

Nutritional and Sports Supplement Use Among Deployed U.S. Army Soldiers in a Remote, Austere Combat Outpost in Eastern Afghanistan

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ABSTRACT Background: Nutritional and sports supplements are commonly used by soldiers, with uncertain implications for health and mission readiness. Methods: An anonymous survey was conducted of a company of U.S. Army paratroopers deployed to eastern Afghanistan between December 2011 and October 2012. Survey questions covered supplements used, duration of use, adverse effects, and medication interactions. Exercise habits, goals for exercise and supplement use, and information and acquisition sources were also queried. Results: Out of 112 surveys distributed, 100 completed surveys were returned. 77 respondents reported using at least one supplement during deployment. On average, 2.5 supplements were used per individual surveyed. Nine respondents reported adverse effects of supplement use. No respondents reported serious complications of supplement use, drug interactions, or seeking medical care for supplement adverse effects. The Internet was the most frequently reported source of information on supplement use. Most frequently, supplements were acquired by Internet mail order. Conclusions and Relevance: Supplement use occurs during deployment among paratroopers at a higher rate than reported in garrison, despite their remote and austere deployed location. These findings have profound implications for military health care providers and policy makers considering the health of deployed combat soldiers.

INTRODUCTION

Supplement use among members of the armed forces in garrison has been studied; however, supplement use under deployed conditions has received limited attention. These substances have numerous potential implications for the health of soldiers, including adverse effects, medication interaction, and contamination with potentially harmful substances.¹ A 2007 Army-wide survey of 990 soldiers by Lieberman et al found that 53% of soldiers used dietary supplements at least once per week.² The most commonly reported supplements among this cohort were multivitamins and multiminerals, followed by protein/amino acid supplements and individual vitamins and minerals with 37.5%, 18.7%, and 17.9% of respondents, respectively.² This cohort included 70 soldiers deployed to Iraq, who exhibited similar patterns of supplement use to soldiers in garrison. Among special operations trainees, a supplement usage rate of 64% was found in a survey conducted in 1999.³ The most commonly used supplements were multivitamins used by 37.3% of respondents, sports bars by 27.4%, vitamin C by 20.0%, pro-performance supplements by 18.2%, and creatine by 17.7%. Pro-performance supplements were defined in this study as containing mixtures of protein, carbohydrates, fats, vitamins, and minerals intended to improve athletic performance. Data from the 2005 DoD Survey of Health Related Behaviors documented that among active duty military, 21% use bodybuilding supplements, 18% use weight

loss products, 9% joint health products, 8% performance-enhancing supplements, and 9% other types of supplements.¹ An IOM report on supplement use reviewing 51 studies found a 46% overall mean prevalence of supplement use among civilian athletes.¹ Inclusion of questions regarding use of bodybuilding, weight loss or energy supplements in the Millennium Cohort Study in 2007–2008 demonstrated that 46.7% of a study population of 106,698 participants endorsed using at least one supplement. Deployment experience was found to be significantly associated with supplement use among men and women.⁴

Exercise supplement use is attended by controversial and uncertain health implications. Under the extremes of combat, this uncertainty is magnified. During the course of the deployment, soldiers were evacuated from the studied combat outpost with respective diagnoses of acute kidney injury, seizure, and ST elevation myocardial infarction. The contribution, or lack thereof, of supplements to these events could not be definitively determined due to a lack of access to requisite diagnostic resources. Connecting the diagnosis to supplement use is a lengthy process of elimination beyond the capabilities of a remote, austere Role I facility.

Given the clinical observation of frequent supplement use among deployed soldiers, this study was initiated to describe the extent of supplement use among a deployed cohort of airborne infantry soldiers. The information obtained may better inform the medical community on supplement use in a deployed environment.

METHODS

A voluntary, anonymous survey was distributed to 112 soldiers assigned to an airborne infantry company deployed to a

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remote combat outpost in eastern Afghanistan during 2011–2012. The questionnaire was administered in the final 8 weeks of a 10-month deployment to all soldiers stationed on the Combat Outpost (COP) assigned to the investigated battalion were offered the voluntary survey. No other combat outposts or units were involved in the study. Female soldiers were stationed on the COP; however, they were not assigned within the investigated battalion during the time period of survey administration, and could not be included. Institutional review board (IRB) requirements to obtain written command authorization to conduct research on soldiers precluded inclusion of soldiers outside of the author's battalion. Further, very small numbers of females (4–7 individuals) were ever stationed on the COP, making their inclusion of minimal statistical significance. Recruitment to participate in the study occurred through an informational brief administered outside the presence of the soldiers' chain of command, and outside mandatory activities or briefings. Information solicited included demographic information, supplements used, supplement usage patterns and goals, exercise patterns and goals, reported beneficial effects, adverse effects, drug interactions, and health care encounters attributed to supplement use. Respondents were asked to record information regarding their use of nutritional and sports supplements in free text.

