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13. ABSTRACT (Maximum 200 words) In April 1992, a multidisciplinary medical team evaluated symptoms reported by 79 members of the 123rd Army Reserve Command who had served in Operations Desert Shield and Desert Storm. Although several had previously received some medical care, no unifying diagnosis had emerged. For the evaluation, each soldier completed a questionnaire and symptom inventory and was interviewed by a medical epidemiologist, occupational medicine physician, and psychiatrist. All were examined by an oral pathologist and had blood drawn for routine hematologic tests and serum liver function studies. Serum was tested for antibodies against the organisms causing leishmaniasis. Results of routine physical and dental examination and routine laboratory tests were similar to those found in the general population. Testing for various infectious disease agents indicated no role for them in explaining the symptoms reported by the group. Psychiatric evaluation suggested that many symptoms were likely to have been stress-related. Additional medical evaluation of this group is warranted on an individual basis, and additional epidemiological studies are indicated if specific diagnosable conditions become apparent.

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INVESTIGATION OF A SUSPECTED OUTBREAK OF AN UNKNOWN DISEASE
AMONG VETERANS OF OPERATION DESERT SHIELD/STORM
123d ARMY RESERVE COMMAND
FORT BENJAMIN HARRISON, INDIANA, APRIL, 1992

15 June 1992

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I. Executive summary

In early spring 1992, 125 veterans of Operation Desert Shield/Storm (ODS/S) assigned to the 123d Army Reserve Command (ARCOM) reported a wide variety of non-specific symptoms including fatigue, joint pains, skin rashes, headaches, loss of memory, mood changes, diarrhea, bleeding and painful gums, and loss of hair. Most of these symptoms were first noticed after the soldiers returned home after the deployment to southwest (SW) Asia. Although several had been medically evaluated, no unifying diagnosis other than a suspected reaction to stress had emerged. On 11-12 April, seventy-nine 123d ARCOM soldiers with symptoms or concerns were evaluated by a multidisciplinary medical team. Each soldier completed a medical questionnaire and a brief symptom inventory, and was interviewed by an epidemiologist, an occupational medicine physician and a psychiatrist. All were examined by an oral pathologist and had blood drawn for laboratory testing. There was no evidence of an outbreak or cluster of any unique disease process. Very few soldiers gave histories that suggested any known hazardous exposures. Because of the wide variety of experiences during the deployment, there were very few exposures common to the entire group. Reported symptoms did not correspond with known health effects of those exposures. Positive objective findings on physical examination and laboratory screening testing were very limited, and were similar to those found in soldiers from Fort Lewis, WA, and Fort Bragg, NC, who were not deployed to SW Asia. Dental examination revealed gingivitis, periodontal disease, caries, and other chronic oral conditions as likely causes for the dental symptoms. Results of specific testing for leishmaniasis, brucellosis, and other agents indicated no role for them in causing the symptoms reported by this group. Although no confirmed pathogens have yet been isolated from those soldiers with diarrhea, some chronic diarrhea could conceivably have been related to the deployment and may require additional evaluation. The paucity of abnormal physical or laboratory findings, the types of symptoms reported, the association of onset of the symptoms with redeployment, and results of the psychiatric evaluation suggest that many of the symptoms are likely to be stress-related. These may represent a stress reaction to redeployment and subsequent readjustment to civilian life.

Additional medical evaluation of these soldiers is indicated only on an individual basis. Stress management intervention with full command support is warranted. Additional epidemiological evaluation may be necessary, but only if specific diagnosable medical conditions emerge from this group.

II. Background

A. Chronology

In January 1992, staff of the 123d ARCOM Surgeon's Office became aware of complaints of symptoms among members of the Command who had deployed to SW Asia as part of ODS/S. Several of these soldiers had sought medical care from private or military physicians for these symptoms since returning from the deployment. During early February, acting on her own initiative, an NCO of the 300th Supply and Service (S&S) Bn, Lafayette, IN, designed and circulated a symptom questionnaire (Sample, Appendix A) to ODS/S veterans. Although the total number of soldiers who received and completed these questionnaires is not known, an initial investigation conducted by the Command Surgeon's staff near the end of February revealed that there were 43 soldiers of HHC, 300th S&S Bn, and the 209th Supply Co (co-located at the Armory in Lafayette, IN) who were reporting symptoms and expressing concerns. These symptoms included fatigue, or "always tired" (60.4%), intestinal complaints, including stomach pains (56.3%), headaches (47.9%), joint pains (47.9%), fever (41.7%), painful and bleeding gums, or tooth pain (35.4%), loss of memory (35.4%), feeling of distrust, or imminent problems (25%). Other complaints included insomnia, mood swings, thick saliva, and hair loss. The symptoms were reported to have arisen at various times during and since the deployment.

By early March, the number of concerned soldiers grew to include members of the 417th Quartermaster (QM) Co, in Scottsburg, IN. Concerns of the members of this unit, which handled petroleum fuels during ODS/S, principally involved the potential hazards of the exposure to petroleum, and the possibility of exposure to hazardous levels of microwave radiation from communication equipment.

On 19-20 March, COL Norman H. Teer MC, 123d ARCOM Surgeon, interviewed and briefly examined 58 of the 75 soldiers who had reported symptoms or concerns by that time. These soldiers belonged to the above units or others in the 123d ARCOM. Three had depression, seven had bone or joint pain, several others had diarrhea, and the remainder a variety of minor medical problems. Several of these soldiers were referred to the VA hospital in Indianapolis or Ireland Army Community Hospital at Fort Knox, KY for additional evaluation. One soldier was referred to Walter Reed Army Medical Center for evaluation for possible viscerotropic leishmaniasis.

There seemed to be no single or unifying diagnoses linking the symptoms expressed by the persons evaluated at that time, although many of the symptoms were thought to be stress-related.

On 30 March, the Office of the Surgeon General requested an Epidemiology Consultant Service (EPICON) assessment of these symptoms. In response to this request, a multidisciplinary EPICON team was formed. Two epidemiologists, a psychiatrist, an occupational medicine physician, a dentist specializing in oral pathology, and a preventive medicine technician comprised the team. The team members and the EPICON mission statement are included in memorandum dated 8 April 1992 SUBJECT: Epidemiology Consultation (EPICON) to 123rd Army Reserve Command Surgeon (Appendix B).

B. The 123d ARCOM

The 123d ARCOM, headquartered at Fort Benjamin Harrison, in Indianapolis, includes 9200 soldiers in over 90 separate Reserve units in Indiana, Michigan, and Ohio (Appendix C). The majority of the soldiers who had expressed symptoms or concerns were presently assigned to units in the 123d ARCOM Support Group (Provisional), or had belonged to these units during ODS/S. During ODS/S, approximately 1900 personnel of this ARCOM were mobilized, and 1200 were deployed to SW Asia.

III. EPICON actions

MAJ DeFraités traveled to Fort Benjamin Harrison, Lafayette, Camp Atterbury, and Scottsburg, IN 3-5 April for briefings on the activities, structure, and personnel of the 123d ARCOM in advance of the team's visit the following week. He met with LTC Peter F. Connallon, MSC, medical operations officer for 123d ARCOM. Deployment itineraries were reviewed with NCOs and officers of 209th Supply Co, HHC, 300th S&S Bn, 199th Supply Co, and 417th QM Co. While in Scottsburg, MAJ DeFraités and LTC Connallon also met with MAJ Cynthia A. Brandt MC, Chief, Preventive Medicine Service at Fort Knox, KY, to discuss the progress in the medical evaluation of several ARCOM soldiers at Fort Knox.

On 9 April, MAJ DeFraités, MAJ Wanat, MAJ Norwood, MAJ Williams, and SPC Callahan traveled to Fort Benjamin Harrison. The team met with LTC Connallon and his staff, toured the clinic facilities of Hawley Army Community Hospital, Fort Benjamin Harrison with COL Gretchen Hoagland NC and other hospital staff. On

10 April, the team briefed MG Back, 123d ARCOM Commander, Mr. Beachamp, Chief Administrative Officer, and 123d ARCOM staff. On 11 and 12 April, 79 soldiers were evaluated by the team and COL Teer at Hawley Hospital. The team outbriefed 123d ARCOM staff and departed Fort Benjamin Harrison 13 April.

An analysis of the data collected during the two site visits to 123d ARCOM, conclusions, and recommendations for additional actions comprise this report. MAJ DeFraités, MAJ Wanat and MAJ Cowan collaborated on the analysis of the data on symptoms, physical findings, and laboratory results. MAJ Wanat also contributed the analysis of potential occupational exposures, and MAJ Norwood analyzed and summarized the results of the psychiatric evaluation.

IV. Methods

By 9 April, 125 soldiers assigned to or affiliated with units of the 123d ARCOM currently or during ODS/S had noticed symptoms or expressed some concerns about possible hazardous exposures during the deployment. These persons were given appointments at Hawley Hospital on either 11 or 12 April for evaluation by the team. During those two days, 79 individuals appeared for evaluation and completed a medical questionnaire (Appendix D). Some of these had not been given appointments, but appeared for evaluation after having learned about the team's visit through their unit or the media. Several others with appointments (approximately five) stated that they no longer had any concerns or symptoms and did not participate.

Seventy-eight of the group completed a Brief Symptom Inventory (BSI) (Appendix E) and were available for detailed interview. Each soldier was individually interviewed by MAJ Norwood and either MAJ DeFraités or MAJ Wanat. In these interviews, the questionnaires were reviewed and a medical history and review of symptoms obtained. Soldiers with concerns about potential occupational and environmental exposures (most of the group) were interviewed by MAJ Wanat and MAJ DeFraités separately. MAJ Norwood discussed the responses to the BSI and conducted a brief psychiatric intake-type interview. Each soldier had vital signs (blood pressure, temperature, pulse, height and weight) measured. All but one of the group were individually examined by MAJ Williams in the dental clinic. Dental radiographs were also obtained on several soldiers at MAJ Williams' discretion.

All 78 soldiers who participated in the interviews also had blood drawn for complete blood count, with white blood cell

differential and platelet count, erythrocyte sedimentation rate (ESR) and liver function studies. The liver profile included lactate dehydrogenase (LDH), aspartate aminotransferase (AST or SGOT), alanine aminotransferase (ALT or SGPT), albumin, total protein, alkaline phosphatase, and total bilirubin. Several soldiers had additional laboratory tests, such as thyroid function studies, rheumatoid factor, or stool for ova and parasites, at the discretion of the team or COL Teer. All of these laboratory procedures were performed by the clinical laboratory at Hawley Hospital.

An aliquot of serum from each of the 78 soldiers was frozen and transported to WRAIR on dry ice. All sera were tested for antibody to Leishmania tropica by indirect fluorescent antibody (IFA) in the laboratory of MAJ Max Grogl, Division of Experimental Therapeutics, WRAIR.

Sera from selected individuals in this group were tested for antibody to Brucella sp. by the Serology section, Department of Pathology, Walter Reed Army Medical Center.

Some additional medical history and laboratory results on 123d ARCOM soldiers were available. Five of the soldiers screened on the weekend had also been extensively evaluated by physicians at Ireland Army Community Hospital, Fort Knox KY. Two other 123d ARCOM soldiers (not included among the 79) were also evaluated at Fort Knox. One of these was referred to Walter Reed Army Medical Center, as mentioned previously, and the other was referred to Wright-Patterson Air Force Base, Dayton, Ohio. Medical records from the private physician of one additional soldier were also available for review.

Data from other groups of soldiers who were not deployed to SW Asia were used for some comparisons with the sample from the 123d ARCOM. Blood pressure screening data were available from an evaluation of a health promotion program among active duty soldiers at Fort Lewis, WA in 1988-9¹. Baseline laboratory data from vaccine trials among healthy active duty volunteers were also used for comparison. Complete blood count data from a voluntary cholera vaccine field trial at Fort Bragg (October, 1991, n=186) and liver function test results from 333 soldiers on a similar study of hepatitis A vaccine at Fort Lewis in January 1991 were compared with the results obtained from the evaluation of the 123d ARCOM.

BSI comparison data collected by Division of Neuropsychiatry, WRAIR, from 8600 deployed and 475 non-deployed soldiers were also used in the analysis (Appendix F).

Demographic and interview data were entered into a computerized database using dBase III Plus (Ashton-Tate, Inc.).

Statistical analyses were performed using Epi Info software (in the public domain through the Centers for Disease Control, USD Software, Stone Mountain, GA, Version 5.01, 1991). Non-parametric statistical tests were performed on continuous data. Analytical techniques used for evaluating categorical data included chi squared, Fisher's exact test, and chi squared test for trends. Unless otherwise indicated, all tests were two-tailed, with a test-based probability of Type I error of less than 0.05. There was no statistical adjustment for multiple comparisons.

V. Results

A. Demographics

The demographic profile of the 79 soldiers screened by the team is as follows:

Sex: 77.2% Male

Race: 89.9% White, 8.9% Black/Afro-American, 1% Asian

Rank: Non-commissioned officers 54.4%, E4 and below 36.7%,
Commissioned Officers 5%, Warrant Officers 4%

Present Unit: 209th Supply Co 46.8%, HHC, 300th S&S Bn 19%,
417th QM Co 8.9%, 425th PSC 6.3%, 425th QM Co 5.1%,
199th Supply Co 5.1%, HQ, 123d ARCOM 2.5%.

One person was no longer in the Army. The following units were represented by one soldier each: 221st Ord Co, 4/20 FA Bn, 766th TC Bn, 5030th USARF.

Unit of assignment during deployment: 209th Supply Co 49%,
HHC, 300th S&S BN 19%, 417th QM Co 12.7%, 425th PSC
5.1%, 425th QM Co 3.8%, 199th Supply Co 2.5%.

Each of the following units was represented by one soldier (1.3%): 129th Postal Co, 196th FA Bde, Hq, 3d Army, 426th Signal Bn, 766th TC Bn, 4th Squadron/8th Cav (3d Armored Div).

Soldiers assigned to 209th Supply Co, 417th QM Co, or HHC, 300th S&S Bn either at the time of the screening or during the deployment to SW Asia comprised the majority of the group we evaluated. Unit rosters allow for some comparison of the sizes of these units. For example, during ODS/S, 169 soldiers (71 NCOs and seven officers) were assigned to the 209th Supply Co, 141 (56 NCOs and 4 officers) belonged to 417th QM Co, and 224 (81 NCOs and 6 officers) were assigned to 199th Supply Co. The group we evaluated represented the personnel in these units who had deployed to SW

Asia and had symptoms or concerns about possible illness. The 209th Supply, 300th S&S, and 417th QM were the first to report symptoms, so it is not surprising that they were well represented. Soldiers in the other units became involved as a result of the earlier unofficial questionnaire, or through informal channels, such as the media. Any soldier in a 123d ARCOM unit (or assigned to one during ODS/S) who had contacted the Command Surgeon staff about symptoms or concerns was potentially included in the evaluation.

B. Analysis of questionnaire and screening results

Because no single diagnosis had emerged after several soldiers had undergone thorough medical evaluation, we were limited to examining our findings without the guidance of a principal diagnosis or single suspected exposure. The fundamental issue thus became whether there was sufficient evidence to indicate the presence of any outbreak of disease in 123d ARCOM.

Our results can be characterized as subjective findings (symptoms), objective outcomes, (eg., screening laboratory tests and physical examination), and psychiatric testing and evaluation.

1. Symptoms

a. Frequency and timing of onset

Symptoms reported by these 79 soldiers comprised the bulk of the data available for analysis. Because of the non-specific nature of these symptoms, soldiers were encouraged to report every symptom of concern, regardless of date of onset, suspected source, relation to other symptoms, or if it had resolved. Although many of these symptoms had resolved by the time of our evaluation, we were not able to differentiate among symptoms which occurred in the past but had resolved, symptoms which had occurred on an intermittent basis, and those which were still present at the time of our evaluation. If a symptom was checked on the list provide on the questionnaire, the soldier was asked to estimate the month during which the symptom first became noticeable, or troublesome. Most of the group were able to provide these dates. The most prominent symptoms are listed in Table 1 in order of frequency of report. Most of the soldiers had multiple symptoms. Half of the group reported seven or more of the symptoms listed on Table 1;

74.7% reported three or more. "Fever", as a symptom, was relatively rare.

Some of these symptoms were related to acute illnesses which had occurred in the preceding months. Some soldiers reported that they had not become concerned about any symptoms until after they had been given the questionnaire at their Reserve unit to complete in February. Since the nature and scope of the problem in the 123d ARCOM were unclear at the time of our interviews, all symptoms were accorded equal weight in the analysis.

The most commonly reported symptom was fatigue. Most soldiers with fatigue mentioned at least one other symptom; 57% with fatigue reported either irritability, forgetfulness, or difficulty thinking or concentrating. Most described the fatigue as not having the same level of energy, or being "wiped out" after exercise. Reporting fatigue was not associated with age, sex, present unit, or unit of assignment during the deployment to SW Asia.

Most of the soldiers with fatigue were able to estimate the month of onset of this symptom (53/56, 95%). Figure 1 shows the number of soldiers with fatigue by month of onset. There are two peaks evident on this graph; the first occurred in June-July 1991, and the second in December 1991-January 1992. When asked to estimate the date of onset for this and many of the other symptoms, these soldiers consistently responded that symptoms began to be noticed soon after leaving SW Asia. Figure 2 shows the date of onset of fatigue, expressed as the number of months before or after redeployment. For 90.6% of the soldiers with this symptom, fatigue began to be noticed no earlier than a month or less before returning home, regardless of the date they left SW Asia. About half dated the onset of fatigue to the interval from about 30 days before redeployment to 60 days after they returned home. Soldiers in this group returned home as early as 15 March 1991, and as late as 30 August 1991. Figure 2 also shows a second peak in reported onset present 6-7 months post-redeployment. The relationship between onset of fatigue and redeployment persists after stratifying by the units to which these soldiers were assigned during the deployment, although the total number of individuals from some of these units was small. The units examined were HHC 300th S&S Bn, which returned 10 May 1991 (Figure 3), 209th Supply Co, which returned 22 June 1991 (Figure 4), 417th QM Co (returned 25 May 1991)(Figure 5), and nine "other units" (Figure 6). For most of these units, the majority of the soldiers reporting fatigue date the onset within several weeks of the day they returned, with a second peak four to ten months later. Most striking is the pattern from the soldiers who

were in the units in the "other" category (Figure 6). These 11 individuals were assigned to nine different units (some of which are not in the 123d ARCOM) during the deployment. Despite the fact that their individual experiences and potential exposures varied greatly while deployed, the pattern of onset of fatigue was very similar to that displayed by the group as a whole.

