

Gulf War I exposure summary. Prepared by Dr. Doug Rokke, Ph.D., Major, MS, USAR

1. Chemical agents- The deliberate destruction of over 100 Iraqi bunkers containing chemical warfare agents caused a release of the following nerve agents: sarin, cyclo-sarin, tabun, soman, VX, multiple seven, and novachuks. Each of these possesses anticholinergic properties and when combined or used as individual agents can result in varying degrees of immediate and delayed nicotinic and muscartinic effects. Reactions do not need to be acute but can be sub-clinical and delayed until thresholds are reached by combination with other fat or even water soluble nerve agents. For example, one specific exposure occurred when a facility known as Kamasiah was destroyed. It is important to understand that chemical agent alarms designed and set up to detect releases and exposures to nerve agents were going off all the time all over the theater during the air and ground war campaigns. Known releases of nerve agents were documented as late as May and into June 1991. DOD officials still attempt to discount these releases and detections by claiming they were false alarms. They were not false but actual detections as we verified at the time.
2. Immunizations- Immunizations were administered without concern for combined reactions nor concern for immunization scheduling. These included: Anthrax, Botulinum toxin, flu, GG, and standard immunizations for region. In almost all cases, doses, batch number, lot number, and adverse reactions were not reported by directive. Immunizations were not recorded on shot records. The anthrax vaccine was delivered into theater and distributed within theater without any required temperature control. Anthrax vaccines were administered without recording lot numbers, batch numbers, reactions, or even who received how much and when by direct order. We observed and had adverse reactions reported in well over 60% of those who received the anthrax vaccine but this was not reported by direct order. Congressional investigations and chemical analysis have verified that the illegal adjuvant squalene was used in the anthrax vaccine to extend dose availability (Metcalf Report on potential Role of Squalene in Gulf War illnesses- prepared by the Office of Congressman Jack Metcalf September 27, 2000).
3. Radiological materials- The primary source of radioactive material exposure was the use and distribution of depleted uranium munitions which are simply solid uranium 238. Another source was the willful destruction of Iraqi reactors and facilities containing other radioactive materials. Destroyed and operational equipment also contained an entire range of radioactive materials.
4. Endemic diseases- These included diseases prevalent within Saudi Arabia, Iraq, and Kuwait and those brought in by personnel from all the nations involved in the military or relief operations. Observed problems included GI, URI, rashes, and fevers to mention only a few. Careful assessment and reference to public health references should be completed during any assessment and treatment program.
5. Hazardous materials- Hazardous materials consisting of organic and inorganic compounds were used throughout the theater from initial deployment until the

present. Exposures have occurred since the beginning with adverse health effects observed and reported at all times. Activities resulted in spills and releases and consequent inhalation or absorption of these compounds. Individual adverse health effects from hazardous materials exposures did and will depend on the compound and route of exposure. (Refer to USACHPPM TG 230A, May 1999)

6. Pesticides- Pesticides were completely misused. As we prepared for deployment, public health concerns regarding health threats from endemic and imported pests was recognized. Consequently pesticides were ordered and use was planned. As a consequence of combat actions and limited transportation assets most of the requested and approved pesticides did not arrive in theater. Therefore, preventive medicine personnel assigned to the 12th PM and other units purchased pesticides from local sources then used these pesticides which were of unknown quality in addition to those pesticides acquired from the Department of Army supply system.. These pesticides were applied without concern for exposure doses and combined effects. A recent report prepared and released by OSAGWI (www.gulflink.osd.mil) recognizes and discusses some of the health problems but this report is still incomplete because DOD officials did not talk to those of us involved and did not consider all of our reports. MANY INDIVIDUALS WERE EXPOSED TO PESTICIDES WHICH WERE MISUSED BY UNTRAINED AND TRAINED PERSONNEL!!! We observed and received numerous reports of adverse health effects from pesticide exposures. Consequently neurological problems have been observed and must be considered during any physiological examination and treatment program. I would also include PB tablets (mestinone) in this category as they are carbamate related compound and caused adverse health effects in well over 50% who took these tablets as cited in Army handbook: "Medical Management of Chemical Casualties".
7. Biological agents- Iraq was known to possess various biological agents. One agent Bacillus Globigii is known to cause GI problems. We suspect based on observed problems and intelligence reports that this agent was probably released. I had one unit 822 MP that came down with severe GI problems within 24 hours. The only explanation based on discussions with unit members and intelligence information analysis was some type of unknown biological exposure. Other biological agents were related to water and food borne illnesses. Local food purchases and use of food that was grown in night soil (human waste etc.) occurred. Consequently GI problems were observed throughout the theater in thousands of individuals. Water borne problems from oil well combustion byproduct and chemical agent distribution were also observed and reported throughout the theater. We were also unable because of political problems to ensure that food handlers passed physical and public health exams and employment criteria such as common within the U.S. Consequently we saw food borne problems and suspect that deliberate contamination may have occurred which could explain some observed adverse problems.
8. Oil well fires- The deliberate burning of the oil wells resulted in immediate adverse health effects. Oil well byproducts were complex and consisted of (per OSAGWI Oil Well Fire report, September 2000 see www.gulflink.osd.mil):