To guarantee respondents' privacy and diminish command influence, surveys were administered to soldiers in their living quarters. Officers and enlisted men were assigned to separate quarters, according to military custom. Each soldier on the COP had a private room within a living quarters unit, and a unit housed approximately 10 to 14 soldiers. Surveys were administered to quarters units with a preceding oral informational brief emphasizing the voluntary nature of the survey. The survey document was provided with attached informed consent and printed informational brief documents. Soldiers were then allowed to complete surveys within the privacy of their room and deposit surveys within a locked box left in the common hallway of the quarters unit, following completion or declination to respond. Following delivery of the oral brief, the investigator departed for 30 minutes to 1 hour to allow private responses before returning to collect the lock box.

Sample size estimation determined that with a sample of 120 to 200 respondents, differences between the cohort and the U.S. Army Airborne Infantry population of roughly 10,000 paratroopers, should be detectable with an accuracy of 0.14 to 0.18, assuming a power of 80% and an alpha value of 0.05. Power analysis was conducted with PASS 2008 and the assistance of Dr. James Aden at the U.S. Army Institute of Surgical Research, Ft. Sam Houston, Texas.

The survey instrument was designed based on input from Dr. Harris R. Lieberman, PhD, during the IRB review process to improve the methodological validity and design of the survey instrument. This study was approved by the U.S. Army Medical Research and Materiel Command Institutional Review Board (Protocol Number M-10253) with the assistance of the Joint Combat Casualty Research Team (JC2RT)

to facilitate approval of research protocols in the Central Command area of operations during Operation Enduring Freedom.

Responses included 151 brand names, and 100 generic responses. The supplements reported were searched online to determine their ingredients and classify them as protein, amino acid mixture, ergogenic, herbal hormone, prohormone, multivitamin, fish oil, weight loss, herbal mixture, joint health, liver health, immune boosting, postworkout, and unknown. Protein supplements were defined as containing protein, without ergogenic substances such as caffeine and creatine. Ergogenic supplements were defined as containing caffeine, creatine, yohimbine, synephrine, dimethylamine, or other substances intended to increase muscle contraction or energy levels, but may also include protein, amino acid mixture, multivitamins, and other proprietary substances. Non brand name responses listed as "preworkout" were counted as ergogenic based on review of marketing information for this category of supplements on several popular websites, identified by soldiers as a source of supplement purchase. Multivitamins were defined as not having ergogenic substances, protein, or amino acids, but containing vitamins and minerals. Herbal hormone boosters were identified based on the inclusion of plant-based substances marketed to increase androgenic hormone levels or effects. Weight loss supplements were defined as those marketed specifically to decrease adiposity. Fish oil supplements were reported by all respondents as "fish oil." The remaining classes of supplements to include herbal mixtures, joint health, liver health, immune boosting, postworkout, and unknown were derived from the available information on intended benefits for the substance in question. "Unknown" was utilized for those supplements where no information or unclear statements of purported benefit were made.

Questions were asked regarding motivations to exercise and use supplements. A multiple-choice format and a free-response format were used to query motivations in order to ensure that unique motivations to supplement use could be written in, and selections from a multiple-choice list could facilitate a high response rate.

Energy drinks such as Rip Its and protein bars such as Cliff Bars were universally available throughout deployment in dining facilities, both on the COP and throughout theater. Protein shakes were available in the dining facility for the last 3 months of deployment. One soldier included the dining facility protein shakes in his response, but this was not tallied in the survey results. Use of energy drinks, protein shakes, and bars was intentionally not included in design of the protocol or survey, owing to their ubiquity throughout theater and provision for consumption alongside other foodstuffs. Given their official sanction, and ready accessibility, these substances were deemed to be closer to other dietary sources of caffeine, vitamins, or protein, than exogenously procured supplements, purchased and shipped overseas.

Respondents were also offered questions on information sources used to make decisions about supplement efficacy,

safety, and supplement acquisition sources during deployment. All soldiers were prescribed doxycycline malaria prophylaxis, save two soldiers who were switched to mefloquine during the course of deployment due to intolerance of doxycycline.

The information brief delivered verbally by the author to soldiers taking the survey is available as Appendix A. The Research Information Sheet to provide written information regarding the study is provided as Appendix B. The survey instrument is available as Appendix C.