Several of the other symptoms were found to share this pattern of delayed onset; most soldiers with sleep disturbances (Figure 7), and depression (Figure 8), for example, dated the onset of the symptom to the interval immediately prior to redeployment to several months later, regardless of the date of redeployment. Because smaller numbers of soldiers reported these symptoms, however, stratified analysis was not possible. On the other hand, symptoms such as fever (Figure 9) and hair loss (Figure 10), showed no obvious pattern relative to redeployment. Finally, the pattern of reported diarrhea onset (Figure 11) was somewhat different than that found with fatigue. Soldiers who reported this symptom were slightly more likely to note its onset before redeployment (median month of onset was the month before leaving SW Asia).

Therefore, these symptoms can be categorized by pattern of onset. The largest group includes fatigue, sleep disturbance, depression and the related cognitive symptoms, such as forgetfulness. These symptoms occurred either at the time of redeployment or several months later. The second group are represented by hair loss, the onset of which seems unrelated to redeployment. The third type is characterized by diarrhea, which predominantly began during the deployment.

The onset of non-specific symptoms (fatigue, sleep disturbance, depression, and cognitive symptoms) in proximity to returning home from SW Asia, with a second peak 6-7 months later, is difficult to explain if exposure to an unknown disease agent or agents during the deployment SW Asia is proposed as the cause. The individuals in this group were deployed at different times to many different locations throughout the theater of operations, performing different tasks under a variety of conditions. Any proposed exposure must therefore have been omnipresent for several months in theater. The onset of the proposed "disease" would be delayed until the time of return to CONUS, or about six months after redeployment, which was slightly different for each unit that we studied. The length of deployment varied greatly within the group. Half spent 170 days or more in SW Asia; individuals spent as few as 64 or as many as 262 days in theater. Using the length of deployment in SW Asia as a surrogate for exposure to an undefined agent, we found no

association between the total days deployed and any of the individual symptoms, or groups of symptoms (fatigue with one or more cognitive symptoms, for example).

Based on these and other data discussed below, we suggest that factors associated with the redeployment itself and subsequent events, rather than an agent or agents in SW Asia, may explain this group of symptoms. The unique pattern of onset of these symptoms, and its consistency among several symptoms and among the units support this hypothesis.

On the other hand, diarrhea caused by a wide variety of organisms is one of the most common health threats to travelers to SW Asia and other areas of the developing world ². Diarrhea acquired in this manner typically occurs after an incubation period of several hours to days, last for several days to two weeks, and resolves. Multiple episodes during prolonged travel in these areas are not unusual. Several outbreaks of acute diarrheal disease have been reported among U.S. forces in SW Asia during the Bright Star Exercises in Egypt during the 1980's, and during Operation Desert Shield/Storm. The agents implicated in these outbreaks include enterotoxigenic E. coli, Shigella, Salmonella, viruses resembling the Norwalk agent (unpublished data on file, Division of Preventive Medicine, WRAIR), and parasites such as Giardia lamblia ³. Therefore, the occurrence of diarrhea among the soldiers of the 123d ARCOM during the deployment would not be unusual. All of the soldiers we interviewed obtained at least some of their food from local vendors or ate food which was supplied and prepared by non-military catering services, both which have been associated with diarrhea in troops and travelers in the past. Indeed, one of the soldiers in the group had been diagnosed and treated for giardiasis after returning from SW Asia. However, diarrhea with delayed onset of more than several months after the exposure has ended, or persistence of diarrhea for more than several weeks to months is unusual with most known enteric pathogens, and may warrant additional evaluation on an individual basis. In addition, the general pattern of diarrhea reported by the soldiers we evaluated suggested multiple sources and causes, unlike that experienced in the outbreaks mentioned above.

b. Severity

Severity of the reported symptoms was difficult to assess. However, by reporting the number of days of duty, work, or school lost due to injuries and illnesses, the soldiers we interviewed were

able to give us an objective measure of the impact of these problems on their lives. These 79 lost 397 duty days due to illnesses or injuries during the deployment to SW Asia (2.8% of all days deployed). Acute injuries and convalescence from surgical procedures accounted for 237 of these days (59.7% of total "sick days" while deployed) Other illnesses accounted for 160 lost days (1.1% of all days deployed). Non-injury illness during the deployment caused only 5.1% of the group to lose 14 days or more of duty; 63.3% lost none. However, this may underestimate the true impact of illness and injury during the deployment. Some of these problems required air evacuation out of theater, which would shorten that person's sick days during the deployment. We found no association between the number of days lost due to illness (non-injury illness) and any of the symptoms that were reported.

We conducted a similar analysis of the days of duty, work, or school lost due to injuries and illness since returning home. The group reported 762 total days lost (3.0% of total days home through 11 April 1992), which is comparable to the rate during the deployment. However, while every day during the deployment was considered a duty day, not all of the days spent at home since return can be considered "work" days, so the actual amount of work lost since return may be higher. The single most common causes for lost days were injuries, elective surgery, or their sequelae, at 334 days (43.8% of all days lost). The illnesses of six (7.6%) individuals accounted for 48% of the work days lost to non-injury illness since the deployment. These illnesses included hospitalization for post-traumatic stress disorder (1 person, 60 days), laboratory-confirmed mononucleosis (1 person, 40 days), lack of motivation and fatigue, dropped out of college at mid-semester (1 person, 35 class days), recurrent "flu" (1 person, 30 days total), recurrent diarrhea, irritable bowel (1 person, 21 days), and recurrent fever (1 person, 20 days/laid off job). No work days were lost by 36 (45.6%); 85% of the group we interviewed reported losing 10 days or less due to non-injury illness since returning home an average of 316 days earlier.

For most symptoms, those reporting the symptom were neither more likely to have any sick days, nor to have more sick days, than those without the symptoms. The two exceptions to this general rule were the symptoms of abdominal pain (median of 5 days lost by personnel with abdominal pain vs. 0 without, $p=0.047$) and irritability (median of 2 days lost by personnel with irritability vs. 0 without, $p=0.041$). Although both of these may be statistical aberrations, there may be some plausibility to the association of abdominal pain with lost work due to illness. Abdominal pain was

related to diarrhea, and although reporting diarrhea alone was not associated with lost work days post-deployment, abdominal pain with or without diarrhea was (chi sq. for linear trend $p=0.021$).

2. Objective findings

Three types of objective findings were recorded: Dental, other physical examination, and laboratory tests.

a. Dental

At the time of the screening on 11-12 April, 39/77 (50.6%) had no dental complaint or abnormality. Gingivitis was found in 11 (14.3%) and periodontitis (with or without caries) in 8 (10.4%). Four others had problems related to large caries or previous dental repair work. Seven (9%) had jaw pain stemming from bruxing (grinding) the teeth or keeping the jaws clenched; one had temporomandibular joint dysfunction (1.3%). The remainder were found to have a variety of dental problems, including occlusive wear (3.8%), third molar (wisdom tooth) pain and problems with prosthetic devices (bridges and dentures)(1.3% each). One soldier was thought to have ectodermal hypo/dysplasia, a hereditary thinning or absence of tooth enamel. All of the problems identified were of relatively long duration, and most are very common in the general population. They help explain the bleeding of the gums, the loose and painful teeth, and pain and soreness in the gums and jaws that were reported. The primary causes of periodontitis, gingivitis, and caries are inadequate oral hygiene practices and lack of routine dental care over a number of years.

b. Physical examination.

Examination was cursory by necessity, and limited generally to physical signs which were visible, or could be measured in some way. The only physical findings which could be consistently documented by the team were visible skin rashes, scalp hair appearance, and vital signs.

(1) Skin rashes

Twenty-eight soldiers (35.4%) reported skin rashes. Thirteen of these had a visible skin rash or other finding present on the day of our evaluation. These rashes were in several different locations. Four were present in the groin and appeared to be tinea cruris ("jock

itch"). One soldier had been seen by a dermatologist and had an area of hypopigmentation biopsied on his trunk. Other rashes suggested generalized dryness of the skin (3.8%) folliculitis on the legs (2.5%), pityriasis alba of the arms, post-inflammatory hypopigmentation of the face, and tinea corporis (1.3% each). Although some of these soldiers were to be further evaluated by a dermatologist for confirmation, these rashes appeared to have many different etiologies and were typical of skin conditions one would find in the general population in the United States.

(2) Scalp hair appearance

Unusual hair loss was reported by 17 (21.5%), 12 men and 5 women. Among those for whom an approximate onset date could be determined, 6 (40%) initially noted the hair loss during or within one month of return from the deployment to SW Asia. For an additional 5 (33%), on the other hand, hair loss did not start until 8 or more months after returning home from SW Asia. The remainder noted the onset of the hair loss sometime in the interim. There was no association of reported hair loss with sex, age, length of deployment, or unit of assignment in SW Asia.

The hair loss was typically described as a generalized thinning of the hair on the scalp, usually manifested by the soldiers finding more hair than usual in combs or brushes, or having someone else take note of it. We saw no soldiers with loss of facial hair (eyebrows), or discrete areas of baldness, suggesting, for example, alopecia areata, nor anyone who had suddenly lost most, or all, of their scalp hair. For the men, the amount of hair thinning and the area of the scalp involved was typical of male pattern baldness. For the women, with one exception, there was no obvious loss of hair that could be confirmed upon examination. The single exception was a female soldier who had noticed some patchy hair loss which resolved after changing hairdressers and hair treatments. Although upon examination her hair appeared thinner in certain areas of the scalp, she reported that it had improved by the time of the team's evaluation.

The hair loss reported by these soldiers may have resulted from several causes, including that expected among normal men (male pattern baldness). Telogen effluvium resulting from an illness or emotional stress is a possible etiology, especially if the hair loss occurred rather acutely within several months after the stress. The prognosis for complete resolution is excellent ⁴.

Other medical causes for hair loss in this group have not been found. Hypothyroidism, for example, had been considered by

physicians at Fort Knox and elsewhere for two women who reported hair loss and two women and one man without hair loss; all have had normal thyroid function test results.

(3) Blood pressure

Twelve of 78 (15.3%) soldiers who had blood pressure measured were found to have hypertension, defined as a systolic blood pressure of 140 mm_{Hg} or higher, a diastolic reading over 89 mm_{Hg}, or both. All are male. Elevated blood pressure was more common in men 35 years and older (6 of 19, 32%) than those less than 35 years old (12.8%, chi square for trend=0.03). We found no relationship between elevated blood pressure and symptoms such as fatigue or headaches. These blood pressure results compare favorably with those compiled from a routine hypertension screening program at Fort Lewis, Washington, in 1988-9¹. In that program, 505 healthy active duty soldiers had their blood pressure measured under circumstances similar to those experienced by the 78 reservists of the 123d ARCOM. Fifty-two (10.2%) Fort Lewis soldiers had elevated blood pressure. All of them were males. Older soldiers were more likely than younger ones to have high blood pressure. There is no significant difference between the prevalence of high blood pressure among healthy men 35 years and older at Fort Lewis in 1988-9 (20%) and the prevalence in men of comparable age who we screened at 123d ARCOM (Fisher's exact test p=0.35).

The diagnosis of hypertension requires, at a minimum, the confirmation of high blood pressure with a series of measurements on several occasions. Some of the soldiers who had a high blood pressure measurement on screening may eventually be diagnosed as hypertensive. Although the small number of soldiers we saw limits the statistical power of the comparison with the Fort Lewis sample, high blood pressure in the 123d ARCOM group seems to be no more common than expected in a population of healthy soldiers screened in 1989.

(4) Other physical signs

Although joints were not routinely examined in most individuals, those persons with prominent joint complaints were given a brief exam. There were no signs of acute joint inflammation such as redness, swelling, or tenderness.

c. Laboratory results

Laboratory test results of two general types will be discussed: (1) Non-specific screening tests, and (2) tests and results for a specific disease or etiological agent (disease-specific testing).

(1) Non-specific screening tests

Interpreting the results laboratory tests used for screening is very difficult in the absence of a single specific suspected diagnosis to be confirmed or ruled out. Performing a large number of laboratory tests on any group of persons usually results in a number of positive results by chance alone. For any test performed on a population of normal individuals, for example, about 5% of the results can be expected to fall outside the normal range. Confirmatory testing of all those with abnormal results is necessary before assigning a diagnosis to a particular laboratory test result.

The results of the screening of the 78 soldiers of the 123d ARCOM are still very useful, however, since patterns of results can be examined and the results can be compared with those from other populations. All soldiers with significant abnormal test results should be retested to confirm the initial screening result, and referred for additional diagnostic evaluation if necessary.

Most abnormal findings were extremely rare. Eosinophilia, which is associated with certain parasitic infections, such as enteric helminth infestations, was absent. The erythrocyte sedimentation rate (ESR) is a non-specific indicator of systemic inflammation. It can be positive in persons with certain infections, or in inflammatory diseases like rheumatoid arthritis. At Hawley Army Community Hospital, Fort Benjamin Harrison, Indianapolis, IN, the upper limit of normal for the ESR is 10-20 mm/hr. Of the 78 persons screened, 4 had ESR >20mm/hr (3.8%). Two of these were 21mm/hr, and the others were 46 and 55mm/hr, respectively. The latter two results are being repeated.

Several other abnormal laboratory indices were slightly more common. A low hematocrit or hemoglobin usually indicate anemia. Of the 78 soldiers screened, two men (2 of 60, 3.3%) and two women (2 of 18, 11.1%) had hematocrits below the normal range at Hawley Hospital. A third female soldier had a hematocrit and hemoglobin which was at the extreme lower end of the normal range.

In all but one case (a male soldier with evidence of macrocytic anemia with an ESR of 46 mm/hr), the anemias appeared to be mild, and of the types commonly encountered in general clinical practice. Up to 20% of adult women of child-bearing age, and 2% of men may have iron-deficiency anemia, for example ⁵. We can also directly

compare the results from this group with those from 186 healthy male soldiers of 7th Special Forces Group, Fort Bragg, NC, who were screened for anemia as part of a voluntary cholera vaccine program in October 1991. Nine (4.8%) had a low hematocrit. This result is very similar to that of the 123d ARCOM, where 3.3% of the men were found to have a low hematocrit. There is also no significant difference between the two groups if the results from the women in the reserve unit are included in the analysis (overall 6.4% -men and women- with low hematocrit vs. 4.8% at Fort Bragg, $p=.40$, 1-tailed Fisher's exact test).

The most common laboratory abnormalities found upon screening were the liver enzymes, lactate dehydrogenase (LDH), aspartate aminotransferase (AST or SGOT), and alanine aminotransferase (ALT or SGPT). Three (3.8%) soldiers had elevated LDH, 9 (11.5%) had elevated AST and 9 (11.5%) had elevated ALT. Four of these soldiers had elevation of more than one of the liver enzymes. Although most of these enzyme elevations were mild, ALT and SGOT for one soldier (1 of 78, 1.3%) were more than twice the upper limit of normal for the laboratory.

These results can also be compared, in part, to data from 333 healthy active duty soldiers at Fort Lewis who did not deploy to SW Asia. In January, 1991, these soldiers had ALT levels measured before enrollment in a voluntary hepatitis vaccine program (unpublished data on file, Division of Preventive Medicine, WRAIR). Twenty-six (7.8%) had ALT results above the upper limit of normal at the reference laboratory at Madigan Army Medical Center. Three (0.9%) Fort Lewis soldiers had ALT results greater than twice the upper limit of the laboratory normal range. These proportions are not significantly different than the results from the 123d ARCOM (7.8% vs. 11.5%, and 0.9% vs. 1.3%).

(2) Disease-specific testing

Specific tests for leishmaniasis, chronic brucellosis, and enteric parasites were ordered as part of the screening by the EPICON team. Tests for other diseases, such as Lyme disease and hypothyroidism, were obtained independently by physicians at Fort Knox, KY, as part of specific medical evaluations for several of the individuals in the group.

(a) Leishmaniasis

The serological test used for detecting leishmaniasis was the indirect fluorescent antibody (IFA) for Leishmania tropica, performed at WRAIR. L. tropica is the etiological agent of cutaneous

(Old World "dry" cutaneous leishmaniasis) and suspected to be the agent for a newly described manifestation of the infection called viscerotropic leishmaniasis. Serum from two soldiers in this group had a titer of 1:16, which may indicate exposure to leishmaniasis sometime in the past. Full interpretation of these IFA data must be deferred pending the availability of pre-deployment sera on these soldiers from the Army/Navy Serum Repository. Individual pre-exposure IFA titers provide an optimal basis of comparison for interpretation of marginally positive serological results such as these. Unfortunately, the performance characteristics of the IFA (which is available for research purposes only) for use as a screening test have not been fully defined, nor has the presence of anti-leishmanial antibody in the serum been definitively associated with specific symptoms or syndromes. However, additional clinical evaluation of any individuals in this group manifesting a significant antibody response may be indicated.

The diagnosis of viscerotropic leishmaniasis requires a positive bone marrow aspiration for confirmation. At present, ten individuals (out of over 500,000 deployed to SW Asia) have been diagnosed with bone marrow infection; several others are suspected to have been infected but have not been confirmed. These ten have manifested a wide spectrum of symptoms ranging from none to a persistent febrile illness resembling mononucleosis. Three of the confirmed cases have had other concurrent illnesses or infections (HIV, renal cell carcinoma, and mononucleosis). Although viscerotropic leishmaniasis in a limited number of personnel is a possibility which cannot be ruled out at present, several factors suggest that the broad spectrum of complaints reported by the soldiers of the 123d ARCOM as a group are unlikely to be attributable to viscerotropic leishmaniasis. Hair loss, bleeding gums, and joint pains localizable to specific joints have not been prominent symptoms of those patients with confirmed viscerotropic leishmaniasis.

(b) Brucellosis

Sera from six of the ARCOM soldiers were tested for antibody to Brucella spp. Although there was no evidence for definite exposure to brucellosis while these persons were in SW Asia, some of the symptoms reported by the soldiers, such as fatigue, arthralgias, myalgias, and headaches were suggestive of chronic brucellosis ⁶. Prominent symptoms reported by the six soldiers whose sera were tested were representative of the whole spectrum of reported symptoms, such as lower extremity joint pains with

fatigue (3), fever with fatigue (1), abdominal pain (1), and fatigue with hair loss (1). These sera were all determined to be negative (less than 1:80 tube agglutination titer) by the serology section, Department of Pathology, Walter Reed Army Medical Center.

(c) Enteric parasites

Seven soldiers who had reported diarrhea as a symptom submitted single stool specimens for examination for ova and parasites. No enteric pathogens were found. Blastocystis hominis was found in specimens from two of the soldiers. The role of B. hominis in causing diarrhea in humans is not widely accepted⁷. This organism has been found with approximately equal frequency (12%) in persons with and without gastrointestinal symptoms⁸. However, the presence of this organism has been suggested as an indicator of exposure to fecal contamination in the past. Since the diarrhea in both of the soldiers from whom this protozoan was isolated started during the deployment, the exposure may have occurred during that time. However, Blastocystis has also been found in persons who never left the United States.

Although with no confirmed etiological agent we cannot attribute the symptom of diarrhea to any exposure in SW Asia, the fact that the majority of soldiers with diarrhea reported the onset during the deployment does suggest the possibility of an association. In any case, a single negative stool specimen does not rule out parasitic causes of enteritis; additional stool specimens or other evaluation may be required for soldiers who have chronic persistent diarrhea.