Table 9. Mean and maximum concentrations of pollutants of concern, May-December 1991 ^[182]

Pollutant	Mean Concentration	Maximum Concentration	NAAQS ⁽¹⁾	ACGIH TLVs ⁽⁶⁾
Criteria Pollutants				
Ozone	53.4 m g/m ³	104.8 m g/m ³	160 m g/m ³⁽²⁾	100 m g/m ³
Sulfur dioxide	23.8 m g/m ³	92.5 m g/m ³	80 m g/m ³⁽³⁾	5,200 m g/m ³
Nitrogen dioxide	58.5 m g/m ³	86.1 m g/m ³	100 m g/m ³⁽³⁾	5,600 m g/m ³
Polycyclic Aromatic Hydrocarbons (PAHs)				
Acenaphthene	0.62 ng/m ³	2.25 ng/m ³		200,000 ng/m ³
Benzo-anthracene	0.60 ng/m ³	2.23 ng/m ³		200,000 ng/m ³
Biphenyl	7.2 ng/m ³	19.07 ng/m ³		200,000 ng/m ³
Chrysene	0.48 ng/m ³	2.25 ng/m ³		200,000 ng/m ³
Fluoranthene	1.41 ng/m ³	2.23 ng/m ³		200,000 ng/m ³
Phenanthrene	0.48 ng/m ³	1.84 ng/m ³		200,000 ng/m ³
Pyrene	0.65 ng/m ³	3.5 ng/m ³		200,000 ng/m ³
Particulates	354 m g/m ³	3,000 m g/m ³	150 m g/m ³⁽⁴⁾	300,000 m g/m ³
Metals				
Cadmium	0.003 m g/m ³	0.0078 m g/m ³		10 m g/m ³
Chromium	0.027 m g/m ³	0.0898 m g/m ³		500 m g/m ³
Nickel	0.052 m g/m ³	0.2136 m g/m ³		120 m g/m ³
Lead	0.675 m g/m ³	1.671 m g/m ³	1.5 m g/m ³⁽⁵⁾	50 m g/m ³
Vanadium	0.028 m g/m ³	0.0898 m g/m ³		50 m g/m ³
Zinc	0.068 m g/m ³	0.193 m g/m ³		500 m g/m ³
Volatile Organic Compounds (VOCs)				
Benzene	7.82 m g/m ³	13.1 m g/m ³		1,600 m g/m ³
Toluene	21.8 m g/m ³	36.9 m g/m ³		188,000 m g/m ³
Ethyl-benzene	14.7 m g/m ³	41.2 m g/m ³		435,000 m g/m ³
m, p-Xylene	40.5 m g/m ³	116 m g/m ³		435,000 m g/m ³
o-Xylene	12.8 m g/m ³	30.4 m g/m ³		435,000 m g/m ³

It is important to consider the combined health effects of these compounds. Many of these affect the same organ or physiological process so even if one or more than one are below established thresholds the combined effects must be considered. A recent PBS documentary “Bill Moyer’s Report – Trade Secrets” (see www.pbs.org) discussed potential exposures and adverse health effects. We saw immediate respiratory and dermatological effects (Col. Kenison’s Report top Col Tsoulos) . The byproducts also mixed with bathing and clothes washing water and water used for cleaning equipment.