RESULTS

The survey response rate was 89%, and 100 completed surveys were returned out of 112 surveys distributed. Baseline demographic information is provided in Table I. Table II describes the volume of supplement use. The prevalence of supplement use was 77% with an average of 3.26 supplements per user. An average of 7.24 supplement dose per week and an average of 5.13 months of supplement use over the

TABLE I. Demographics of Survey Respondents

	<i>n</i>	%
Age (Years)		
18–20	8	8.16
21–22	27	27.55
23–26	39	39.80
27–30	15	15.31
31–35	5	5.10
36–45	4	4.08
Total	98	
Gender		
Male	99	100
Female	0	0
Ever Married	<i>n</i>	%
Yes	59	60.20
No	39	39.80
Total	98	
Ethnicity		
African-American	8	8.25
Asian	2	2.06
Caucasian	73	75.26
Hispanic/Native American	14	14.43
Middle Eastern	0	0.00
Total	97	
Avg. Years Active Duty		
3.91 years		
Avg. Deployments		
1.56		
Rank	<i>n</i>	%
E1–E4	60	60.61
E5–E8	35	35.35
2LT–COL	4	4.04
Total	99	
Military Occupational Specialty		
11, 13, 68 Series	91	91.92
Other	8	8.08
Total	99	

TABLE II. Reported Volume of Supplement Use

	<i>n</i>	%
Respondents Reporting Supplement Use	77	77
Total Respondents	100	
Average Supplements Used Per Soldier Surveyed	2.5	
Average Supplements Used Per Supplement Using Soldier	3.26	
Number of Soldiers Reporting Use of Only One Supplement During Deployment	16	
Standard Deviation of Number of Supplements Used Among Supplement Using Population	2.846	
Range of Values for Number of Supplements Used	0–20	
Average Number of Days of Supplement Use Per Week	5.36	
Average Number of Months of Use	5.14	
Number of Supplements Used in the Course of Your Lifetime		
1–2	22	23.40
3–4	22	23.40
5–6	18	19.15
7–8	5	5.32
9–10	4	4.26
>11	20	21.28
0 or NA	3	3.19
Total Respondents	94	
How Many Times Per Week Do You Exercise		
1	7	7.00
2–3	10	10.00
3–4	25	25.00
5–6	45	45.00
7+	3	3.00
>1/Day	10	10.00
Total Respondents	100	

10-month deployment were reported. Only 3.19% of respondents indicated that they had never used supplements in their lifetime. The number of supplements used by type and the number of individuals reporting use of types of supplements are detailed in Tables III and IV, respectively. The most

TABLE III. Total Numbers of Supplements Reported, Classified by Type of Supplement

Supplement Type	<i>n</i>	%
Protein	75	29.88
Amino Acid	15	5.98
Herbal Anabolic	5	1.99
Prohormone	12	4.78
Multivitamin	36	14.34
Ergogenic/Preworkout	70	27.89
Fish Oil	10	3.98
Weight Loss	9	3.59
Herbal	4	1.59
Joint Health	3	1.20
Liver Health	1	0.40
Immune	2	0.80
Postworkout	3	1.20
Unknown	6	2.39
Total	251	

TABLE IV. Number of Individuals Who Reported Use of Various Supplement Types^a

Supplement Type	<i>n</i>	%
Protein	59	76.62
Amino Acid	12	15.58
Herbal Anabolic	4	5.19
Prohormone	10	12.99
Multivitamin	24	31.17
Preworkout	45	58.44
Fish Oil	10	12.99
Weight Loss	4	5.19
Herbal	3	3.90
Joint Health	3	3.90
Liver Health	1	1.30
Immune	1	1.30
Postworkout	3	3.90
Unknown	6	7.79

^aPercentages reported as supplement type per total number of supplement users.

commonly reported supplements used included protein with 29.88% of responses, ergogenic/preworkout with 27.89%, and multivitamin supplements with 14.34% of responses.

Adverse effects were reported to have occurred by 9 soldiers (Table V), with 2 of them reporting that they ceased supplement use as a result. No soldiers reported medication interactions or having sought medical attention due to a supplement-induced adverse effect. Information sources soldiers used to select supplements and their acquisition sources are detailed in Table VI.

In the multiple choice “select all that apply format,” the three most commonly cited exercise goals were physical appearance, muscle strength, and cardiorespiratory performance. In a total of 79 free written responses to primary goals of exercise, the three most commonly cited responses were variants of physical appearance, mission requirements, and muscle size. Goals for exercising and use of supplements are reported in Table VII.