(d) Lyme arthritis

The evaluation of two of the soldiers who reported joint pain as a predominant symptom included testing for antibody to Borrelia burgdorferi, the etiological agent of Lyme disease. Both were reported as having negative IFA titers (<1:128) at Fort Knox. In addition, none of the rashes we saw resembled erythema chronicum migrans, the rash normally associated with Lyme disease.

(e) Hypothyroidism

As mentioned above, six individuals (five females and one male) had thyroid function tests performed as part of their medical evaluation at Fort Knox (3), Fort Benjamin Harrison (2), or by a private physician (1). All were essentially normal; the TSH from one woman was slightly lower than normal.

3. Psychiatric evaluation.

The results and analysis of the psychiatric evaluation performed by MAJ Norwood are detailed in Appendix F . There was ample evidence for a very high level of distress in the 79 soldiers we evaluated, but post-traumatic stress disorder, as a specific psychiatric diagnosis, was entertained as a possibility for only a select few.

VI. Evaluation of potentially hazardous exposures

In order for any exposure to be considered as a potential source of symptoms, several criteria must be met. For example, the exposure should precede the onset of the symptom, the exposure must be present in a significantly higher number of those with the symptom than in those without it, and any symptoms attributed to the exposure should be linked to it as plausibly resulting from it as well. In considering other possible exposures to account for the symptom reports in the 123d ARCOM, any proposed exposure must be almost universal; that is, have had the potential to affect practically all military personnel in SW Asia. Soldiers in the group we evaluated were deployed to SW Asia from many different locations with at least 12 different units. Units, small groups of soldiers, and individual soldiers traveled and stayed in a wide variety of locations in theater. They deployed and returned at different times, from different locations.

A. Travel and activities of involved units during ODS/S

In an attempt to evaluate possible common or unique exposures experienced by these soldiers during ODS/S, deployment itineraries for four of the major units involved (209th Supply Co, HHC, 300th S&S Bn, 199th Supply Co, and 417th QM Co) were reviewed (Appendix G). The units, the sites they used, and dates of occupation are summarized in Table 2. There was no single location common to all of these units. Some common locations, such as Log Base Alpha and KKMC, were huge complexes shared by thousands of soldiers. In addition, the itineraries of individual soldiers within several of these units varied greatly. No proposed hazardous exposure linked to any single location can account for the symptoms in all the soldiers assigned to these units.

B. Other potential exposures

The soldiers in this group represented 37 Military Occupational Specialties (MOS), with duties as diverse as tank crewman to postal clerk, and subsequently were assigned to 11 different units in the 123d ARCOM upon demobilization.

There are few unhealthy exposures which would result in the types of symptoms and findings that we have described. Some examples of confirmed universal exposures for the group which we evaluated are: drinking bottled water in SW Asia, eating MREs (meal, ready to eat) while in SW Asia, eating locally prepared "catered" meals, living in tents, receiving an injection of immune serum globulin before deployment to SW Asia, and being bitten by insects or other arthropods in SW Asia. While all of these possibly could be responsible for some type of illness or injury, none of these exposures can explain the type of symptoms or unique timing of their onset that we have observed.

Other proposed exposures were anthrax vaccine, malaria pills and nerve agent antidote. Each of these agents has a well-described spectrum of side and adverse effects, all of which occur over a period of hours to days, which do not correspond with our findings in this group of soldiers. Anthrax vaccine was given to 69 of 79 (87.3%) soldiers interviewed, malaria tablets and nerve agent antidote were each reported by 50.6%. We found no association between any of these exposures and any of the symptoms reported; there also was no association between these agents and the number of lost days due to illness or injury, either during the deployment or after returning home.

There were other potential hazards associated with the deployment which had caused considerable concern among the soldiers in these units, including suspected exposure to microwave and ionizing radiation, petroleum products, and pesticides. These exposures, their known effects, and an evaluation of their role in explaining the symptoms experienced by the soldiers are discussed by MAJ Wanat in Appendix H.

VII. Discussion

There is no objective evidence for an outbreak of disease among the personnel of 123d ARCOM who we evaluated during this investigation.

Despite the fact that several individuals have had extensive medical evaluations, no single diagnosis has emerged. Two soldiers in this group have been hospitalized. One has been evaluated at

Walter Reed, as mentioned above, for possible viscerotropic leishmaniasis and chronic fatigue syndrome. This female soldier has been diagnosed as having major depressive illness vs. post-traumatic stress disorder; she was not felt to have chronic fatigue syndrome nor leishmaniasis. The second hospital admission was for a male soldier at Fort Knox for an evaluation of severe hip pain. He was later transferred to Wright-Patterson Air Force Base for a rheumatologic evaluation, which has been negative to date.

Chronic fatigue syndrome, although not a specific disease, was initially suggested as a unifying description for the bulk of the symptoms reported by these soldiers. We feel that this is unlikely for several reasons. Most accepted definitions of the chronic fatigue syndrome include a reduction in daily activity of 50% or more, and require exclusion of all other chronic clinical conditions, including pre-existing psychiatric diseases, as major criteria ⁹. Given the relatively low levels of documentable morbidity and disability of the fatigue reported by this group as a whole, the distinctive pattern of the symptoms, lack of common exposures, and high levels of external stressors, we feel that the chronic fatigue syndrome may apply to very few of the soldiers, if any.

Prolonged, exaggerated effects of jet lag may be responsible for some of the symptoms ¹⁰. Although this would explain the nature of the symptoms and the clustering of symptoms around the time of redeployment, persistence of these symptoms for more than two to three weeks would not be expected.

Stress had been considered as a discrete causative agent for many of the reported symptoms before the EPICON request was forwarded. Post-traumatic stress disorder and other manifestations of stress had been suggested as possible diagnoses by COL Teer in his assessment of the first group of 58 reservists on 19-20 March.

The results of our investigation suggest that stress may be significantly contributing to, if not the major cause for a large proportion of the symptoms reported. Insomnia, lassitude and fatigue, lack of motivation, forgetfulness, mood changes, irritability, feeling depressed, and diarrhea are classical physiological manifestations of stress. The timing of the onset of most of these symptoms in association with redeployment may be a reflection of the stress of homecoming more than that related to specific events in SW Asia.

Soldiers in this group told us about considerable emotional difficulties they faced during the mobilization, during the deployment, and since returning from ODS/S. Many spoke of strained

or broken marriages and relationships, financial setbacks, and the adjustments that returning home has demanded. We feel that the experience of being mobilized and deployed was very stressful for them. We hypothesize that the adjustments demanded by these stresses may have been especially difficult for Reservists, many of whom may not have been prepared for the abrupt transition from civilian to military life when mobilized, and the equally sudden return to their homes and families when released from active duty.

In addition, for a few, the deployment experience was not entirely unpleasant. These soldiers felt that they were making an important contribution to a good cause, and have found that getting back to college classes and work has left them feeling empty and unmotivated. One turned down an opportunity to extend his stay in SW Asia, which he said he now regrets.

Although there also seemed to be some sources of stress unique to these units, such as dissatisfaction with some of the command structure, the other sources of stress discussed here would not be expected to be limited to the 123d ARCOM. Problems and symptoms like those found here would be expected to occur throughout the Reserve forces which deployed. Even before the current investigation received national media attention in late March and early April, other units experiencing similar problems had contacted the staff of the 123d ARCOM Surgeon's office for information. Since then, the staff has received calls from Reserve units and individual soldiers with complaints very similar to those expressed by the soldiers we evaluated.

There are several plausible explanations for the occurrence of this outbreak of symptoms in the 123d ARCOM. The unit questionnaire (Appendix A) may have stimulated interest and concern when it was circulated in mid to late February. However, concern and discussions among the soldiers about shared symptoms preceded this questionnaire. Some of the soldiers we evaluated failed to note their symptoms, or did not consider them a problem, until after some attention had been focused upon them by other reservists, the questionnaire, and the media publicity about them. This may also explain the second peak in onset of fatigue and other symptoms in December 1991-January 1992 that we found in this investigation (Figures 1 and 2). This "second wave" may have occurred as awareness and concern about symptoms increased in the units.

The medical problems experienced by other soldiers may have also generated increased concern. In addition to the 123d ARCOM soldier admitted to Walter Reed mentioned above, two other soldiers

in this ARCOM (not part of the present investigation) have been evaluated for viscerotropic leishmaniasis at Walter Reed since October 1991. One of these has a confirmed bone marrow infection with Leishmania.

These factors may have stimulated sufficient interest and concern in the ARCOM to allow the problems experienced by these soldiers to become the first recognized occurrence of this type since the deployment to SW Asia.

VIII. Limitations of the study

There are several factors which limit the investigation of this possible outbreak of unknown illness. Most importantly, there is no cohesive concept or definition of a "case" of disease which is compatible with the broad spectrum of reported problems. Secondly, there is no evidence for a unifying, universal or well-recognized exposure to any biological or physical cause of disease.

Since all soldiers included in the investigation were self-selected, the prevalence, incidence, or attack rates of "disease" cannot be estimated. In addition, there was no true control group, evaluated concurrently, with which the experiences of this group could be compared. With these limitations, it is impossible to determine if the frequency of symptoms reported here are higher than one would expect in other similar groups of Reservists, deployed or not deployed to SW Asia. Unfortunately, we would expect to encounter considerable difficulty in pursuing any type of studies which address this question which could control or adjust for the selection bias inherent in our study. The symptoms of concern were non-specific and relatively common. We suspect that any group of adults may yield similar reports when similarly questioned under the circumstances found in the 123d ARCOM in April 1992. The subjective nature of the symptoms coupled with widely disseminated suspicion of their association with the deployment to SW Asia provide substantial obstacles to the conduct of a productive, unbiased study.

The lack of a plausible, unifying diagnosis has restricted the analysis to symptoms, or groups of symptoms, none of which appear to be associated with any objective measure of poor health or injury for the group as a whole. We were unable to distinguish those symptoms (diarrhea, for example) which were associated with acute, self-limited illnesses, from those which occurred on an intermittent basis outside the context of an acute illness. Another restriction on our ability to distinguish between persons who were

"ill" from those who were merely reporting symptoms was the lack of an objective rating of severity for individual symptoms. One symptom, back pain, for example, can be disabling for one individual, while many minor symptoms can be tolerated by another person very well.

Because of the relatively small number of soldiers involved, there are substantial limits to the statistical power of the analyses; the associations between exposures and symptoms might attain statistical significance if a larger group of soldiers were examined. On the other hand, this group, though small, probably included the soldiers of the 123d with the most troubling symptoms. The lack of objective evidence of a shared disease or adverse exposures even in this highly selected group, and the fact that there are no substantial differences between them and the comparison groups at Fort Lewis and Fort Bragg, are reassuring. If the soldiers from the 123d ARCOM that we evaluated had developed a significant illness which affected the parameters we were able to examine, one would expect to find striking differences between them and the non-deployed comparison groups which had been pre-screened to be in good health.

IX. Summary of Major Findings, Conclusions and Recommendations.

A. Following screening of 79 soldiers of the 123d ARCOM and extensive medical evaluation of six, no single diagnosis or medical cause has emerged which can account for the majority of the reported symptoms.

B. Ruled out as major factors: Leishmaniasis (All 78 screened, two possible positive), brucellosis (none positive out of six with the most prominent symptoms tested), Lyme disease (none positive out of two with joint pains as major complaint tested), hypothyroidism (none positive out of five tested)

C. The evaluation of 79 soldiers on 11-12 April can be summarized as follows:

1. Subjective findings.

a. Fatigue was most common (70%) symptom. Other systemic symptoms like feverishness, abdominal pain, and diarrhea were much less common.

b. One typical pattern for these symptoms was the onset of fatigue and associated symptoms (memory loss, sleep disturbance, etc.) *after* redeployment from SW Asia. There was one exception to this trend: diarrhea with onset during the deployment was slightly more common than reported with other symptoms.

c. Morbidity and disability associated with these symptoms were low.

(1) Musculoskeletal injury, (or recovery from elective surgery) was the largest single medical cause of lost time from work/duty/school: 59.7% of total sick days during deployment, 43.8% since returning home.

(2) There has been a low number of lost work days due to all non-injury illnesses since returning from SW Asia : 45.6% of soldiers interviewed reported no loss of work due to any non-injury illness, and 85% have lost 10 days or less. Six individuals (7.6%) accounted for 48% of all work days lost due to illness since redeployment.

(3) We found no association between most individual symptoms (or groups of symptoms) and lost time from work due to illness. Exceptions to this were soldiers with abdominal pain and irritability (mood changes).

2. Objective findings

a. Reported hair loss by 21.5% was manifested primarily as diffuse thinning of the hair.

b. Skin rashes were representative of dermatological conditions found in general population.

c. Oral and dental complaints stem from poor preventive care and suboptimal hygienic practices over years. There was abundant objective evidence of chronic neglect of teeth.

d. The proportion of 123d ARCOM soldiers with elevated blood pressure (15%), elevated liver enzyme (ALT) (11.5%), or low hematocrit (6.4%) was not markedly different than that of comparison populations of healthy active duty soldiers not deployed to SW Asia.

e. Enteric parasites were not ruled out: Chronic persistent diarrhea may require additional individual evaluation to make diagnosis.

3. Specific exposures.

a. There was no association of anthrax vaccine, nerve agent antidote, or malaria pills with any symptom or lost work days.

b. We have no evidence that hazardous exposures to microwaves, chemicals or radiation occurred. The types and pattern of the symptoms reported and available objective evidence also do not support any link with these exposures.

4. Measures of stress were the most striking positive findings of our evaluation. These soldiers reported very high levels of stress, to which many of the subjective symptoms, and some of the objective ones, such as high blood pressure and loss of hair may be attributable. Post-traumatic stress disorder, on the other hand, seemed to be present in very few of these soldiers.

D. Conclusions.

1. There is at present no objective evidence to suggest an outbreak of any disease in 123d ARCOM. We feel that the documentable medical problems and illnesses found in this group are typical of what one would expect in the general population.
2. Musculoskeletal injuries and their sequelae were the most important medical problems experienced by this group, during and since the deployment.
3. Stress associated with post-deployment adjustment to civilian life is a plausible etiology for the many of the symptoms reported, especially sleep disturbances, depression, forgetfulness, and cognitive difficulties. In general, these symptoms have been worrisome, but not debilitating.
4. Association of any illness, injury, or symptom with the deployment must be made on an individual basis. In this group, the only problems which seem directly related to the deployment were some of the injuries. To date we have found no objective evidence of disease which could be proven to be related directly to deployment to SW Asia.
5. Chronic or persistent diarrhea may be associated with the deployment, although no specific agent has been identified. However, diarrhea and other gastrointestinal symptoms with onset now or in the future are much less likely to be related to known enteric pathogens from SW Asia.

E. Recommendations.

1. Obtain at least three stool specimens or a formal GI consult on soldiers in the group of 79 who have chronic diarrhea dating back to deployment.
2. No additional medical referrals are necessary at present. Soldiers of the 123d ARCOM should be encouraged to go to their health care providers if they feel ill, and receive the appropriate care. Once evaluated, a determination about the potential for the association of the illness or injury with military service can be

made. Once diagnoses or syndromes are recognized, additional epidemiological studies may be possible.

3. Continue the stress management evaluation and intervention using resources of 55th Medical Detachment (Psych), as described in Appendix F.

X. Acknowledgements

The EPICON team is grateful for the hospitality and support exhibited by the staff of the Headquarters, 123d ARCOM, at Fort Benjamin Harrison during the course of this investigation.

We thank the Reservists who appeared for medical evaluation for their patience throughout what was for many a slow and tedious process on 11 and 12 April, and for their candid responses to our questionnaires and in the interviews.

We gratefully acknowledge the substantial contributions of LTC Peter Connallon MSC and CPT Joyce Flanigan NC, of the Office of the 123rd ARCOM Surgeon in completing this investigation. LTC Connallon provided an invaluable service in organizing and coordinating the efforts of personnel at WRAIR and the 123d ARCOM to accomplish this mission under difficult circumstances. We recognize CPT Flanigan for her professionalism and dedication to the soldiers of 123d ARCOM. We are also grateful to SFC Bradley Nahas and LTC Sandra Campbell NC for their assistance during the medical screening.

