the current conflict without incidence.

### **Iraq**



### **Toxic Exposures**

- Burning wells
- Refinery explosions
- Pipeline fires
- Organophosphate exposure
- Cyanide
- Phosgene
- Smoke inhalation
- Irritant gases acids and alkalis

**Domestic Experience  
Toxic Fume Center  
Texas Lung Institute**

### Toxic Fume Center

- Pro active – Standing committee
- Data base of hazardous materials refineries, chemical plants, and transportation
- Stockpiled appropriate antidotes
- Coordinated with plant safety personnel
- Houston Fire Dept and Hazmat and law enforcement

### Toxic Fume Center

- Life Flight helicopters and ambulances
- Decontamination facilities
- Level 1 trauma emergency center
- Burn unit
- Tertiary care hospital
- Multi specialty medical support







**Catalytic Cracking Unit**



**Flare Stack**



**Flare Stacks**



**Refinery Fire**



**Refinery Fire**



**Petrochemical Plant**



During the past 25 years evaluation of thousands of Texas refinery and chemical plant workers exposed to crude oil, and its products of combustion have failed to reveal a pattern similar to "Gulf War Syndrome" in a civilian population.

### SUMMARY

The majority of wells were controlled by a contingent of experienced oil well firefighters from Houston, Texas. They were in Kuwait significantly longer than other fire fighting teams. They extinguished high pressure and high volume wells.

### SUMMARY

No significant illnesses have been reported from this cohort. Specifically no complaints resembling "Gulf War Syndrome"

### Military





## Literature

D.M. Spektor, A Review of the Scientific Literature As It Pertains to Gulf War Illnesses, vol. 6, Oil Well Fires  
National Defense Research Institute  
(RAND)

### RAND – VOC's, PAH, Pollutants

The concentrations of VOCs, polycyclic aromatic compounds, metals, and criteria pollutants were much lower than initially presumed, considering the magnitude of the fires.

D.M. Spektor, A Review of the Scientific Literature As It Pertains to Gulf War Illnesses, vol. 6, Oil Well Fires (Nat. Def. Research Inst. – RAND)

### RAND – Levels Same or Lower Than U.S.

The maximum concentrations measured in the Persian Gulf region are virtually the same levels found in suburban locations in the United States, lower than those found in large urban centers in the United States, and much lower than the U.S.-recommended occupational levels.

D.M. Spektor, A Review of the Scientific Literature As It Pertains to Gulf War Illnesses, vol. 6, Oil Well Fires (Nat. Def. Research Inst. – RAND)

### **RAND Lower Than Occupational**

The data show that the concentration of the pollutants present in the environment as a consequence of the oil well fires fell below the exposure limits for hazardous substances in the workplace recommended by the National Institute of Occupational Safety and Health, Occupational Safety and Health Administration, or American Conference of Governmental Industrial Hygienists.

D.M. Spektor, A Review of the Scientific Literature As It Pertains to Gulf War Illnesses, vol. 6, Oil Well Fires (Nat. Def. Research Inst. - RAND)

### **RAND - Particulates**

- “Measurements at all monitoring sites show that particulate concentrations were much higher than ambient levels in the U.S. The high density of atmospheric particles did not result from the oil fires; rather, it is characteristic of the region itself. Comparison of measurements taken in 1991 and in 1994, when the fires had long been extinguished, show similar average values.”

■ D.M. Spektor, A Review of the Scientific Literature As It Pertains to Gulf War Illnesses, vol. 6, Oil Well Fires (Nat. Def. Research Inst. - RAND)

### **Environmental Exposure Report Oil Well Fires Bernard Rostker Special Assistant for Gulf War Illness (DOD)**

### **US Army Environmental Hygiene Agency (USAEH)**

- Maximum concentration of air contaminants (other than particulates) were similar to levels found in suburban location and below those found in large urban areas.
- Over 4000 samples
- Concentration of pollutants in area of US troops and civilians fell below ACGIH, OSHA or NIOSH workplace exposure limits

Environmental Exposure Report Oil Well Fires Bernard Rostker (DOD)

### Particulate Matter

- Kuwait has one of the highest background levels of particulates in the world due to sand.
- Only 22% of PM<sub>10</sub> was due to soot.

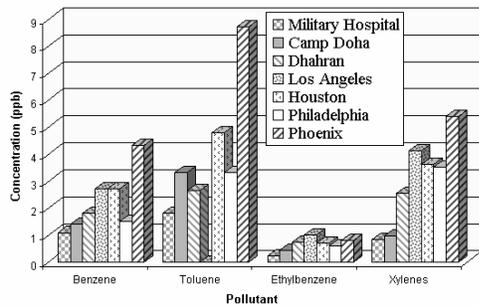
Environmental Exposure Report Oil Well Fires Bernard Rostker (DOD)

### Polyaromatic Hydrocarbons (PAH)

- Porier et. al. reported blood levels of PAHs on 61 army soldiers in Persian Gulf in 1991. Compared to soil and air measurements from areas where deployed. No evidence of increases in blood PAHs.

Environmental Exposure Report Oil Well Fires Bernard Rostker (DOD)

### Volatile Organic Compounds (VOC)



### Risk Assessments

- Risk levels were calculated for all US troop units and compared against levels determined to be safe by the US EPA.
- “In all cases troop unit excess cancer and non-cancer risk levels were below their respective US EPA safe risk levels”

Environmental Exposure Report Oil Well Fires Bernard Rostker (DOD)

**B. Rostker Special Assistant for  
Gulf War Illness Dept. of Defense**

“The exposures that troop units received from oil fires and other industrial sources in the Gulf should not, by themselves, have caused health problems.”

Environmental Exposure Report Oil Well Fires Bernard Rostker (DOD)



**Canary In A Cage**



**Raw or burning crude oil  
should be dismissed as a  
cause for Gulf War  
Syndrome**

**Mr. Red Adair**  
**1915 - 2004**