TABLE V. Reported Adverse Effects of Supplement Use

Supplement	Number of Concurrently Used Supplements	Adverse Effect	Manufacturer-Listed Ingredients of the Implicated Supplement	Action Taken
Ergogenic	3	Dehydration	Creatine, Caffeine, Synephrine	Stopped Then Reduced Dose to 1/2
Ergogenic	4	Dizziness, Dehydration	Creatine, L-Arginine, L-Citrulline	Stop Use
Prohormone	3	Lower Back Pain	17-Beta-hydroxy-2-alpha, 17-Beta-dimethyl-5-alpha-androstan-3-one-azine, Eurycoma, NAC, Milk Thistle	“Continue to Take”
Ergogenic	20	Cardio Feels Like You Don’t Get Enough Oxygen/Increase Heart Rate	Creatine, Caffeine, 1,3 Dimethylamine	Goes Away After a Few Hours
Ergogenic	20	Cardio Feels Like You Don’t Get Enough Oxygen/Increase Heart Rate	Creatine, <i>Camellia sinensis</i> , Caffeine, Astragalus	Goes Away After a Few Hours
Herbal hormone	20	Hair growth speeds up, ears, nose, etc.	<i>Tribulus terrestris</i>	n/a
Ergogenic	4	Stomach Ache, Nausea	Creatine, Caffeine, L-Arginine, L-Citrulline, Betaine	Stop Taking It
Ergogenic	12	Made Me Sick to My Stomach	L-Citrulline, Amino Acids, b6	Stop Using for a While, Try Using Again, Adjust Amount Until No Effects Felt
Ergogenic	12	Felt Hot, Dizzy, Opposite of Appetite Suppressant, Felt Hungrier	Caffeine, Rhodiola, Yohimbine, <i>Camellia sinensis</i>	Continued Using to Assess “Tolerance” Per Directions—No Change After Several Days, Stopped Using
Ergogenic	10	Upset Stomach	Creatine, Caffeine, L-Arginine, L-Citrulline, Betaine	Changed Eating Schedule
Ergogenic	10	Upset Stomach	Creatine, <i>Camellia sinensis</i> , Caffeine, Astragalus	Changed Eating Schedule
Ergogenic	3	Trouble Sleeping	Creatine, Caffeine, L-Arginine, L-Citrulline, Betaine	Tried Not Taking It Late in the Day
Multivitamin	2	Easier to Dehydrate	A, B, C, D Vitamins, Amino Acids, Bromelain Carnitine, Choline, Fenugreek, Hawthorn, Milk Thistle, Chromium	Hydrate More

Those individuals who reported an adverse effect from supplement use, the supplement to which they attributed the adverse effect and the action the respondent then took were queried on the survey instrument. The number of concurrently taken supplements was abstracted from survey data from that respondent, and the components of the implicated supplement were obtained from examination of named supplement’s ingredients through online resources marketing the sale of the implicated supplement.

TABLE VI. Information and Acquisition Sources Reported to for Supplement Use

	<i>n</i>	%
Information Source on Supplement Use		
Civilian Friend	23	27.06
Military Friend Outside the Battalion	21	24.71
Friend in the Battalion	44	51.76
Internet	51	60.00
Magazine	30	35.29
Books	9	10.59
Expert	24	28.24
Health Care Provider	5	5.88
Total Responses	207	
Total Respondents	85	
Information Source for Supplement Safety		
Civilian Friend	3	5.00
Military Friend Outside the Battalion	3	5.00
Friend in the Battalion	5	8.33
Internet	24	40.00
Magazine	6	10.00
Books	1	1.67
Expert	9	15.00
Health Care Provider	7	11.67
User	4	6.67
Friend, Not Otherwise Specified	6	10.00
Family	1	1.67
Total Responses	69	
Total Respondents	60	
Information Source for Supplement Effectiveness		
Civilian Friend	3	4.84
Military Friend Outside the Battalion	1	1.61
Friend in the Battalion	10	16.13
Internet	15	24.19
Magazine	4	6.45
Books	1	1.61
Expert	10	16.13
Health Care Provider	2	3.23
User	7	11.29
Friend, Not Otherwise Specified	14	22.58%
Personal Experience	2	3.23
Total Responses	69	
Total Respondents	62	
Source of Supplement Acquisition		
Internet	57	79.17
Friend	7	9.72
Family	26	36.11
Military Contact Outside Theater (Afghanistan)	2	2.78
Military Contact in Theater (Afghanistan)	4	5.56
Carried in Baggage Into Theater	10	13.89
Dining Facility	2	2.78
Total Responses	108	
Total Respondents	72	

Respondents were asked where they obtained information guiding their supplement use, and the sources through which they obtain supplements while in theater. Percentages are expressed as number of responses per respondents.

In the multiple choice “select all that apply” question regarding motivations to supplement use, the three most commonly cited motivations were muscle strength, physical appearance, and muscle size. In a total of 51 free written responses to primary goals of supplement use, 9 responses were given for

cardiorespiratory, muscle size, and physical fitness, followed by 5 for nutrition and 4 for limited dietary choices.

The most commonly cited information source on supplement use, on safety, and efficacy was reported to be the Internet. Supplements were most often acquired through mail shipment from Internet mail order, followed by mail from family. Health care providers were infrequently cited sources of information on supplement use, efficacy, and safety, cited by 2.42%, 11.67%, and 2.90% of respondents, respectively.

The number of surveys returned failed to achieve the intended sample size of 120–200 soldiers.

DISCUSSION

The current study demonstrated a significant amount of supplement use among a deployed cohort. Compared to Arsenault and Kennedy in 1999, it is notable that higher rates of use of protein and ergogenic supplements, such as creatine, were found in the deployed cohort. The 2215 Ranger and SF Trainees in the Arsenault study reported a current supplement use rate of 64%, with 17% and 18% of trainees using creatine and “pro-performance” supplements, respectively. By comparison, 45% of respondents were using ergogenic supplements during the course of the deployment. Further, the high rate of supplement use obtained in the Arsenault study occurred in garrison where participants likely experienced greater access to procure supplements.