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APPENDIX A
SAMPLE UNIT SURVEY QUESTIONNAIRE

0800

MEDICAL SURVEY FOR DESERT SHIELD/STORM TROOPS

NAME _____ GRADE _____ DOB: 68 DMOS IN SWA 71L
 HOME PHONE _____ WORK PHONE _____
 PLACES OF DUTY IN SWA Log Base A + E, Part of Dammam
 PRESENT UNIT OF ASSIGNMENT 300th
 UNIT OF ASSIGNMENT IN SWA 300th

1. DO YOU SUFFER FROM HEADACHES/HOW OFTEN/TO WHAT DEGREE? No
2. DO YOU HAVE NOSE BLEEDS/HOW OFTEN/TO WHAT DEGREE? No
3. DO YOU HAVE EARACHES/HOW OFTEN/TO WHAT DEGREE? No
4. DO YOU HAVE ANY HEARING LOSS/TO WHAT DEGREE? No
5. DO YOU HAVE ANY HAIR LOSE/TO WHAT DEGREE? No
6. DO YOU HAVE PAINFUL OR ACHY JOINTS/HOW OFTEN/TO WHAT DEGREE?
No
7. HAVE YOU SUFFERED FROM DIARRHEA/HOW OFTEN/TO WHAT DEGREE? Yes
Bacteria of Colon / 4 days / Moderate
8. HAVE YOU SUFFERED FROM NAUSEA/HOW OFTEN/TO WHAT DEGREE? No
9. HAVE YOU SUFFERED FROM CONSTIPATION/HOW OFTEN/TO WHAT DEGREE? No
10. HAVE YOU SUFFERED FROM INTESTINAL DISCOMFORT/HOW OFTEN/TO WHAT DEGREE?
No

11. HAVE YOU SUFFERED FROM URINARY TRACT INFECTIONS/HOW OFTEN/TO WHAT DEGREE? _____

No

12. HAVE YOU SUFFERED FROM HIGH OR LOW SEX DRIVE/HOW OFTEN/TO WHAT DEGREE? _____

No Libido

13. HAVE YOU SUFFERED FROM BLACK OUTS OR LOST TIME/HOW OFTEN/LENGTH OF TIME? _____

No

14. HAVE YOU SUFFERED FROM SEIZURES/HOW OFTEN/TO WHAT DEGREE? _____

No

15. HAVE YOU SUFFERED FROM MUSCLE SPASMS/HOW OFTEN/TO WHAT DEGREE? _____

No

16. HAVE YOU SUFFERED FROM LACK OF OR POOR CIRCULATION/HOW OFTEN/TO WHAT DEGREE? Yes/Runs with sleep disorder/Moderate

17. HAVE YOU HAD A DECREASE IN MUSCLE MASS IN YOUR LEGS AND/OR FOREARMS/TO WHAT DEGREE? Yes/Lossing Weight

18. HAVE YOU SUFFERED FROM A CHRONIC AND/OR PRODUCTIVE COUGH/HOW LONG/WHEN/TO WHAT DEGREE? No

19. HAVE YOU SUFFERED FROM CHRONIC FATIGUE OR A STATE OF CONSTANT TIREDNESS/HOW OFTEN/TO WHAT DEGREE? Yes/Can sleep 13 hours through/Constantly tired

20. HAVE YOU SUFFERED FROM INSOMNIA OR AN INABILITY TO SLEEP THROUGH THE NIGHT/HOW OFTEN/TO WHAT DEGREE? No

21. HAVE YOU SUFFERED FROM EYE SENSITIVITY TO INDOOR OR OUTDOOR LIGHT/HOW OFTEN/TO WHAT DEGREE? No

22. HAVE YOU SUFFERED FROM A STIFF NECK/HOW OFTEN/TO WHAT DEGREE? No

23. HAVE YOU SUFFER FROM SORE THROATS/HOW OFTEN/TO WHAT DEGREE? No

24. HAVE YOU HAD PROBLEMS WITH SWOLLEN OR TENDER LYMPH GLANDS/HOW OFTEN/TO WHAT DEGREE? Yes / A Few Times / Tender + Swollen

25. HAVE YOU SUFFERED DIFFICULTY WITH YOUR DEPTH PERCEPTION/HOW OFTEN/TO WHAT DEGREE? No

26. HAVE YOU SUFFERED FROM TEETH HURTING OR FEELING MUSHY IN THE GUMS/HOW OFTEN/TO WHAT DEGREE? No

27. HAVE YOU SUFFERED FROM SHORT TERM MEMORY LOSS OR CONFUSION/HOW OFTEN/TO WHAT DEGREE? No

28. HAVE YOU SUFFERED FROM DEPRESSION OR NO GET-UP-AND-GO/HOW OFTEN/TO WHAT DEGREE? Yes / No Get-Up + Go / Daily / Moderate

29. HAVE YOU SUFFERED FROM NERVOUSNESS FOR NO APPARENT REASON/HOW OFTEN/TO WHAT DEGREE? No

30. HAVE YOU SUFFER FROM NUMBNESS IN ANY PART OF YOUR BODY/WHERE/HOW OFTEN/TO WHAT DEGREE? No

31. HAVE YOU HAD PROBLEMS WITH HIGH OR LOW GRADE FEVERS/HOW OFTEN/TO WHAT DEGREE? No

32. HAVE YOU SUFFERED FROM WEIGHT GAIN OR LOSS/HOW MUCH/OVER WHAT PERIOD OF TIME? Yes / Lost 7 lbs in 1 month

33. HAVE YOU SUFFERED FROM HIGH OR LOW BLOOD PRESSURE/HOW OFTEN/TO WHAT DEGREE? Unknown

34. HAVE YOU SUFFERED FROM SKIN RASHES AND OR BOILS/HOW OFTEN/TO WHAT DEGREE? No

35. HAVE YOU SUFFERED FROM FEELING OF ANXIETY OR FEELING OF PHOBIA (SUDDEN PANIC, SUDDEN FEAR, SUDDEN OUT BURST, UNABLE TO CONTROL YOUR TEMPER, LACK OF TOLERANCE FOR LOVED ONES) / EXPLAIN WHAT APPLIES TO YOU / HOW OFTEN / TO WHAT DEGREE? Daily, No Known Cause

36. FEMALES ONLY: HAS YOUR MENSTRUAL CYCLE CHANGED ANY / TO WHAT DEGREE?

N/A

37. DID YOU TAKE THE ANTHRAX SHOT IN SWA / APPROXIMATE DATE? Yes / Jan

38. WHERE ENCAMPED NEAR (WITHIN A 4 MILE RADIUS OF A) COMMUNICATIONS CENTER AND MICROWAVE DISHES / WERE THE DISHES ON A GROUND LEVEL OR SET UP ON TOWERS / HOW LONG / WHERE WERE YOU ENCAMPED?

39. DID YOU HAVE DOGS, CATS, CAMELS, SHEEP, DESERT RATS, OR ANY OTHER FURRED ANIMAL AROUND YOU / HOW OFTEN / WHAT WAS (WERE) THE ANIMAL(S) Yes / Dogs

Camels, sheep, Desert Rats / Daily

40. DID YOU TAKE THE NERVE AGENTS PILLS THAT WERE GIVEN BY THE GOVERNMENT / HOW MANY / HOW LONG? Yes / 3-4 pills / Two Days

APPENDIX B
MEMO IN RESPONSE TO EPICON TASKING



DEPARTMENT OF THE ARMY
WALTER REED ARMY INSTITUTE OF RESEARCH
WALTER REED ARMY MEDICAL CENTER
WASHINGTON, D.C. 20307-5100



IN REPLY REFER TO

SGRD-UWK-C

8 April 1992

MEMORANDUM THRU

Director, Division of Preventive Medicine, Walter Reed Army
Institute of Research, Washington, DC 20307-5100

Director, ^{CPT} Walter Reed Army Institute of Research, Washington, DC
20307-5100

FOR Office of the Surgeon General, U.S. Army (ATTN: SGPS-PSP-D
COL Tomlinson) 5109 Leesburg Pike, Falls Church, VA
22041-3258

SUBJECT: Epidemiology Consultation (EPICON) to 123rd Army
Reserve Command Surgeon.

1. In response to request for assistance by the 123rd Army Reserve Command Surgeon, an EPICON team has been formed to investigate a cluster of illness among approximately 75 soldiers of the command. This illness has been characterized as a syndrome of fatigue, head and joint aches, abdominal complaints, depression or other behavioral changes, and other complaints, such as tooth pain, bleeding gums, and hair loss. Onset of illness in these soldiers has not been well characterized; etiology is unknown, but stress is felt to play a major role. All affected soldiers deployed to SW Asia as part of ODS/S 1990-91.

2. EPICON Mission:

- a. Address the concerns (of soldiers and command) that these symptoms have caused, and make appropriate recommendations for care of ill soldiers.
- b. Assess risk factors, possible causes for symptoms.

SGRD-UWK-C

SUBJECT: Epidemiology Consultation (EPICON) to 123rd Army Reserve Command Surgeon.

c. Determine the strength of the association of this illness (or illnesses) with deployment to SW Asia.

3. Team members are:

MAJ Robert F. DeFraités MC, Preventive Medicine Officer, Team leader, Division of Preventive Medicine, WRAIR.

MAJ E. Robert Wanat II MC, Occupational Medicine Officer, Occupational and Environmental Medicine Division, USAEHA, APG, MD.

MAJ Anne Norwood MC, Psychiatrist.

MAJ David Cowan, MSC, Epidemiologist, Division of Preventive Medicine, WRAIR (USAR, to come on active duty for follow-on studies).

MAJ Stephen B. Williams DC, Oral Pathologist, AFIP.

SPC Timothy Callahan, Preventive Medicine Technician, Division of Preventive Medicine, WRAIR

4. Plan.

Mission will be accomplished in three stages:

a. Initial EPICON visit to 123rd ARCOM (9-13 April): Determine the nature of the illness(es) by examining ill soldiers and their records. This will permit some narrowing of the differential diagnosis, and definition of the temporal relationship of the illness(es) with the deployment to SW Asia and other events. MAJ DeFraités traveled to Indianapolis 3-5 April to coordinate plans for the team visit.

b. Follow-up EPICON visit to 123rd ARCOM (6-7 June): Survey all members of the affected units to detect unreported cases, and determine attack rates and risk factors for illness.

c. Additional surveys of the units in question and other similar units may be necessary to determine other risk factors for illness (length of deployment, location in SW Asia, unit cohesion, etc.)

4/8/92

ENCL 1

Tasks for Initial EPICON visit (9-13 April)

1. Occupational/Environmental Medicine.

a. Assess and prioritize these potential exposures (reported by soldiers) re: biological plausibility of association with illnesses under consideration:

Chemical:

- Heavy metals/arsenicals
- Organic compounds/solvents
- CARC or other paints or coatings
- Pesticides
- Stored chemicals(?)/hazardous waste

Physical:

- Radioactive waste
- Patriot missile explosion/ radar

Biological:

- Anthrax vaccine

If not biologically plausible, we must have easily understood explanations available. If biologically plausible, how can we evaluate further (survey questions, non-invasive specimens-blood, urine-for biomarkers), to prove or disprove these hypotheses.

b. Construct differential diagnosis to explain symptoms, including OM/EM exposures not mentioned above. Other symptoms to be included as being possibly linked to this syndrome are bleeding gums, hair loss, peripheral neuropathy.

c. Document onset of conditions/symptoms before ODS, if possible.

2. Psychiatry.

a. Determine role (Major/moderate/minor/none) of post-traumatic stress disorder in these illnesses.

b. Determine role of pre-ODS symptoms/history in current behavioral symptoms.

c. Determine possible role of mass psychogenic illness in this situation.

3. Oral health/ Dentistry.

a. Examine soldiers with oral complaints; examine records.

b. Categorize findings:

- (1) No physical finding to explain symptom
- (2) Plausible explanation for symptom (positive physical finding)

- (a) Condition probably pre-dated ODS.
- (b) Condition likely to have arisen during or since ODS. How recent?

c. Make recommendations for additional referral and care.

APPENDIX C
STRUCTURE OF 123d ARMY RESERVE COMMAND

APPENDIX D
EPICON MEDICAL QUESTIONNAIRE

Label

123rd ARCOM Medical Questionnaire

Today's Date (Mo/Day/Yr): ___/___/___

Name: Last: _____ First: _____ MI: _____

SSN: _____

Present Branch of service:

- Army
- Other Branch _____

Present Component:

- Reserves
- Active
- National Guard

Grade/Rank: _____ Present MOS: _____ Job description (fuel handler, clerk, etc.) _____

Age: _____

Ethnic Group: White Black Hispanic Oriental Other: _____

Sex: Male Female

Street Address: _____ City: _____ State: _____ Zip: _____

Work phone: (____) _____ Home phone: (____) _____

Present Unit: _____

When did you arrive in SW Asia/Saudi?(Mo/Day/Yr) ___/___/___

(If you made several trips to and from the Persian Gulf region, indicate approximate dates for each trip below)

In-theater:

From(Mo/Day/Yr) ___/___/___ to (Mo/Day/Yr) ___/___/___

and again

From(Mo/Day/Yr) ___/___/___ to(Mo/Day/Yr) ___/___/___

In which day/month did you leave SW Asia for the last time? (Mo/Day/Yr) ___/___/___

To which unit(s) were you assigned while you were in SW Asia? _____

Describe your itinerary while in Southwest Asia: (Locations, how long you stayed, where you slept)

Location (City, camp)	Length of Stay (approx. dates)			Quarters (warehouse/tent)	Source food/water
	Arrived	Departed	Total days		
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----

Vaccines received immediately before, during and since deployment to SW Asia: (Check all that apply)

- GG (gamma globulin) # doses _____ Dates: _____
- Typhoid # doses _____ Dates: _____
- Anthrax # doses _____ Dates: _____
- Other: _____ # doses _____ Dates: _____
- _____ # doses _____ Dates: _____

Prophylactic medications (medicine to prevent illness, taken for at least 2 weeks in a row):

- Malaria pills (Chloroquine, CP tablets)
- Ciprofloxacin pills (blisterpak)
- Other: _____ Dates: _____

Occupational History

Civilian occupation(s) before deployment (Most recent-> earliest)

Dates	Job(Title/Describe duties)	Hrs/week (avg)	Chemicals used
_____	_____	---	_____
_____	_____	---	_____
_____	_____	---	_____
_____	_____	---	_____

Pre-deployment MOS/job title: _____

Deployment MOS/job title: _____

Dates/Job title	Usual duties	Hrs/week (avg)	Chemicals/envIRON. expos.
_____	_____	---	_____
_____	_____	---	_____
_____	_____	---	_____

Civilian occupation(s) after deployment (First -> most recent)

Dates	Job(Title/Describe duties)	Hrs/week (avg)	Chemicals used
_____	_____	---	_____
_____	_____	---	_____
_____	_____	---	_____
_____	_____	---	_____

Leisure/sports activities

	Activity	Duration	Frequency(#/wk)
Pre-deployment	-----	-----	-----
	-----	-----	-----
	-----	-----	-----
Deployment	-----	-----	-----
	-----	-----	-----
	-----	-----	-----
Post-deployment	-----	-----	-----
	-----	-----	-----
	-----	-----	-----

Hobbies/avocations (eg., woodworking, furniture refinishing, model building)

While deployed in SW Asia, about how many total days missed duty time did you have due to medical problems? _____

After returning from SW Asia, about how many days total (duty, work, or school) did you miss because of medical problems? _____

List the illnesses/injuries you have had while deployed in SW Asia, and since returning, even if no days were missed from duty, school, or work:

General Description (eg. "cold", "flu")	Length of Illness (approx. dates)		Symptoms	# Days missed
	Started	Ended		
1. _____	-----	-----	-----	---
2. _____	-----	-----	-----	---
3. _____	-----	-----	-----	---
4. _____	-----	-----	-----	---
5. _____	-----	-----	-----	---
6. _____	-----	-----	-----	---
7. _____	-----	-----	-----	---

Have you been to a doctor for any of the illnesses or injuries you listed above? Yes No

Which ones?: (List the line number, eg., #1, #3, etc.) _____

Do you smoke cigarettes now? Yes No

If yes, how many packs per day, on the average, do you smoke: _____

How many years have you been a smoker? _____

If no, have you ever smoked more than 100 cigarettes in your lifetime?

- Yes, but quit in the last six months
- Yes, but quit more than six months ago
- Never smoked

Do you use smokeless tobacco (snuff, chewing tobacco)?

- Yes, everyday
- Yes, several times a week
- No

How much alcohol do you drink, per week, on the average?
(1 drink=1 10 oz. beer, 1 oz. hard liquor, or 5 oz. of wine)

- None
- Less than 5 drinks/week
- 5-10 drinks /week
- 11-15 drinks/week
- 16 or more drinks per week

Any marital status changes (within three months before, during , and ever since) deployment?

- Marriage or engagement Date: _____
- Separation Date: _____
- Divorce Date: _____

Family changes (births/deaths)(immediately before, during , and after) deployment:

- Death of close relative
- Birth of child

Present Illness Data (MD)

Major reason for referral to COL Teer (check the one that applies best):

- Symptoms (self referred)
- As result of previous questionnaire(s)
- Follow-up of injury, Describe: _____
- Other: _____

CHIEF COMPLAINT: _____

Any other symptoms at present?:
(Check all that apply)

	Approximate Date of Onset	≥ 6 months?
<input type="checkbox"/> Fever(____°).....	_____	<input type="checkbox"/>
<input type="checkbox"/> Chills.....	_____	<input type="checkbox"/>
<input type="checkbox"/> New gen. Headaches.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Muscle pain (not due to physical activity).....	_____	<input type="checkbox"/>
<input type="checkbox"/> Gen. muscle weakness.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Unusual fatigue (in excess of normal).....	_____	<input type="checkbox"/>
Does not resolve with bedrest <input type="checkbox"/>		
Reduces daily activity by ≥50% <input type="checkbox"/>		
<input type="checkbox"/> Gen. Fatigue ≥24 hrs after normal exercise.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Joint pains with swelling.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Joint pains without swelling.(migratory).....	_____	<input type="checkbox"/>
<input type="checkbox"/> Sore throat.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Tender Lymph Nodes in neck.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Sleep disturbance.....	_____	<input type="checkbox"/>
 <input type="checkbox"/> Neuropsychological symptoms		
<input type="checkbox"/> Depressed.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Photophobia.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Transient visual scotomata.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Forgetfulness.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Excessive irritability.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Confusion.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Depressed.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Difficulty thinking.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Inability to concentrate.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Unusual/excessive hair loss.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Dental problems.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Ear pain or ringing.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Urinary frequency or urgency.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Abdominal pains.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Night sweats.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Jaundice (yellow eyes or skin).....	_____	<input type="checkbox"/>
<input type="checkbox"/> Nausea or Vomiting.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Loss of appetite.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Diarrhea	_____	<input type="checkbox"/>
<input type="checkbox"/> Cough/cold.....	_____	<input type="checkbox"/>
<input type="checkbox"/> Menstrual problems.....	_____	<input type="checkbox"/> Descr: _____
<input type="checkbox"/> Skin sores or rash (describe below).....	_____	<input type="checkbox"/>

Skin rash description: _____

Any other symptoms? _____

Symptoms onset described as sudden, or subacute? Yes No

Weight loss: Yes No amount, estimated, in pounds: _____

Physical Examination

Date:(DD/MM/YY)_____

Vital signs:

Weight:_____lbs./kgs Height:_____in./cm

Temp:_____° C. or _____° F.

Pulse_____

BP _____/_____sitting If other than sitting, specify:_____

Respirations:_____/minute

HEENT: Normal Abnormal

Scalp:_____

Throat:_____

Lymph nodes: _____

Comments:_____

Respiratory: Normal Abnormal

Comments:_____

Cardiovascular: Normal Abnormal

Comments:_____

Abdomen: Normal Abnormal

Comments:_____

Hepatomegaly: Yes No

Comments:_____

Liver size (cm)_____

Splenomegaly: Yes No

Comments:_____

Spleen size (cm)_____

Abdominal mass: Yes No

Mass size (cm)_____

Comments:_____

Other abdominal findings: Yes No

Comments:_____

Musculoskeletal: Normal Abnormal

Comments: _____

Neuro: Normal Abnormal

Comments: _____

Genital: Normal Abnormal

Comments: _____

Rectum: Normal Abnormal Not Done

Comments: _____

Skin: Normal Abnormal

Comments: _____

Lymph nodes: Normal Abnormal

Comments: _____

APPENDIX E
BRIEF SYMPTOM INVENTORY QUESTIONNAIRE

BSYM

Below is a list of problems and complaints that people sometimes have. Please read each one carefully. Using the scale below, please circle the number to the right that best describes how much discomfort that problem has caused you DURING THE PAST WEEK INCLUDING TODAY. Circle only one number for each problem and do not skip any items.

