Protein Supplementation in U.S. Military Personnel

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Abstract

Protein supplements (PSs) are, after multivitamins, the most frequently consumed dietary supplement by U.S. military personnel. Warfighters believe that PSs will improve health, promote muscle strength, and enhance physical performance. The estimated prevalence of regular PS use by military personnel is nearly 20% or more in active-duty personnel, which is comparable to collegiate athletes and recreationally active adults, but higher than that for average U.S. civilians. Although the acute metabolic effects of PS ingestion are well described, little is known regarding the benefits of PS use by warfighters in response to the metabolic demands of military operations. When dietary protein intake approaches 1.5 g · kg⁻¹ · d⁻¹, and energy intake matches energy expenditure, the use of PSs by most physically active military personnel may not be necessary. However, dismounted infantry often perform operations consisting of long periods of strenuous physical activity coupled with inadequate dietary energy and protein intake. In these situations, the use of PSs may have efficacy for preserving fat-free mass. This article reviews the available literature regarding the prevalence of PS use among military personnel. Furthermore, it highlights the unique metabolic stressors affecting U.S. military personnel and discusses potential conditions during which protein supplementation might be beneficial.

Introduction

The dietary supplement (DS) industry continues to grow rapidly, with sales in the United States now exceeding $30 billion annually (1). The U.S. military population regularly uses large amounts of DSs (2–6). Recent evidence suggests that more than half of the active-duty U.S. Army population regularly consumes DSs (3). Protein supplements (PSs) are, after multivitamins, the most popular DS consumed. Despite the high rate of PS use in warfighters, data addressing the efficacy and safety of consuming supplemental protein are sparse.

Physically active individuals, such as athletes, appear to benefit from consuming dietary protein in excess of the RDA (7–9). In certain military occupations, such as infantry, the strenuous nature of the occupational duties may produce dietary energy and protein requirements similar to resistance- and endurance-trained athletes. Equally important, members of these occupations are often in logistically and time-constrained situations that contribute to underestimating relative to energy expenditure and desired amounts of dietary protein (10). However, the vast majority of military occupations are less physically demanding than occupations such as the infantry, and their protein needs are likely met by normal dietary intake. This diversity of physiological demand within the military requires consideration when assessing efficacy and safety of PS use by warfighters. In addition, the potential for PSs to impose unintentional metabolic harm must be considered, given that concerns have been raised that too much dietary protein might initiate or promote renal dysfunction (11,12), and because DSs could be contaminated (13).

This concise review summarizes what is known regarding PS use among military personnel. It also introduces the reader to the...
varied metabolic demands of military occupations and the challenges (or lack thereof) of service members meeting their nutritional needs by diet alone. The intent is to facilitate informed discussion with regard to the merits and risks of PS use by military personnel.

**Prevalence and Rationale of PS Use among Warfighters**

The U.S. Department of Defense, the Samuei Institute, and the NIH, with additional support from the Food and Drug Administration, requested that the Institute of Medicine convene an ad hoc committee to assess DS use by military personnel and recommended an approach to determine which DSs need to be actively managed (14). An examination of the available scientific evidence revealed widespread use of DSs, particularly PSs. For example, DS use among 2215 U.S. Army Special Forces (SF) and U.S. Army Ranger trainees between 1997 and 1998 was nearly 65%, with most indicating using ≥1 DS daily (6). Nearly 30% of the special operations candidates surveyed were consuming some form of amino acid (AA) or protein-type mixture, and 14% were using PSs daily. The prevalence of PS use was more common among trainees performing resistance- and endurance-type exercise ≥3 times per week. Bovill et al. (2) confirmed these findings, because the rate of PS use among SF soldiers (25%) was also predicted by exercise frequency. Special operations soldiers believed that consuming PSs would enhance physical performance by providing energy. This decision was based on nutrition information obtained mainly from magazines, friends, and teammates and not scientific evidence. The pervasive use of PSs in this population of warfighters, which has been reported to be as high as 63% (15), is not surprising considering the occupational and physical demands of special operations.

Surveys of PS use by U.S. military personnel have provided varied outcomes. Brasfield (16) assessed DS use among 874 active-duty U.S. Army soldiers across 16 army installations located within the continental US, and found that only 5% of the population reported using AA supplements. However, those who reported using AA supplements were doing so >5 times per week. In contrast, 43% of U.S. Marine Corps recruits entering basic training in 2007 indicated using PSs regularly, and PSs were the most popular DS surveyed in this population (5). Data from >105,000 U.S. military personnel in the Millennium Cohort Study further support a high rate of PS use: 23% of men and 5% of women reported regular consumption of bodybuilding supplements. The prevalence was highest in warfighters with ≥1 of the following characteristics: U.S. Marines, healthy weight, active duty, married (for men), deployed, or combat specialist and individuals that participate in routine resistance- and endurance-type training (4).