These data substantiate a high volume of sustained supplement use for the duration of a combat deployment, with supplement users outnumbering nonusers by a wide margin within this cohort. Given that the study population is a company of infantry in a remote location, it stands to reason that they face a greater risk of combat injury, and apart from the assignment of a physician to their location for the duration of deployment, greater challenge in accessing care for Disease and Non Battle Injuries (DNBI).

It is notable that 8 of the 12 supplements reported by soldiers to have caused adverse effects contain caffeine, with symptoms consistent with caffeine toxicity. With the ready availability of caffeine through soft drinks, energy drinks, and ergogenic supplements, caffeine toxicity may occur through ingestion of multiple sources to include ergogenic supplements. Concern regarding the possibility of caffeine toxicity arising from supplement use among soldiers has previously been raised.⁵

Motivations to the use of supplements and exercise were illuminating in the predominance of physical appearance in the responses. Requirements of military missions and limited dietary choices were described as among the top three most commonly identified motivations to exercise and use supplements. These data indicate that personal and operational factors motivate supplement use among this cohort.

Soldiers surveyed were stationed on a COP with access to Internet and mail services, but without commercial retail, such as a post exchange found on larger bases in theater. Nevertheless, soldiers maintained high rates of use throughout the course of deployment, and obtained supplements

TABLE VII. Exercise and Supplement Use Goals

Exercise Goal	<i>n</i>	%
Reported Exercise Goals		
Cardiorespiratory	64	65.31
Muscle Strength	68	69.39
Muscle Size	56	57.14
Physical Appearance	69	70.41
Weight Loss	31	31.63
Military Mission	10	10.20
Army Physical Fitness Test	51	52.04
Total Respondents	98	
Total Responses	349	
Goals of Supplement Use		
Goal		
Nutrition	44	58.67
Limited Dietary Choices	37	49.33
Improved Memory	7	9.33
Problem Solving	7	9.33
Alertness	15	20.00
Sleep	0	0.00
Fatigue	28	37.33
Illness Prevention	21	28.00
General Health	39	52.00
Cardiorespiratory	18	24.00
Muscle Strength	54	72.00
Muscle Size	41	54.67
Physical Appearance	44	58.67
Gaining Weight	21	28.00
Meet Height and Weight Standards	5	52.00
Lose Weight	18	24.00
Reduce Fat	22	29.33
Military Mission	33	44.00
Army Physical Fitness Test	25	33.33
Total Respondents	75	
Total Responses	479	
Written Goals of Exercise		
Primary and Additional Exercise Goals		
Reported Goal	Additional	Primary
Nutrition	0	1
Limited Dietary Choices	0	1
Improved Memory	0	0
Problem Solving	0	0
Alertness	0	0
Sleep	0	1
Fatigue	0	0
Illness Prevention	0	0
General Health	0	6
Cardiorespiratory	0	1
Muscle Strength	1	9
Muscle Size	0	10
Physical Appearance	3	22
Gaining Weight	1	2
Meet Height and Weight Standards	0	1
Lose Weight	0	8
Reduce Fat	0	0
Mission	0	16
Army Physical Fitness Test	0	1
Number Total Responses	5	79
Free-Text Written-In Responses		
Nonmilitary Professional Aspirations	3	1
General Physical	0	6
Stress Relief	0	1
Positive Attitude	0	1

(continued)

TABLE VII. Continued

Exercise Goal	<i>n</i>	%
Specific Health Concern	0	1
Reduce Injury Risk	0	1
More Energy	0	1
Feel Better	0	1
Survival	0	1
Total	3	14
Written Goals for Supplement Use		
Primary and Additional Supplement Use Goals		
Reported Goal	Additional	Primary
Nutrition	0	5
Limited Dietary Choices	1	4
Improved Memory	0	0
Problem Solving	0	1
Alertness	0	0
Sleep	0	0
Fatigue	0	1
Illness Prevention	0	1
General Health	0	4
Cardiorespiratory	0	1
Muscle Strength	0	9
Muscle Size	0	9
Physical Appearance	0	9
Gaining Weight	0	2
Meet Height and Weight Standards	0	0
Lose Weight	0	3
Reduce Fat	0	0
Mission	0	2
Army Physical Fitness Test	0	0
Number Total Responses	1	51
Free-Text Written-In Primary Goals		
Repair Muscles Faster		1
Endurance		1
Military Appearance		1
Motivation To Exercise		1
Workout Recovery		1
Improved Workout		1
Total		6
Free-Text Written-In Additional Goals of Supplement Use		
Preworkout Pump	1	
Longevity	1	
Repair Muscles Faster	1	

Respondents were asked to indicate their goals motivating them to use supplements. Questions were in both multiple choice and written free-response format. Percentages are expressed as number of responses per respondents.

through mail order or shipment from friends and family. Future deployments with similar access to mail and Internet services will likely facilitate use of supplements as demonstrated here.