	NOT AT ALL	A LITTLE BIT	MODERATELY	QUITE A BIT	EXTREMELY	
	0	1	2	3	4	
S 1.	Nervousness or shakiness inside.....	0	1	2	3	4 (401)
S 2.	Repeated unpleasant thoughts that won't leave your mind.....	0	1	2	3	4 (402)
S 3.	Faintness or dizziness.....	0	1	2	3	4 (403)
S 4.	Loss of sexual interest or pleasure.....	0	1	2	3	4 (404)
S 5.	The idea that someone else can control your thoughts.....	0	1	2	3	4 (405)
S 6.	Feeling others are to blame for most of your troubles.....	0	1	2	3	4 (406)
S 7.	Trouble remembering things.....	0	1	2	3	4 (407)
S 8.	Feeling easily annoyed or irritated.....	0	1	2	3	4 (408)
S 9.	Pains in heart or chest.....	0	1	2	3	4 (409)
S 10.	Feeling afraid in open spaces or streets.....	0	1	2	3	4 (410)
S 11.	Feeling low in energy or slowed down.....	0	1	2	3	4 (411)
S 12.	Thoughts of ending your life.....	0	1	2	3	4 (412)
S 13.	Feeling that most people cannot be trusted.....	0	1	2	3	4 (413)
S 14.	Poor appetite.....	0	1	2	3	4 (414)
S 15.	Crying easily.....	0	1	2	3	4 (415)
S 16.	Suddenly scared for no reason.....	0	1	2	3	4 (416)
S 17.	Temper outbursts that you could not control.....	0	1	2	3	4 (417)
S 18.	Feeling lonely even when you are with people.....	0	1	2	3	4 (418)
S 19.	Feeling blocked in getting things done.....	0	1	2	3	4 (419)
S 20.	Feeling lonely.....	0	1	2	3	4 (420)
S 21.	Feeling blue.....	0	1	2	3	4 (421)
S 22.	Worrying too much about things.....	0	1	2	3	4 (422)
S 23.	Feeling no interest in things.....	0	1	2	3	4 (423)
S 24.	Feeling fearful.....	0	1	2	3	4 (424)
S 25.	Your feelings being easily hurt.....	0	1	2	3	4 (425)
S 26.	Feeling others do not understand you or are unsympathetic.....	0	1	2	3	4 (426)
S 27.	Feeling that people are unfriendly or dislike you.....	0	1	2	3	4 (427)
S 28.	Feeling inferior to others.....	0	1	2	3	4 (428)
S 29.	Nausea or upset stomach.....	0	1	2	3	4 (429)
S 30.	Feeling that you are watched or talked about by others.....	0	1	2	3	4 (430)
S 31.	Trouble falling asleep.....	0	1	2	3	4 (431)
S 32.	Having to check and double-check what you do.....	0	1	2	3	4 (432)
S 33.	Difficulty making decisions.....	0	1	2	3	4 (433)
S 34.	Feeling afraid to travel on buses, subways, or trains.....	0	1	2	3	4 (434)
S 35.	Trouble getting your breath.....	0	1	2	3	4 (435)
S 36.	Hot or cold spells.....	0	1	2	3	4 (436)

	NOT AT ALL	A LITTLE BIT	MODERATELY	QUITE A BIT	EXTREMELY		
	0	1	2	3	4		
S 37.	Having to avoid certain things, places, or activities because they frighten you					0	1 2 3 4 (437)
S 38.	Your mind going blank					0	1 2 3 4 (438)
S 39.	Numbness or tingling in parts of your body					0	1 2 3 4 (439)
S 40.	The idea that you should be punished for your sins					0	1 2 3 4 (440)
S 41.	Feeling hopeless about the future					0	1 2 3 4 (441)
S 42.	Trouble concentrating					0	1 2 3 4 (442)
S 43.	Feeling weak in parts of your body					0	1 2 3 4 (443)
S 44.	Feeling tense or keyed up					0	1 2 3 4 (444)
S 45.	Thoughts of death or dying					0	1 2 3 4 (445)
S 46.	Having urges to beat, injure, or harm someone else					0	1 2 3 4 (446)
S 47.	Sleep that is restless or disturbed					0	1 2 3 4 (447)
S 48.	Having urges to break or smash things					0	1 2 3 4 (448)
S 49.	Feeling very self-conscious with others					0	1 2 3 4 (449)
S 50.	Feeling uneasy in crowds, such as shopping or at a movie					0	1 2 3 4 (450)
S 51.	Never feeling close to another person					0	1 2 3 4 (451)
S 52.	Spells of terror or panic					0	1 2 3 4 (452)
S 53.	Getting into frequent arguments					0	1 2 3 4 (453)
S 54.	Feeling nervous when you are left alone					0	1 2 3 4 (454)
S 55.	Others not giving you proper credit for your achievements					0	1 2 3 4 (455)
S 56.	Feeling so restless you couldn't sit still					0	1 2 3 4 (456)
S 57.	Feelings of worthlessness					0	1 2 3 4 (457)
S 58.	Feeling that people will take advantage of you if you let them					0	1 2 3 4 (458)
S 59.	Thoughts and images of a frightening nature					0	1 2 3 4 (459)
S 60.	Feelings of guilt					0	1 2 3 4 (460)
S 61.	The idea that something is wrong with your mind					0	1 2 3 4 (461)
S 62.	Repeated, unpleasant dreams or nightmares					0	1 2 3 4 (462)
S 63.	Feelings of reliving something very unpleasant and traumatic					0	1 2 3 4 (463)
S 64.	Avoiding certain things, places, or activities because they remind you of something unpleasant and traumatic					0	1 2 3 4 (464)
S 65.	Feeling hyperalert					0	1 2 3 4 (465)
S 66.	Feeling easily tired					0	1 2 3 4 (466)
S 67.	Less interested in activities once important to you					0	1 2 3 4 (467)
S 68.	Feeling detached or estranged from others					0	1 2 3 4 (468)
S 69.	Less upset or angry about things which once caused you to be upset or angry					0	1 2 3 4 (469)
S 70.	Trying to avoid certain thoughts and feelings because they remind you of something unpleasant or traumatic					0	1 2 3 4 (470)
S 71.	Feeling distressed because something reminds you of an unpleasant or traumatic event					0	1 2 3 4 (471)
S 72.	Less happy or pleased about things that once caused you to be happy or pleased					0	1 2 3 4 (472)
S 73.	Drinking more alcoholic beverages					0	1 2 3 4 (473)
S 74.	Feeling easily startled					0	1 2 3 4 (474)

APPENDIX F

RESULTS AND ANALYSIS OF PSYCHIATRIC EVALUATION

SUMMARY OF PSYCHIATRIC FINDINGS

Psychiatric consultation was requested for evaluation of the 123rd ARCOM for Post-Traumatic Stress Disorder (PTSD) and/or psychological/behavioral contagion. Seventy-nine soldiers completed Brief Symptom Inventory questionnaires and 78 soldiers were given brief interviews by a psychiatrist. Approximately one-quarter of the group reported exposure to potentially traumatic stressors during the war (e.g. 28% endorsed having seen dead bodies). Relatively few described symptoms highly suggestive of PTSD. BSI results and interviews support the view that this is a distressed group.

Based on brief clinical interview approximately 12% had signs and symptoms of psychiatric disorders and needed further evaluation. The role that psychological/behavioral contagion might have played is difficult to determine. There were many factors which contributed to a climate conducive to contagion. It is recommended that group debriefing take place and that soldiers not complaining of symptoms also take the BSI for comparison purposes. Further evaluation and disposition should be made for individuals who may suffer from psychiatric disorders. Follow-up assessment in six months is needed.

8 June 1992

MEMORANDUM FOR TEAM LEADER, 123RD ARCOM EPICON

Psychiatric consultation was requested for evaluation of the 123rd ARCOM for Post-Traumatic Stress Disorder (PTSD) and/or psychological/behavioral contagion.

On 11 and 12 April 1992 a questionnaire which included the Brief Symptom Inventory (BSI) (Derogatis and Spencer) and additional questions was administered to 79 soldiers who reported symptoms or problems which they felt might have been related to their deployment during Operation Desert Shield/Storm. In addition, 78 soldiers were given brief psychiatric interviews. During these interviews data were gathered on the nature and degree of stressors which the soldiers encountered before, during and after deployment.

Walter Reed Army Institute of Research (WRAIR) had collected similar BSI data on approximately 8600 soldiers who deployed to Southwest Asia during Desert Storm and 475 soldiers who did not deploy. These data have been used below for comparison purposes.

REPORTED SYMPTOMS

Items below were endorsed at the level of "quite a bit" or "extremely" by 20% or more of the soldiers of the 123rd ARCOM. Asterisks indicate those symptoms reported at a frequency two or more times that reported by the WRAIR post-deployment samples. (N=79)

- *61% "Feeling low in energy or slowed down"
- 52% "Feeling easily tired"
- *51% "Feeling easily annoyed or irritated"
- *44% "Sleep that is restless or disturbed"
- *37% "Trouble falling asleep"
- *36% "Feeling weak in parts of your body"
- *33% "Trouble remembering things"
- *33% "Trouble concentrating"
- 32% "Worrying too much about things"
- *28% "Temper outbursts that you could not control"
- *28% "Having to check and double-check what you do"
- *25% "Numbness or tingling in parts of your body"
- 24% "Feeling less interested in activities once important to you"
- 24% "Feeling tense or keyed up"
- 24% "Getting into frequent arguments"
- *24% "Nervousness or shakiness inside"
- *23% "Nausea or upset stomach"
- 23% "Feeling so restless you couldn't sit still"
- 22% "Repeated unpleasant thoughts that won't leave your mind"
- 21% "Your mind going blank"
- 20% "Feeling lonely"
- 20% "Having urges to break or smash things"
- 20% "Feeling easily startled"

INTERVIEW DATA

Brief psychiatric interviews were given to 78 soldiers over the course of two days. Rumors and beliefs about the etiology of the soldiers' reported symptoms were explored. Several etiologies were commonly endorsed: exposure to radiation (both microwave and nuclear), toxins (from pesticide-laced fish, SCUD fragments, petrochemical residuals, etc.), biological agents (anthrax vaccine or whatever substance(s) were administered through immunization process) and endemic disease (leishmaniasis, etc). Concerns were also raised by the soldiers on whether they may have been exposed to something from which they might become ill in the future (e.g. long latency for virus, malignancy, etc) or which might be passed along to their offspring (Agent Orange and HIV Disease were mentioned as examples).

Only one of the soldiers interviewed described being in combat. (He was on active duty at the time and was not assigned to the 123rd ARCOM during the Persian Gulf War.) No one in the units sustained battle-related injuries. A post newspaper reported that an officer had been killed in a truck accident while in Southwest Asia. She was not assigned to the units we interviewed; none of the soldiers mentioned her death. Hypervigilance and physiologic reactivity upon exposure to events reminiscent of the war were seldom reported in this group. Several soldiers mentioned that they still found themselves reaching for gasmasks when they heard the tornado sirens go off.

A survey of medical problems experienced by the soldiers had been collected by a member of the 123rd ARCOM. The precipitating factors prompting medical referral were not specifically asked during interview, however, one or two soldiers spontaneously identified this survey as a factor in their decision to seek medical evaluation.

Many of the soldiers reported feeling that the Reserves had been treated as "second class citizens" during the war by Active Army components. For example, members of the 417th voiced disappointment that in contrast to their active duty counterparts who were recognized for their achievements, the 417th was not awarded a unit citation due to a technicality.

There was considerable diversity in how the deployment was experienced. Many voiced their disappointment in life since their homecoming; they viewed the deployment as an opportunity for adventure and felt that they had made valuable contributions to their country. Others felt that the experience was terrible, that their lives had been disrupted and that they really had not been needed. Most soldiers voiced something in between these two extremes.

Based on these brief interviews approximately 12 of the soldiers were felt to have a psychiatric disorder(s) and warrant further evaluation. The tentative diagnoses were diverse, e.g. substance abuse, adjustment disorder, major depression, etc.

STRESSORS

Each soldier's interview was coded for the presence or absence of deployment and war stressors. Probable Axis I psychiatric conditions warranting further assessment were also noted. Because the time spent with each individual was limited, the interviews were not comprehensive. Therefore, while a notation of the endorsement of a stressor may be interpreted as reflecting the soldier's report, the absence of a given stressor may or may not reflect the soldier's experience.

The following percentages of soldiers reported:

PRE- AND POST-DEPLOYMENT STRESSORS:

Financial	23%
Break-up of relationship	24%
Loss of job/quit school	11%
Death or serious illness in family	09%
Children having problems	11%
Newly married	10%
New baby	01%
Recent promotion/demotion	06%
Other deployment stressors	23%

WAR-RELATED STRESSORS:

Frustration/anger at command	47%
Exposure to dead bodies	28%
Exposure to combat	01%
Exposure to SCUD attacks	15%
Isolated/dangerous duty	06%
Boring duty	10%
Fear of dying/being killed	20%
Other war-related stressors	08%

N.B. It should be noted that many of those who said they saw corpses in Southwest Asia denied being particularly troubled by them. However, since this aspect of war often represents a significant trauma it was included if any exposure took place, irrespective of the individual's reaction to it.

PSYCHIATRIC CASENESS USING THE BSI

The BSI determines caseness criteria in two ways. If an individual has scores on two of the subscales that are greater than or equal to T-score 63 then the individual is considered a positive diagnosis or case. In addition, a T-score greater than or equal to 63 for the General Severity Index also indicates a case. These criteria were used in this sample and the WRAIR deployed and non-deployed samples (see below).

BSI Subscale Scores**(Percent of individuals with T > 63)**

	123rd ARCOM		WRAIR	
	WOMEN	MEN	DEPLYD	NON- DEPL
Somatization	67%	57%	18%	17%
Obsessive- Compulsive	56%	67%	25%	23%
Interpersonal Sensitivity	35%	25%	20%	19%
Depression	28%	59%	34%	32%
Anxiety	22%	51%	20%	23%
Hostility	56%	57%	35%	33%
Phobic Anxiety	33	39%	27%	25%
Paranoid Ideation	44%	34%	38%	41%
Psychoticism	44%	52%	35%	32%

Global Severity Index

Examination of the GSI for T-score of 63 and above:

(Percent of individuals with T > 63)

GSI	123RD ARCOM		WRAIR	
	WOMEN	MEN	DEPLYD	NON- DEPL
	50%	64%	33%	31%

Using both methods yielded an overall caseness frequency of 66% (12/18) for women and 75% (46/61) for men.

ANALYSIS OF RELATIONSHIP BETWEEN STRESSORS AND CASENESS

Those soldiers who were identified as cases showed significantly more pre- and post-deployment stressors than the non-cases. There was no difference between cases and non-cases on the war stressors.

CONCLUSIONS

Is there a high prevalence of PTSD in this population?

To review DSM-III-R criteria for Post-Traumatic Stress Disorder (PTSD):

- A. PTSD is characterized by an event that is outside the range of usual human experience and that would be markedly distressing to almost anyone.
- B. The traumatic event is persistently reexperienced in at least one of the following ways: recurrent and intrusive distressing recollections of the event, recurrent distressing dreams of the event, sudden acting or feeling as if the traumatic event were recurring, and/or intense psychological distress at exposure to events that symbolize or resemble an aspect of the traumatic event.
- C. Persistent avoidance of stimuli associated with the trauma or numbing of general responsiveness (not present before the trauma) must be present as indicated by at least 3 of the following: efforts to avoid thoughts or feelings associated with the trauma, efforts to avoid activities or situations that arouse recollection of the trauma, inability to recall an important aspect of the trauma, markedly diminished interest in significant activities, feelings of detachment or estrangement from others, restricted range of affect and/or a sense of a foreshortened future.
- D. There must be persistent symptoms of increased arousal (not present before the trauma) as indicated by at least two of the following: difficulty falling or staying asleep, irritability or outbursts of anger, difficulty concentrating, hypervigilance, exaggerated startle response, and/or physiologic reactivity upon exposure to events that symbolize or resemble an aspect of the traumatic event.
- E. The symptoms mentioned above must have lasted for at least 1 month in order to meet criteria as a disorder.

Using the above criteria for establishing a diagnosis of Post-Traumatic Stress Disorder, PTSD related to Operation Desert Shield/Storm was not a frequent diagnosis based upon review of the data at this time. Factors mitigating against PTSD as a major problem in this population include:

1. Based on clinical interview only a small percentage were thought to have Axis I psychiatric disorders warranting further evaluation.
2. The symptoms most highly endorsed by the soldiers are not strongly suggestive of this diagnosis; conversely, signs and symptoms most strongly associated with PTSD were not heavily endorsed.
3. The general elevation on most of the BSI primary dimensions suggest generalized distress rather than a specific psychiatric disorder.
4. Based on the soldier's histories, the majority do not fulfill the DSM-III-R criterion for exposure to Desert Storm-related trauma; 28% reported exposure to dead bodies, 15% mentioned SCUD attacks as a source of fear, etc.
5. War-related stressors did not correlate significantly with measures of caseness.

Is psychological/behavioral contagion responsible for this "epidemic"?

Contagion is both difficult to diagnose and exclude. The circumstances of the population examined are consistent with those which have been associated with contagion, e.g. the spread of fear about a powerful element or agent which, when added to existing high levels of stress, causes involuntary psychosomatic reactions among the affected. Based on BSI results and interview this group has demonstrated a high degree of distress.

The rumors about numerous potential causative agents, as well as diagnosed leishmaniasis in several unit members created a climate in which fantasies and concerns about exposure to various toxins were common and a source of great concerns. This fear was exacerbated by worry that the Army might attempt a cover-up; individuals cited the Army's LSD experiments in the past and (by report) the lack of documentation about what they received in their immunizations for deployment.

The ubiquitous symptomatology associated with many of the rumored potential causes of the outbreak in the 123rd potentiated this process. All these factors describe a climate conducive to psychological and behavioral contagion but are insufficient to demonstrate that this occurred. Further data about this question could be gathered during debriefings.

What do we know about the psychological state of these soldiers?

The most consistent finding is that these soldiers are quite distressed. The pattern of generalized elevations on the BSI primary dimensions and the global severity index are consistent with this finding. Moreover, while war-related stressors did not distinguish BSI cases from non-cases, those soldiers identified as cases showed significantly more stressors related to deployment and reunion than did non-cases.

The symptoms endorsed by the soldiers are consistent with arousal and indicative of distress: one-half of the group endorsed feeling easily annoyed or irritated, one-third reported trouble concentrating and 37 and 44% respectively complained of trouble falling asleep and sleep that was restless or disturbed. Approximately 12% had signs and symptoms needing further evaluation for a wide range of psychiatric disorders.