Sources of information on supplement use were described among respondents to most frequently come from Internet sources, and from their peers. This is unsurprising, given the ubiquity of Internet access throughout theater in 2012. It is further worth considering that the Internet was the preferred information source despite ready access to a physician for medical advice.

The limitations of this study include the underpowered sample size, limiting extrapolation of the data to the broader airborne infantry population. Females were not included in

the study; however, they constitute, as yet, a small proportion of the population of airborne infantry battalions. Supplement definitions were based on review of listed ingredients obtained from popular vendor websites. Supplements marketed for different purposes may include the same components, and may be of unproven benefit for either purpose toward which they are marketed. Under these conditions, obtaining consistent definitions of supplement classes between studies remains a challenge to generalizing findings from the nutritional and exercise supplement literature and limits applicability of these data.

Published reports document the potential health consequences of several supplements reported to have been used by soldiers in this study. Dimethylamine, which is found in the formulation of Jack3D that was available at the time of data collection, was previously implicated in the death of two soldiers.⁶ Contamination of supplements with banned and potentially harmful substances, such as anabolic androgenic steroids is a serious issue of concern.^{7–10} Furthermore, the poor quality control^{9,11} in supplement products adds to cause for caution regarding the use of these supplements in an environment where access to medical care is limited, and adverse medical outcomes can have disastrous effects on individuals and units. The potential adverse psychiatric complications of androgenic steroids, to include psychosis, could be catastrophic in a combat environment. Given the difficulty assessing the magnitude of threat to deployed soldiers' health constituted by supplements, DNBI tracking of supplement-related diagnoses could be implemented at all echelons of care to clarify the impact on soldier health and combat readiness.

A recent consensus statement on protein supplement use among U.S. Armed Forces Personnel indicates that protein supplement use is acceptable under conditions requiring increased physical activity such as combat.¹² This is an important step forward in providing guidance to soldiers, commanders, and providers on acceptable and safe supplement use.

These data should serve as an indicator of the possibility that airborne infantry soldiers use supplements at high rates in deployed settings, particularly with access to mail, and guide further study of patterns of supplement use among deployed soldiers. Survey studies of larger populations of deployed service members throughout the DoD and within different subpopulations (SOF, combat arms, support, etc.), and with a more diverse population, may reveal differing prevalence of use and different mixtures of supplements used. Longitudinal studies of supplement users should also be considered to determine long-term usage patterns, and possible adverse effects. Respondents in this study did not seek medical attention for adverse effects of supplement use; therefore, longitudinal studies may assess the frequency of adverse effects more accurately than a retrospective review of medical records. Undertaking a longitudinal study of supplement users is challenging at the unit level due to high rates of personnel turnover, but may be feasible through email or telephonic follow-up, allowing follow-up across multiple

duty stations. Military medical policy makers and providers should consider the implications of high rates of supplement use in combat environments, if verified in future appropriately powered studies, and provide clear guidance to soldiers on acceptable and unacceptable supplement use. This is particularly true if certain categories of supplements are officially sanctioned, and others remain in an ambiguous status, despite obvious cause for concern regarding safety and disciplinary action, such as anabolic steroid-contaminated prohormone supplements. DNBI tracking of supplement-related medical diagnoses at all echelons of care could help clarify the extent to which supplements impact the health of deployed soldiers.

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APPENDIX A: INFORMATIONAL BRIEF

Study Title: Nutritional and sports supplement use among Airborne Infantry soldiers on a remote Combat Outpost in Afghanistan

Informational Brief

To be administered to all potential study enrollees prior to dissemination of the informed consent document and the study questionnaire by the study investigator, CPT Robert D. Paisley, MC

Thank you for your attention. The purpose of this meeting is to provide a briefing on a medical research study that is being conducted on Combat Outpost Herrera to investigate the use of nutritional and sports supplements among soldiers during deployment to a remote location in a combat environment. The study consists of completing a single questionnaire over your personal use of nutritional and sports supplements, your exercise goals, how you acquire supplements on deployment and the sources of information you use to make decisions about what supplements to use. All written responses you provide to the questionnaire will be strictly confidential and only viewed by the personnel conducting this study. No personal identifying information (such as your name, rank, and social security number) will be requested as part of this study. If you choose to participate in the study and complete the questionnaire, please do NOT include any of this information with your response or record it anywhere on the questionnaire form. Your participation in this study is strictly voluntary, and is not required either by your chain of command or by the medical staff on COP Herrera or in 3-509th IN (ABN).

As previously mentioned, all responses you record on the study questionnaire will be strictly confidential. Demographic information will be solicited in the study survey, and a small possibility exists that your identity could be determined based on your answers. It is important that you are aware of this risk, and if you prefer, you may choose to not participate in the study.

If you do not wish to participate in the study, you may decline to receive an informed consent document and questionnaire. If you decide not to participate, it will not have any unfavorable effects on you, your medical care at COP Herrera Battalion Aid Station, or with me. If you wish to participate, then please accept the informed consent document, read it fully and ask any questions you have regarding its contents. You may keep the information sheet for your records, if you wish. After reading the informed consent document in full, and having any questions answered, I will leave the area so that you can begin the questionnaire. Again, as your participation is strictly voluntary, you may skip any questions you wish to not answer.

A locked box will be left in the hallway of the B-hut for you to deposit your completed survey in. After finishing the questionnaire, please deposit it in the locked box at the front of the room and return to your duties quietly to allow other soldiers to complete the survey. I (the study Principle Investigator) will leave the B-hut for one hour in order to allow soldiers to complete the survey and leave it in the box without being seen to ensure that your participation in the survey is anonymous.

Thank you for your time and attention.

APPENDIX B INFORMED CONSENT

RESEARCH INFORMATION SHEET

Title of Protocol: Nutritional and sports supplement use among Airborne Infantry soldiers on a remote Combat Outpost in Afghanistan

Principal Investigator: CPT Robert D. Paisley, MC USA

INTRODUCTION

You are asked to participate in a research study conducted at Combat Outpost Herrera by CPT Paisley, 3-509th IN (ABN) Battalion Surgeon. You are asked to participate in this research because you are a member of 3-509th IN (ABN) and deployed to a remote and austere combat outpost. Your participation in this research is voluntary. You may decline to participate without any penalty or loss of benefits to which you are entitled. Your medical care, future relationships with COP Herrera Battalion Aid Station, or with CPT Paisley will not be affected in any way if you decline to participate.

WHY IS THIS RESEARCH BEING DONE?

The purpose of this research is to investigate the use of nutritional and sports supplements among airborne infantry during combat deployment in remote and austere environments. Specifically, it is the hope of the investigator to determine how soldiers are using supplements, why they use them, how supplement use meets soldier's exercise goals and how soldiers acquire supplements and make decisions about which supplements to use. Nutritional and sports supplements include substances such as protein supplements, vitamin packs, nitric

oxide, L-arginine, branched chain amino acids, creatine, ephedra, hormone boosters, testosterone boosters, estrogen blockers, and "pre-workout." This is a relevant issue for military medical providers due to the possibility of adverse health consequences that sometimes accompany the use of exercise supplements. In remote settings, such as COP Herrera, the risk is magnified, thus it is imperative that medical providers understand how and why soldiers use supplements.

WHAT ARE THE POTENTIAL RISKS AND DISCOMFORTS FROM BEING IN THIS RESEARCH?

The risk associated in completing the study questionnaire lies in the disclosure of personal identifying information or the association of your identity with your response. In order to limit the risk that your identity be associated with your response, please DO NOT include personal identifying information (name, rank, social security number, date of birth, battle roster number, address, etc.) on the questionnaire form. Once you have completed the survey, deposit it in the lock box.

WHAT ARE THE POSSIBLE BENEFITS FROM BEING IN THIS RESEARCH?

It is expected that by gathering this information on supplement use that the safety of supplement use by soldiers during deployment to austere locations will be improved. Medical providers treating deployed soldiers in the future will have the benefit of greater understanding of how and why soldiers use nutritional supplements. Armed with that knowledge, the risk to soldier's health from supplement side effects and adverse reactions can be limited.

HOW WILL YOU PROTECT MY PRIVACY AND THE CONFIDENTIALITY OF RECORDS ABOUT ME?

All completed questionnaires will be deposited into a locked box. Only the study investigator (CPT Paisley) will have access to study questionnaires. Should any personal identifying information be found on a questionnaire, the physical document will be destroyed by burning or shredding immediately following collection of data necessary for execution of this study. No personal identifying information will be collected or recorded in conjunction with questionnaire responses. Ultimately, the intent of the study investigator is to publish the findings of this research in a medical journal. In doing so, no information that can be linked to an individual soldier will be disclosed to any person not participating in the study.

WHO SHOULD I CALL IF I HAVE QUESTIONS OR CONCERNS ABOUT THIS RESEARCH?

If you have questions about the research at any time, you should contact CPT Robert Paisley, 3-509th IN (ABN) Battalion Surgeon, DSN 303-771-1334.

If you have questions regarding your rights as a research participant, you may contact the HQ USAMRMC IRB Office at 301-619-6240 or by email to irboffice@amedd.army.mil

APPENDIX C: SURVEY INSTRUMENT

Survey of Supplement Use

Demographic Questionnaire

1. What is your age?
 - a. 18–20
 - b. 21–22
 - c. 23–26
 - d. 27–30
 - e. 31–35
 - f. 36–45
 - g. Older than 45
2. What is your gender?
 - a. Male
 - b. Female
3. Have you ever been married?
 - a. Yes
 - b. No
4. What ethnicity are you?
 - a. African-American/African
 - b. Asian/Pacific Islander
 - c. Caucasian
 - d. Hispanic/Native American
 - e. Middle Eastern/Arab/Persian
5. Is your MOS?:
 - a. 11 series, 13 series or 68 series
 - b. other
6. How many years have you been on active duty? _____
7. How many times have you deployed? _____
8. What is your rank?
 - a. E1–E4
 - b. E5–E8
 - c. 2LT–COL

Supplement Use Questionnaire

Questions 1–5 refer to the table attached on the last page. Please record your answers in the spaces provided.