RECOMMENDATIONS

- A. During the site visit information was gathered on potential resources available for further psychiatric assessment and disposition. The 55th Medical Detachment (Psychiatric) was identified as an intrinsic asset of the 123rd ARCOM which with appropriate augmentation could carry out this mission.
- B. Based on the brief psychiatric screening interviews a confidential list was compiled of persons who indicated interest in further psychiatric evaluation and/or for whom it was felt further psychiatric assessment was indicated. This list was discussed and forwarded to the Office of the ARCOM Surgeon.
- C. On 1 MAY 92 LTC Connallon (Office of the ARCOM Surgeon) and LTC Connie Boatright (55th Medical Detachment, Psychiatric) made a liaison visit to USUHS and WRAIR. WRAIR recommended that group debriefings take place in order to gather more data and provide intervention to this distressed group of soldiers. Debriefings focus on a chronologic reconstruction of events. Members of the group talk about what happened before, during and after the incident(s) of interest. Emphasis is placed on trying to recreate as accurate a picture of what happened as possible. During the course of this process feelings about what happened generally emerge naturally. This method has been used frequently with groups involved in traumatic situations.
- D. The BSI should be administered to the unit members who have not filled them out to date. This would give more information as to how representative or non-representative the soldiers evaluated on 11 and 12 APR 92 are with respect to the 123rd ARCOM, as a whole.
- E. The results of the debriefings should be forwarded for to the EPICON team to allow further study of the problems presented by the 79 soldiers.
- F. Follow-up surveys at approximately 6 months after the debriefings will help better understanding of why this particular group of individuals had so many symptoms.
- G. Awards and recognition have been shown to be important facilitators of readjustment. The of awarding of a unit citation to the 417th should be explored further.
- H. Education should be given to the soldiers and their families about recovery from deployment. They should also be given information about the inoculations they received.

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APPENDIX G

TRAVEL AND ACTIVITIES OF 123d ARCOM UNITS DURING ODS/S

Travel and Activities of Selected 123d ARCOM Units During ODS/S

1. 199th Supply Company

The company arrived in Dharan on 14 Mar 91. It was billeted in a compound about halfway between Dammam and Al Jubayl. Three platoons stayed there until May, when the entire company moved back to Dammam. A single platoon (38 persons) moved to Log Base Bravo, in King Khalid Military City (KKMC) about 23 Mar and stayed there until mid-May, when it re-joined the remainder of the company. The company stayed in Dammam until 30 August 91 when it redeployed. Two soldiers spent almost the entire deployment in Kuwait.

The company was engaged in transporting supplies throughout the time up to the move back to Dammam; from May-Aug 91 the company received and cleaned equipment from units returning to the U.S. This equipment, soiled mostly with dust and dirt, was cleaned with high-pressure water hoses, degreasers, and air hoses.

2. HHC, 300th S&S Battalion

The unit arrived in Dammam 5 Dec 90. They were billeted in an open warehouse at the port for about ten days, and then moved to Sodiya (nicknamed "soda pop"), at a location named Log Base Alpha (tapline road, near masts on map #945). There they lived in tents. The unit remained there until the second week of January 1991, when it moved to Log Base Echo (NW of town of Hafir al Batin), and stayed there until 29 April.

However, after the onset of the ground war (24 February), individual soldiers or soldiers in small groups went on missions into Iraq and Kuwait. After 29 April, the unit moved to a location called Desert Sands (on tapline road) until 9 May, then to KKMC, then redeployed to CONUS directly from the airport at KKMC. Soldiers in this unit were engaged in duties such as driving trucks carrying latrines and water, driving forklifts, and handling supplies in warehouses.

3. 417th Quartermaster Company

The unit arrived in Dammam 10 Jan 91. They moved to a site called Whiskey Hotel (WH) area, above the city of Dammam dump, in a series of buildings built for Army use. The entire unit stayed there for 16 days, when a group of 34 persons moved to the port at Al Jubayl. This detachment handled JP4 fuel, and lived in tents. This group stayed there until 27 March. The remainder of the unit

moved from WH area to Kharsaniya (nicknamed "Kittylitter") on 5-10 February, where they constructed a diesel fuel-handling facility. Both of these sites were closed down by 2 April, by which time the company was moved back to WH, where they stayed until redeployment to CONUS 26 May.

This unit was involved in pumping fuel from pipeline to tank trucks, performing water missions, and miscellaneous fuel handling duties.

4. 209th Supply Company.

The unit arrived in Dharhan 14 Nov 90. They stayed in a compound called Cement City near Dammam for three weeks. On or about 3 Dec, the unit relocated to Log Base Alpha near a trash dump, where they saw a "hazardous waste site", with "hospital waste". From 22 December-2 January, the unit sent detachments out to other sites (30 went to a site co-located with the 24th Infantry Division-south of Bastogne-Nariyah, 30 went to a site with the 3d Armored Cavalry Regiment (ACR) southwest of the town of Khafji). After 2 January, the bulk of the unit moved to KKMC where they stayed until 8 April. There were many small details involving groups of soldiers which went to other sites: a site with 2d ACR (north of "sodapop"), 3d ACR site west of Log Base Echo for one and a half weeks, Log Base Echo, to the 1st Armored Division site. All of these detachments considered KKMC the base camp. On 8 April, the unit moved to Dae Lim, on the highway halfway between Jubayl and Dammam (co-located with 199th Supply company) for two weeks, then on 26 April, moved to the ICC compound, next to Cement City.

The detachment that was in Khafji then rejoined the unit. On 22 June they redeployed to the U.S.

APPENDIX H
ANALYSIS OF POTENTIAL OCCUPATIONAL EXPOSURES DURING ODS/S

Qualitative report on occupational histories & concerns of exposure by units of the 123RD ARCOM deployed to SW Asia.

1. Detailed occupational histories on approximately 80 soldiers from several different units of the 123RD ARCOM who deployed to SWA were obtained on 11-12 April 1992. These histories included predeployment as well as postdeployment work histories, and in several cases these soldiers had a greater likelihood of exposure to potentially hazardous substances in their civilian occupations than they did during their deployment to SWA. These soldiers are complaining of a broad range of common symptoms which are rather vague and non-specific in nature. There was no chief complaint common to all the soldiers, nor was there a consistent pattern of illness that could unify this suspected outbreak. In addition a number of the soldiers voiced concerns of exposures that they had heard about from other soldiers or exposures they may have indirectly sustained; without knowing whether these exposures were at levels that could pose a significant threat to their health.

2. Due to the relatively long list of possible exposures that was mentioned by members of the units from the 123RD ARCOM, an attempt will be made to categorize the various exposures, discuss the likelihood of a significant occupational exposure, since no objective monitoring data is available to define the actual levels of exposure, and any acute or chronic health effects that may be relevant to these potential exposures.

a. Fuel Oils and Gases given off by fuel oil heaters:

A number of the reservists were involved in handling a wide variety of fuel oils, and fuel supply points. Activities included filling and emptying large tanker trucks, and maintaining the large bladders for storing fuels. Questioning revealed that vapor exposures may have occurred in overhead fueling operations where a soldier would position his head over the fueling port to observe the fullness of the tanker, also those soldiers operating the pumps complained of fuel oil odors during their operations. From this type of exposure one would expect to see symptoms consistent with an acute exposure such as: mucous membrane and upper respiratory tract irritation, defatting and drying of the skin leading to skin irritation, and general anesthetic effects. The central nervous system depression associated with these general anesthetic effects could result in acute symptoms such as lightheadedness,

dizziness, or headache. Based on the exposure histories obtained and information from standard reference texts there is little if any likelihood that there would be any delayed or long-term health effects of the nature described by the Indiana reservists. Some of the fuel handling operations resulted in dermal contact with a variety of different fuels, however the reservists indicated that when they did come in direct contact with fuels that they washed, generally with soap and water, and within 20-30 minutes after the exposure. Many of the soldiers had limited contact with fuel oils based on filling vehicles and the fuel oil stoves used for heating tents. These limited exposures would not be expected to produce any more of an adverse health effect than that associated with filling a vehicle or kerosene heater in the United States. Several of the reservists mentioned the smoke and odor given off by the heating stoves. Without sampling data to accurately define exposures it is difficult to define the type or level of exposure from such a source. Several factors suggest that the stoves are not a significant source of concern. First, these stoves are widely used in the field, and no delayed or prolonged adverse health effects have been reported from their use. Secondly, the gases given off by combustion of fuel oils would be carbon monoxide (CO), carbon dioxide (CO₂), nitrogen oxides (NO_x), and sulfur dioxide (SO₂). If levels were excessive, acute intoxication would be expected to occur, and references suggest little if any chronic effect from low levels of these gases.

b. Chemical Agent Resistant Coating (CARC) Painting:

Very few of the soldiers who we evaluated directly performed CARC painting operations, and those who did were given appropriate personal protective equipment, including air-supplied respirators. A number of the reservists mentioned working near a CARC painting operation while in SWA, the closest distance to a painting operation that any reservist described was at least 50 yards, and most reservists indicated that they were 100-200 yards from any painting operations. The reservists did indicate that when the wind was blowing in their direction that paint odors could become quite strong, and some individuals complained of having developed headaches, and/or nausea from the paint fumes. These symptoms are consistent with acute paint/solvent exposures, but headache and nausea are not characteristic of long term health effects from CARC paint. An occupationally induced asthma can occur in a relatively low percentage (5%) of individuals exposed to CARC paints; however none of the reservists interviewed related having symptoms suggestive of this disorder.

c. Microwave (non-ionizing) radiation:

Many of the reservists expressed concerns about being exposed to microwave radiation from communication equipment. Of the reserve units deployed to SWA, the 417th Quartermaster Company was the only unit to be co-located with a Signal Brigade. Other units were more than one-fourth to one-half mile from major communication points using microwave equipment. However, even the musculoskeletal complaints expressed by members of the 417TH should not be attributed to microwave radiation for the following reasons. First, the equipment used by signal units produces a very narrow beam, with very little scatter, such that an individual would have to get directly in front of a microwave disk to receive any exposure. This is very unlikely since this equipment is either elevated and/or cordoned off. Secondly, microwave exposure has been shown to cause heating and redness of body tissues and the skin, and cataracts in those that are chronically exposed. Western scientific literature does not support any other acute or chronic health effect. A supporting argument is that signal units work around this equipment on a much more frequent basis, and would therefore be more likely to show any long term adverse health effects than the 417TH Quartermaster Company.

d. Ionizing Radiation:

Based on the histories obtained, only a few Indiana reservists would have been even potentially exposed to any source of ionizing radiation. The concern seems to have arisen from an incident where several reservists were scouting out an area near their base camp and discovered a "hazardous waste site" cordoned off by biological and nuclear hazard warning signs and/or tape. These soldiers then took a radiac meter that they had in their vehicle and monitored for radiation. These soldiers were concerned that the initial radiation levels might be high, so they reviewed the operating instructions for the radiac meter, and retested the area. Retesting indicated that the ionizing radiation appeared to be from an alpha source, and to be within acceptable limits. The type or source of radiation is important in determining the likelihood of a health effect. X- or gamma radiation can cause an acute radiation sickness, with prodromal symptoms consisting of anorexia (loss of appetite), nausea, vomiting, and fatigue at a total body dose of 75-125 rad, however these are acute effects, and would not be expected to account for the symptoms being described by the Indiana reservists this long after possible exposure. More importantly, the suspected type of radiation is alpha radiation, which is not associated with the prodrome described above. Another factor that suggests that the symptoms being experienced by the Indiana reservists are not due to an ionizing radiation exposure, is that the vast majority of these soldiers had no known or suspected contact with an ionizing radiation source.

e. Pesticides:

A few of the soldiers have raised concerns about possible pesticide exposure while deployed to SWA. One of the pesticides was described as a red powder that was sprinkled on dead fish to attract and kill flies. The other was concerns about limited DDT use. Ken Olds of the Pest Management Branch at the U. S. Army Environmental Hygiene Agency (USAEHA) indicated that the red powder was either Apache Fly Bait or a product called Snip (or NIP), but that these products contained the same active ingredient which is an organophosphate pesticide. Exposure to organophosphate pesticides can cause acute symptoms similar to, but generally milder than those associated with nerve agent exposure due to their identical mechanism of action on the acetylcholinesterase enzyme. Since none of the Indiana reservists reported any acute effects from the use of these pesticides, it is extremely unlikely that any of their symptoms upon return are due to these agents. With regard to DDT, which is an organochlorine insecticide, Ken Olds indicated that none of the units should have been issued this pesticide by U.S. forces, but that it was possible that some reserve units may never have turned in their old stock for disposal. Since DDT is poorly absorbed through the skin, a sufficient amount must be inhaled or ingested from the soil to be toxic. Potential exposure to DDT appears to be limited since only 3-5 reservists from a particular unit mentioned using DDT, and none of these soldiers reported any acute symptoms from the potential DDT exposure; therefore there is little likelihood of delayed or chronic effects. Furthermore, since the exposure does not appear to be universal it cannot be used to explain symptoms in other units.

REFERENCES:

1. National Council on Radiation Protection Report No. 86; Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields; Chapt. 12-Behavioral Studies.
2. Rom, Wm. N., Environmental and Occupational Medicine; Little, Brown and Company, 1983.
3. Rosenstock & Cullen, Clinical Occupational Medicine; W. B. Saunders and Company, 1986.
4. USAEHA Technical Guide No. 153; Guidelines for Controlling Potential Health Hazards from Radiofrequency Radiation; April 1987.

TABLES 1 AND 2

Table 1. Symptoms reported by Reservists of 123d ARCOM (n=79)

Symptom	% reporting*
Fatigue	70.9
Sleep disturbance	57.0
Forgetfulness	54.4
Pain in any joint	54.4
Dental complaint	47.4
Easily irritated	46.8
Difficulty concentrating	43.0
Depression	41.8
Difficulty thinking	39.2
Headache	37.2
Rash	35.4
Cough	34.6
Abdominal pain	34.2
Joint pain in upper extremity	32.9
Diarrhea	32.1
Joint Pain in lower extremity	30.4
Pain in back or neck	26.9
Ringling or pain in ear	24.1
Loss of hair	21.5
Fever	12.8

* more than one symptom could be reported by an individual

Table 2. Summary of locations occupied by 199th Supply Co, 417th QM Co, 209th Supply Co, and HHC, 300th S&S Bn during the deployment to SW Asia.

Site	Unit	Dates
Log Base Alpha	HHC, 300th 209th Supply Co	16 Dec-10 January 3 Dec- 2 January
KKMC	199th Sup. Co (1 plt) HHC 300th S&S 209th Supply Co	23 Mar-15 May 9-10 May (1 day) 2 January-8 April
Al Jubayl (Port)	417th (platoon)	26 Jan-27 Mar
Log Base Echo	HHC 300th S&S	12 Jan-19 April
Dae Lim	199th Supply Co 209th Supply Co	14 Mar-15 May 8 April-26 April
Cement City	209th Supply Co	14 Nov-7 Dec 26 April-22 June
Kharsaniya	417th QM (3 plts)	5 Feb-2 April
Whiskey Hotel	417th QM Co	10 Jan-5 Feb 2 April-26 May
Dammam (port)	199th Supply	15 May-30 Aug

FIGURES 1-11

Figure 1.
Onset of Fatigue, By Month

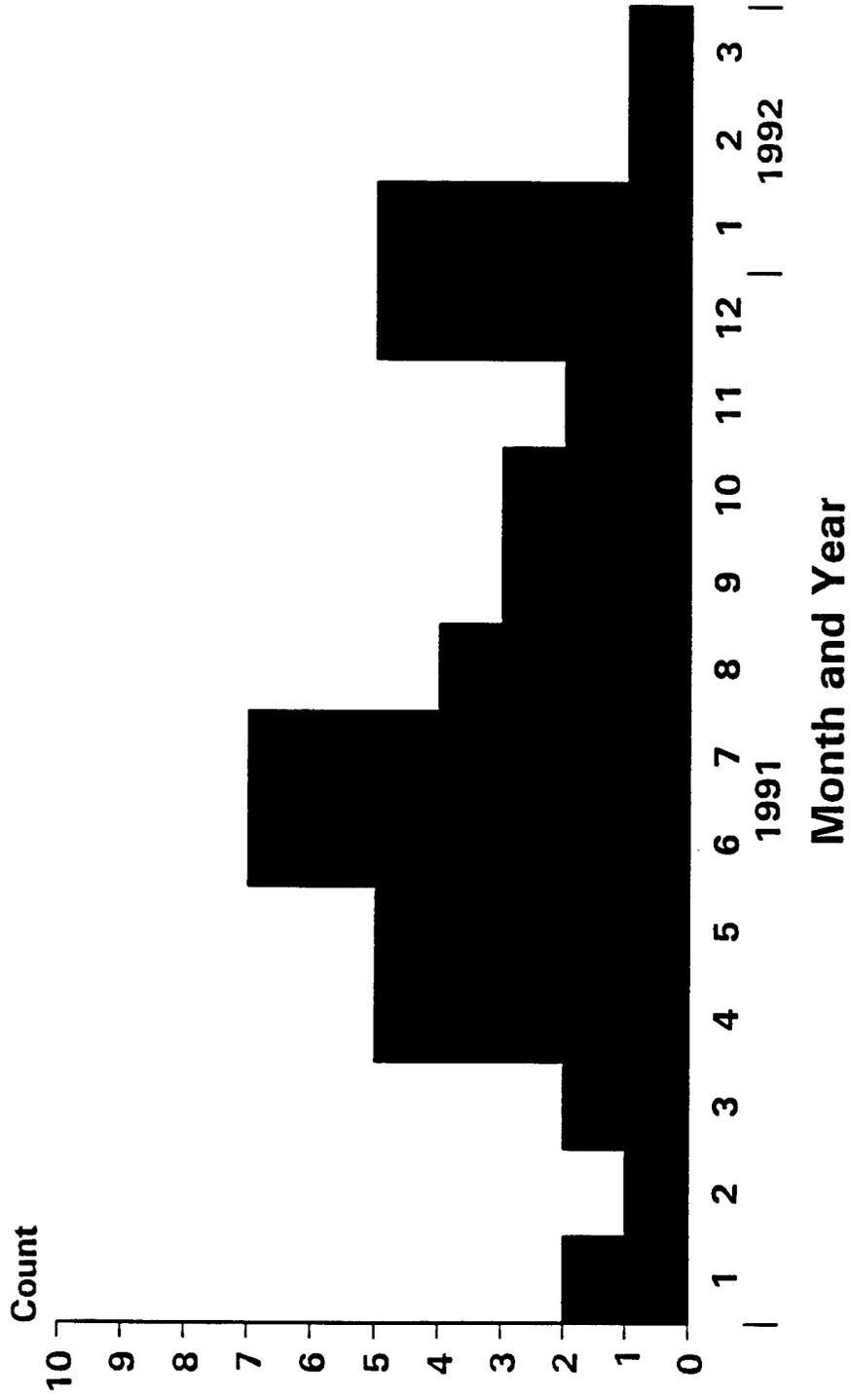


Figure 2. Onset of Fatigue Adjusted to Month of Redeployment

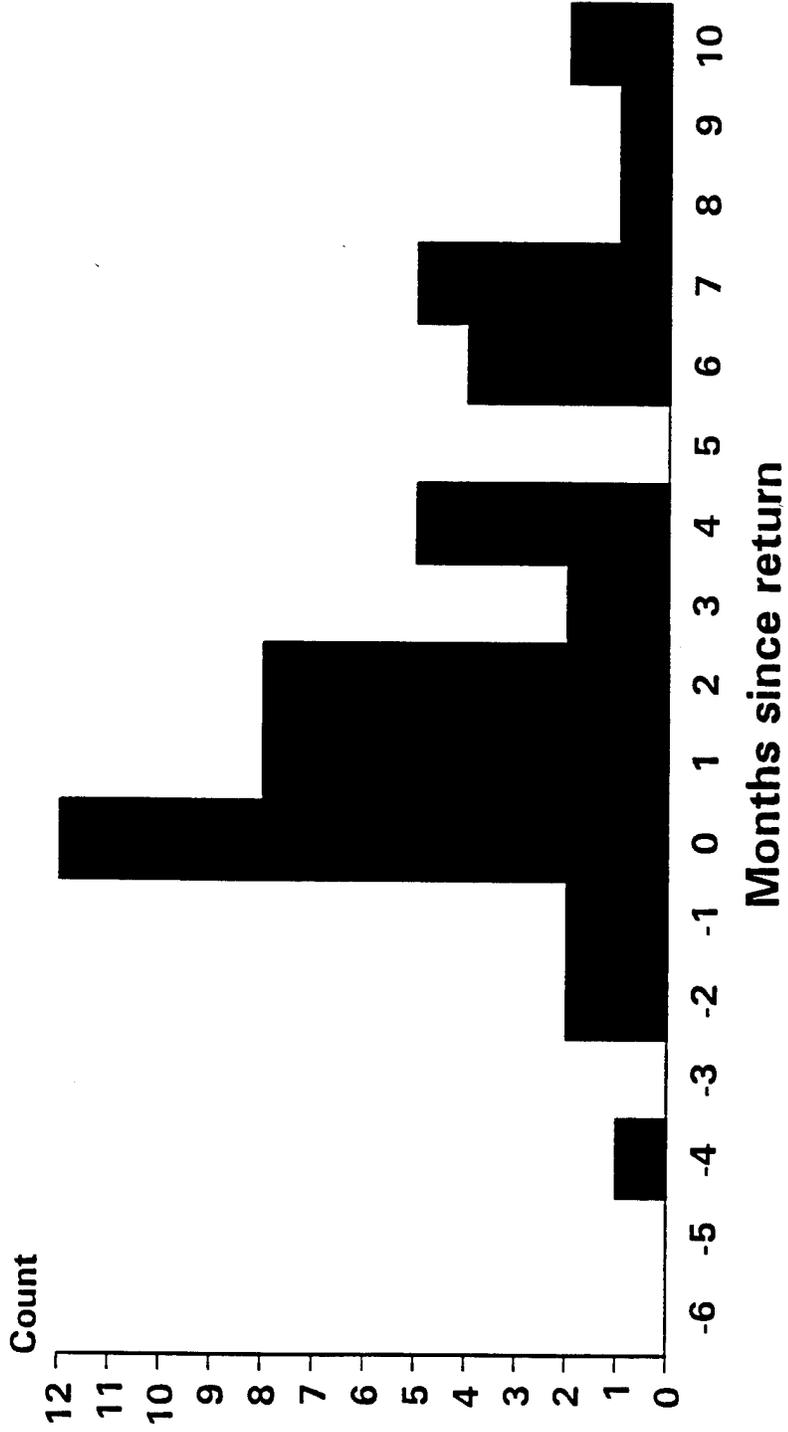


Figure 3.
Onset of Fatigue, HHC 300th S&S Co

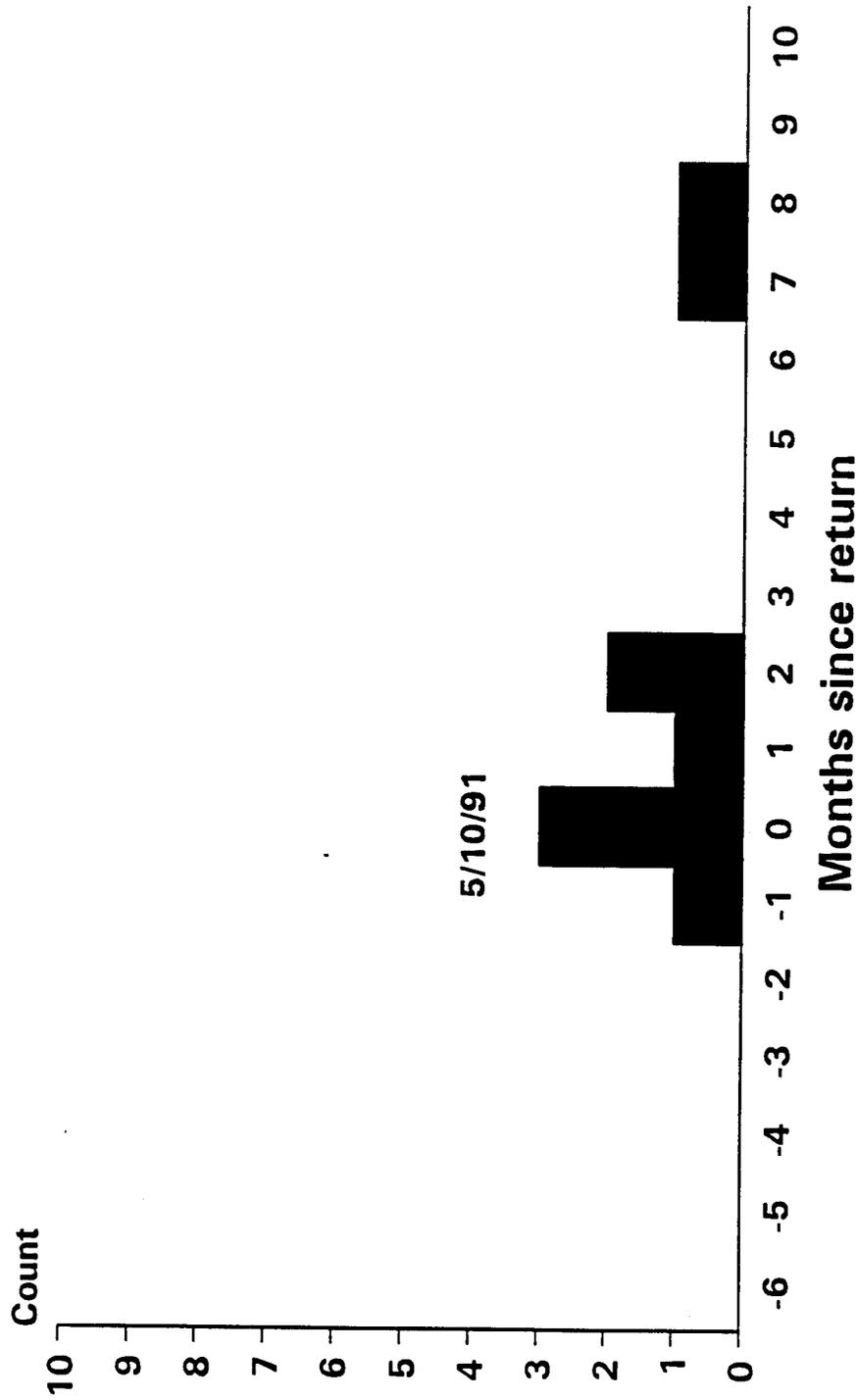
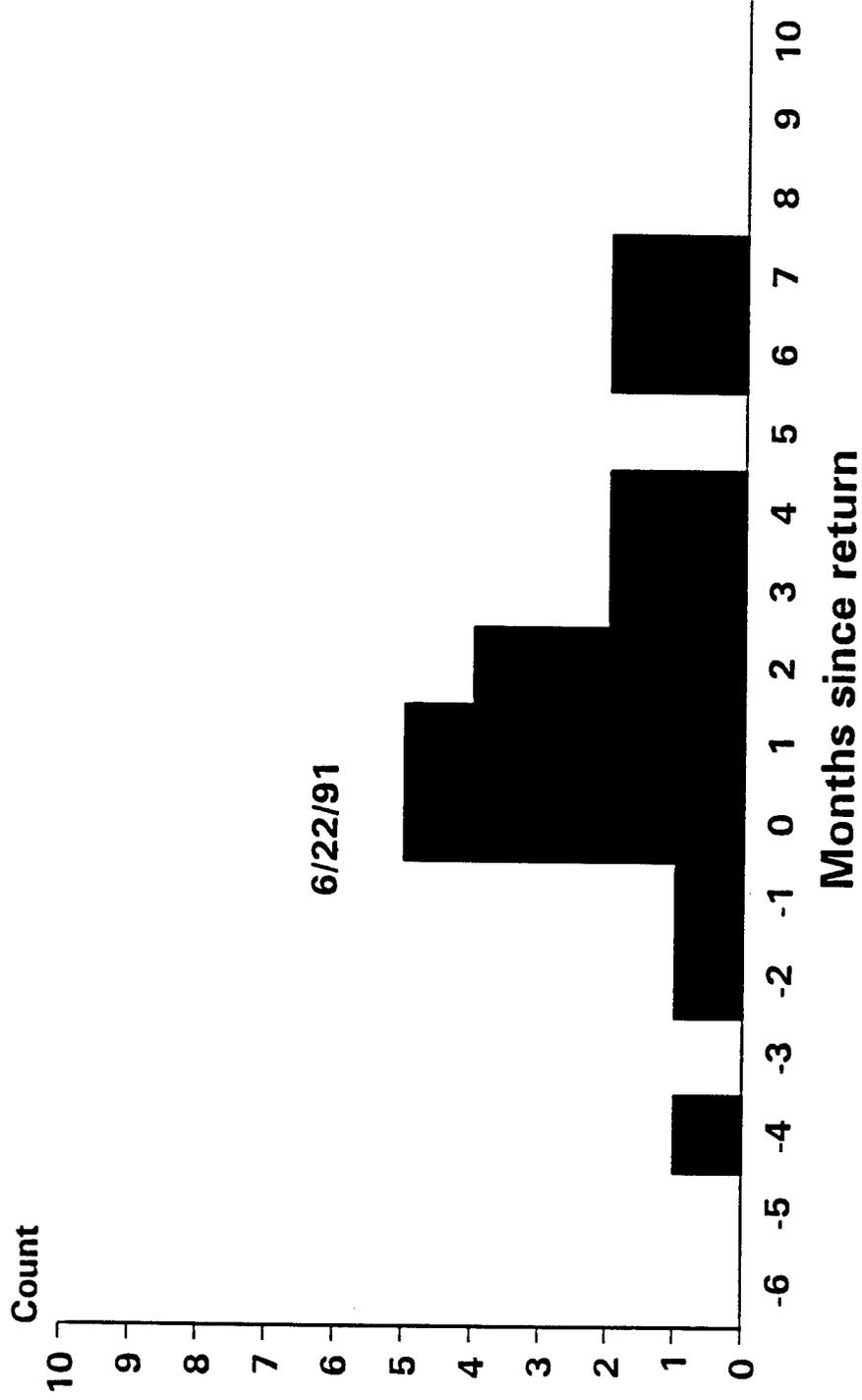


Figure 4. Onset of Fatigue, 209th Supply Co



123d ARCOM EPICON, May 1992

Figure 5. Onset of Fatigue, 417th QM Co

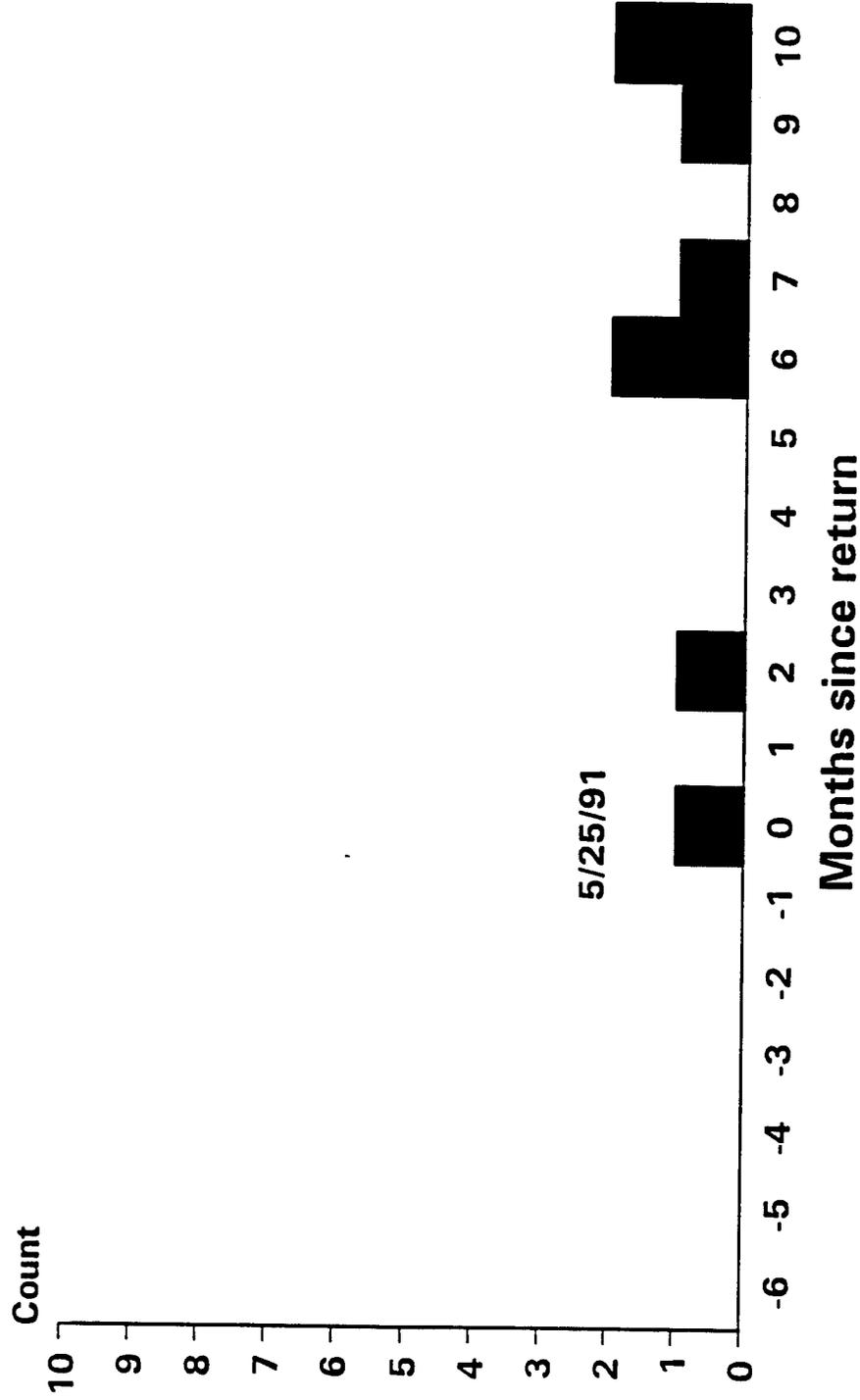
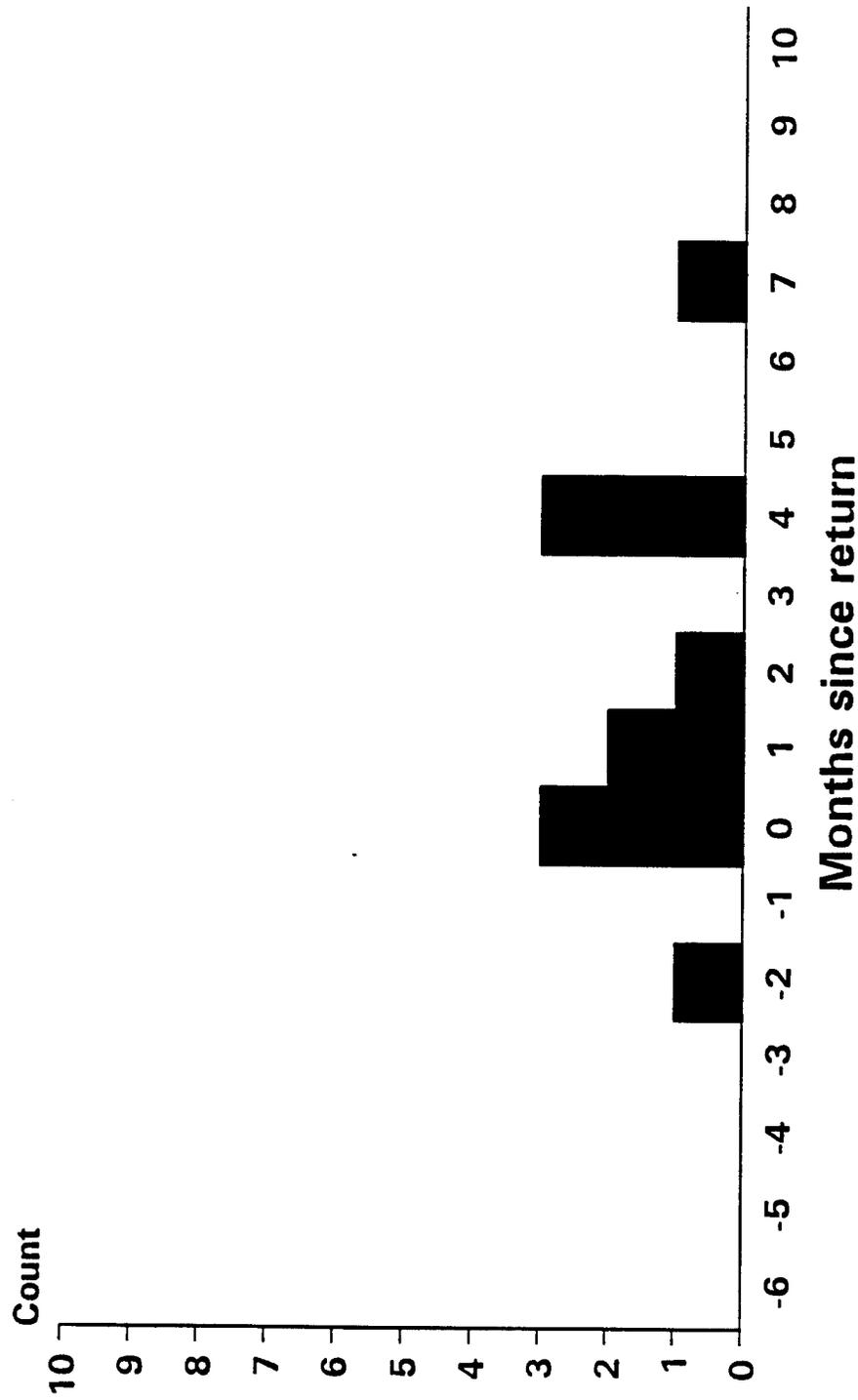