1. Please list all nutritional and exercise supplements you have used over the course of **this deployment**.
2. How many times per week have you used each supplement during deployment?

3. What was the approximate date you began using each supplement listed?
4. If you have stopped using any of the supplements listed, what was the approximate date you stopped?
5. What is the main benefit you get from using each supplement you have listed?

Supplement	Frequency Used	Date of First Use	Date of Last Use	Benefits
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				

Please fill in Questions 6–9 in the table marked Adverse Effects

6. Have you experienced any unwanted or adverse effects during deployment from using any of the supplements you have listed?
7. What was the approximate date you experienced the adverse effect?
8. After you experienced the adverse effect, what action did you take with respect to your supplement use? (Examples: stopped using the supplement, decreased the dose of the supplement, continued using the supplement without change)
9. Do you believe that a supplement you used caused an adverse reaction or unwanted reaction with a prescribed or over the counter medication you were also using?
 - a. Please name the medication
 - b. Please list the effect you experienced from the interaction of the supplement and the medication.

Supplement	Adverse Effect	Date of Adverse Effect	Action Taken after	Medication Interacting with Supplement	Medication—Supplement Interaction Effect
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					

For questions 10–20, please write your response below the question in the space provided or circle the appropriate answer.

10. Have you ever seen a doctor or other healthcare professional because of an effect caused by a supplement?

a. Yes
b. No

Please name the supplement that caused you to seek medical attention and describe the outcome on your health below.

11. How many different supplements have you used over the course of your **lifetime**? Please circle one of the following:

a. 1–2
b. 3–4
c. 5–6
d. 7–8
e. 9–10
f. More than 11

12. How many times per week do you exercise? Please circle one of the following:

a. Once per week
b. Two to three times per week
c. Three to four times per week
d. Five to six times per week
e. Seven or more times per week
i. If you exercise more than seven times per week, how many days per week do you exercise more than once in a day?

Please write in your answer: _____

13. What are your exercise goals. Please circle as many of the listed choices below as apply to your personnel goals for exercise.

a. Increased cardiorespiratory endurance (example: running longer and faster)
b. Increased muscle strength (example: increasing your maximum bench press)
c. Increased muscle size (example: gaining muscle mass)
d. Improved physical appearance
e. Weight loss (example: meeting height and weight standards)
f. Improved performance at military and mission related tasks (example: improved ability to carry mission essential equipment and conduct tactical maneuvers)
g. Improved Army Physical Fitness Test performance

14. Please write in any additional exercise goals beyond those listed above.

15. What is your **PRIMARY** goal for exercise among those you identified in questions 13 and 14? Please write the response here

16. What are your goals for supplement use? Circle as many of the choices below as apply.

a. Improved nutrition
b. Dietary supplementation due to limited food choices during deployment
c. Improved memory
d. Improved problem-solving ability
e. Increased alertness
f. To decrease need for sleep
g. Prevent fatigue
h. Prevent illness or becoming sick
i. General health improvement
j. Increased cardiorespiratory endurance
k. Increased muscle strength
l. Increased muscle size
m. Improved physical appearance
n. Gaining weight
o. Meeting height and weight standards required for service
p. Lose weight
q. Reduce fat mass
r. Improved performance at mission related tasks
s. Improved Army Physical Fitness Test performance

17. Please write in any additional goals for supplement use beyond those listed above.

18. What is your **PRIMARY** goal for supplement use among those you identified in questions 16 and 17? Please write the response here:

19. What sources of information do you use to make decisions about the supplements you use? Please circle one of the choices below or write in a response here: _____

- a. Friends who are civilians
- b. Friends who are in the military and not in 3-509
- c. Friends who are in the military and in 3-509
- d. Internet
- e. Magazines
- f. Books
- g. Health or exercise expert
- h. Health care provider (such as a doctor, PA, nutritionist, or nurse)

20. Out of the information sources **you have used** to make decisions about supplement use, what is the one source of information that you consider to be most trustworthy regarding the **safety** of supplements you use.

21. Out of the information sources **you have used** to make decisions about supplement use, what is the one source of information that you consider to be most trustworthy regarding the **effectiveness** of supplements you use?

22. Where do you obtain the supplements that you have used during the course of deployment? Please circle all of the following choices that apply and write additional sources here:

- a. Mail order over the Internet
- b. Mailed by friend
- c. Mailed by a family member

- d. Mailed by military peer in the United States or outside of Afghanistan
- e. Mailed by a military peer in Afghanistan
- f. Carried with personnel items while travelling into country during initial deployment or when returning from leave

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