Figure 6.
Onset of Fatigue, all other units



123d ARCOM EPICON, May 1992

Figure 7.
Onset of Sleep Disturbance

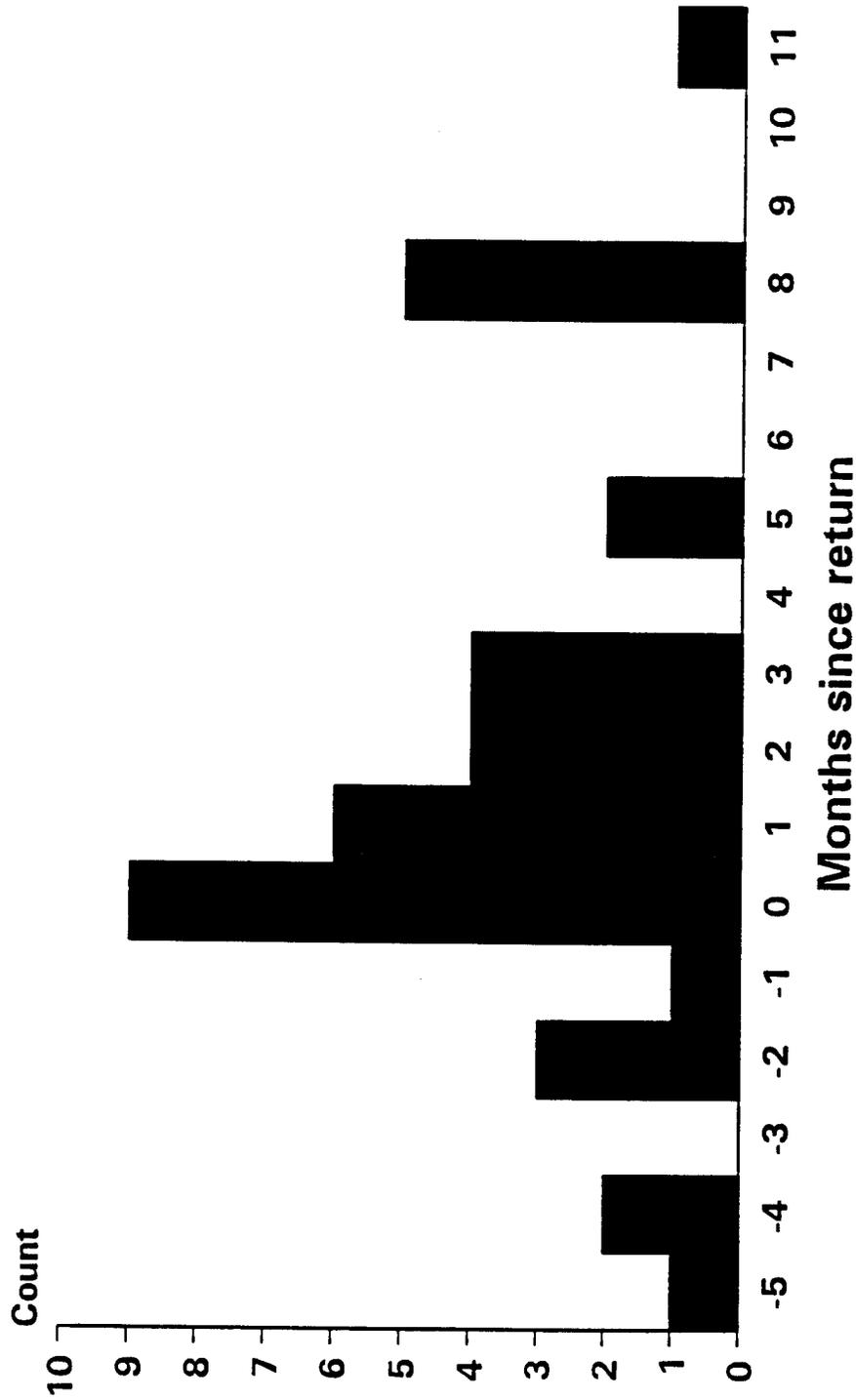
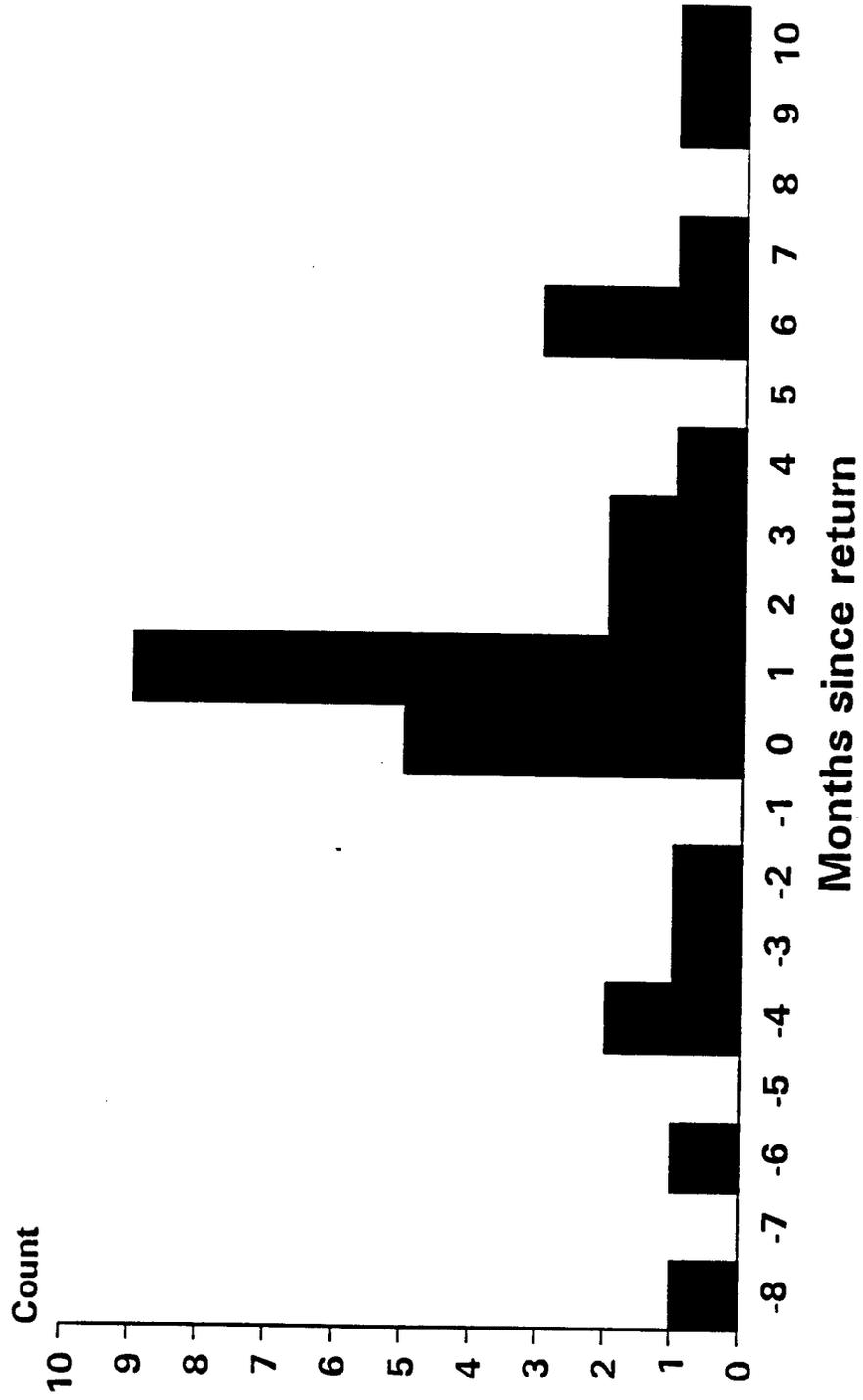


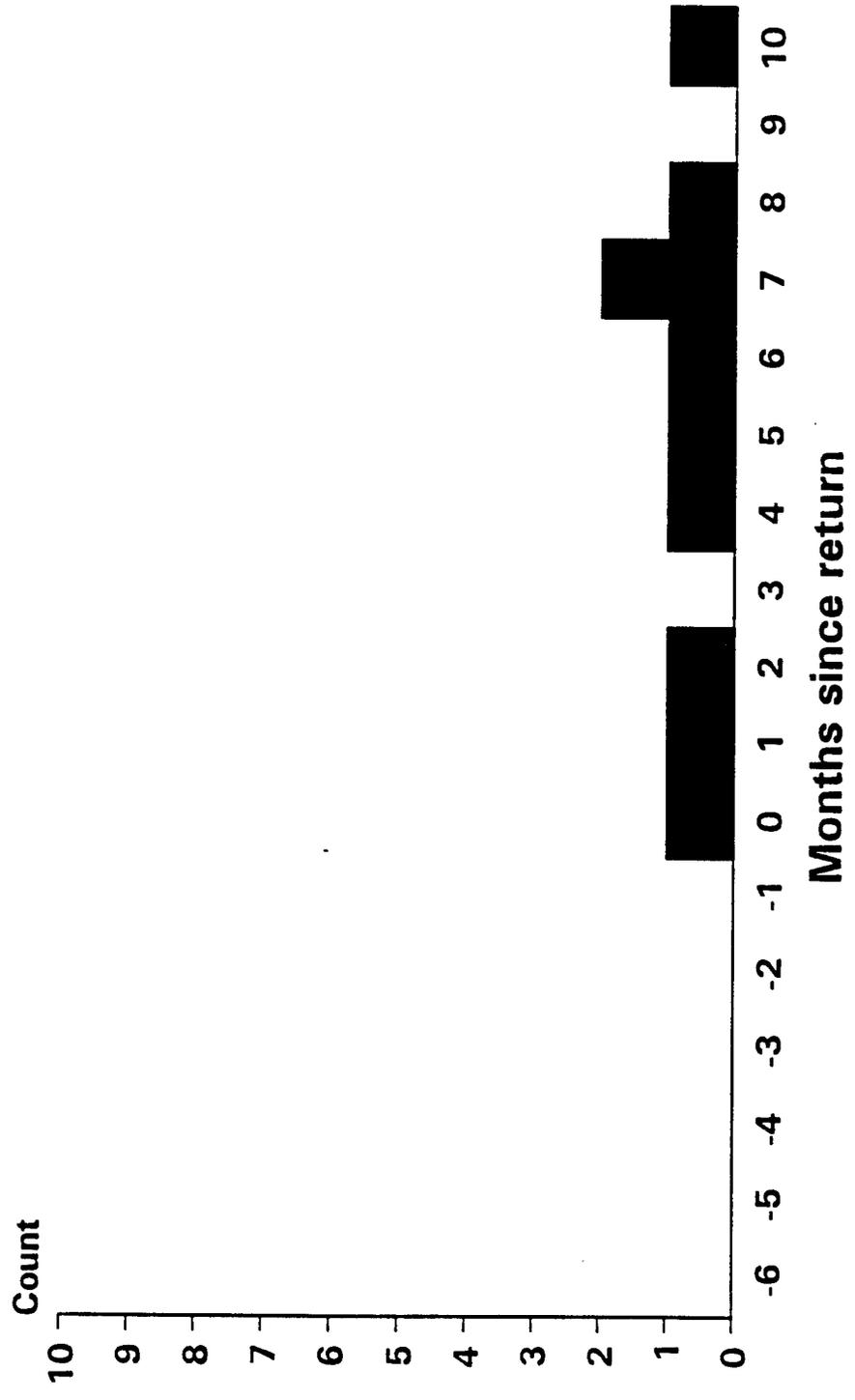
Figure 8.

Onset of Depression



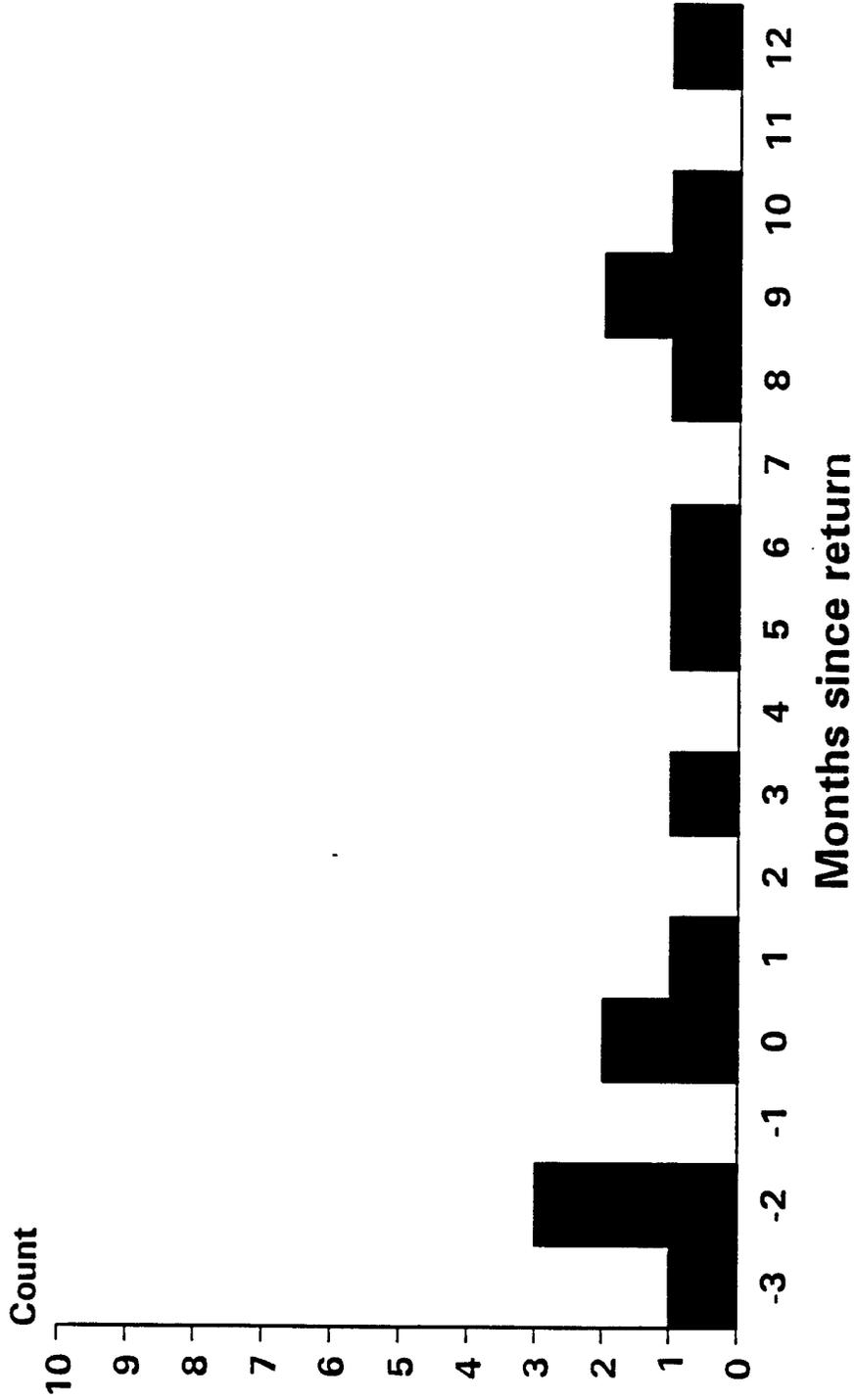
123d ARCOM EPICON, May 1992

Figure 9. Onset of Fever



123d ARCOM EPICON, May 1992

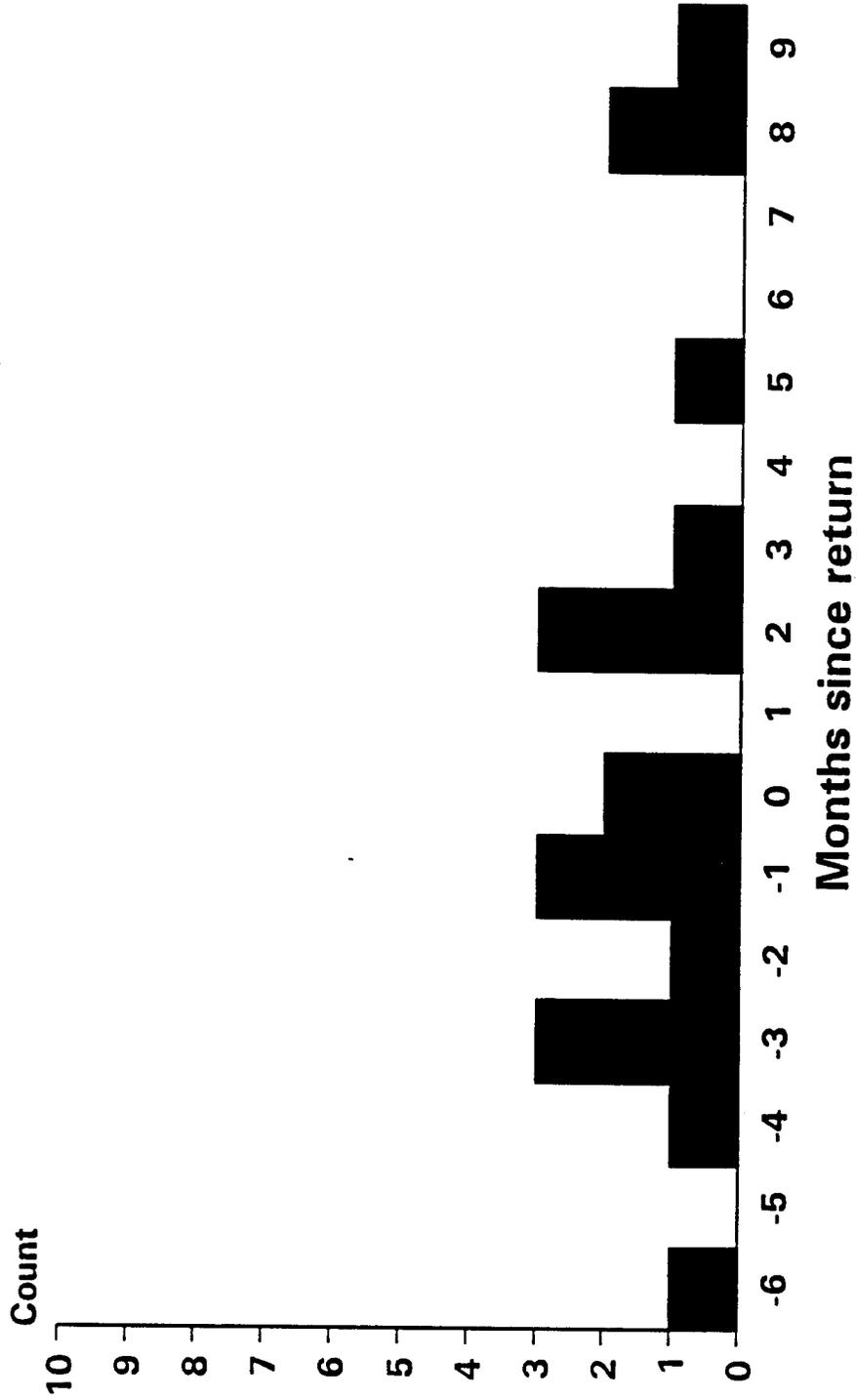
Figure 10. Onset of Hair Loss



123d ARCOM EPICON, May 1992

Figure 11.

Onset of Diarrhea



123d ARCOM EPICON, May 1992