The most comprehensive and detailed assessment of DS use among active-duty military personnel to date was conducted by Lieberman et al. (3), who randomly administered surveys to 990 soldiers across 11 global U.S. Army installations from 2006 to 2007. The use of DSs for the 6 mo before survey administration was queried, and the data were weighted by age, sex, rank, and SF status so as to represent the active-duty U.S. Army. More than 50% reported consuming DSs at least once per week. Multivitamins and multiminerals were the most common (38%) DS consumed. PSs were the second most popular DS, with nearly 19% of the population reporting regular use of PSs. The prevalence of PS use was higher among men (20%) than women (9%), peaked between the ages of 30–39 y (28%), and was not influenced by educational status. Rank influenced PS use: a higher percentage of officers (23%) and senior noncommissioned officers (23%) reported using PSs compared with warrant officers (15%) and junior enlisted soldiers (14%). Nearly half of the SF soldiers surveyed indicated regular use of PSs. Similarly, the use of PSs was higher in soldiers with military occupations classified as combat arms (23%) and combat support (20%) than combat service support (14%). Deployment status did not statistically influence PS use, although ~26% of soldiers deployed to Iraq during this time frame indicated using PSs compared with only 19% and 12% of soldiers stationed within and outside the continental United States, respectively. The use of PSs was more prevalent in soldiers who frequently participated in resistance-type training and those who performed nearly 8 h of endurance-type exercise per week.

The reasons for taking PSs vary. More than half of those surveyed by Lieberman et al. (3) reported using PSs because they believe that PSs will create greater muscle strength. Nearly one-third reported using PSs because they want to enhance physical performance, whereas 21% consumed PSs to promote general health. Approximately 10% of soldiers consumed PSs to provide more energy and increase endurance and because they believe that PSs will aid with weight loss. More than half were very confident that the supplements they were consuming were safe and worked as advertised (17). Similar reasons for using PSs (combined with bodybuilding supplements) were recently reported in a large cohort of U.S. military personnel using data derived from the Department of Defense Survey of Health-Related Behaviors Among Active-Duty Personnel (18). The most common reasons for using PSs in this large group of service members (n = 16,146) were to increase muscle mass (46%), enhance physical performance (32%), and improve overall health (22%). Regardless of the rationale, PS use among U.S. military personnel appears to be common and may be differentially influenced by varying strenuous occupational and physical demands of military service.

**Comparison of PS Use between Warfighters and U.S. Civilians**

PS use among the general U.S. civilian population is relatively low. Using random telephone surveys from 1994 to 1995, the U.S. Food and Drug Administration reported that the use of AA supplements was as low as 5–9% (19). Data from the third NHANES (NHANES III, 1988–1994) suggest that PS use was <2%, although PSs were classified as bodybuilding supplements and not listed individually (20). Interestingly, using data from NHANES III and NHANES 2001–2002, Block et al. (21) reported that 47% of women and 56% of men who were classified as multiple DS users (i.e., used an average of ≥17 different DSs per day) consumed a daily PS. Block et al. (21) reported that multiple DS users were at lower risk of chronic disease and less likely to have elevated blood pressure and be diagnosed with diabetes compared with non-DS users.

Patterns of PS use by service members appear to be similar to those of athletes and avid exercisers (13,22). For example, in a group of Division I athletes (115 men, 88 women) from the University of Nebraska, Froiland et al. (23) reported that nearly 50% used PSs. The most frequently consumed PSs were protein powders (22%), whey protein (13%), and free AAs (12%). Male athletes were more likely to use PSs than females, and athletes participating in metabolically demanding sports including football, soccer, wrestling, and track and field used PSs more frequently than athletes participating in less metabolically demanding sports such as golf, baseball, and softball. The use of PSs is also common in
men and women who exercise regularly at local fitness clubs (24). The patterns of PS use among athletes and routine exercisers across sexes and activities of varying metabolic demands, and the reasons for consuming PSSs including improved muscle strength and power and health promotion, are similar to those recently reported for active-duty military personnel (3).

U.S. Military Dietary Protein and Energy Guidelines: A Brief Overview

The current military DRI (MDRI) for protein is based on the RDA from the Institute of Medicine (25) but incorporates adjustments to meet requirements for periods of increasing metabolic demand, which range from 0.8 to 1.5 g · kg$^{-1}$ · d$^{-1}$ (26). The military recommendations for dietary protein and energy are also consistent with current nutrition recommendations for physically active adults from the American College of Sports Medicine (8).

Recent data from NHANES 2003–2004 suggest that the daily protein intake for adults of military age (19–60 y) should be 0.8–1.4 g · kg$^{-1}$ · d$^{-1}$ (27). As such, dietary protein intake during nonoperational, garrison conditions is likely consistent with the current MDRI and should be adequate for most physically active warfighters when total energy intake is equivalent to energy expenditure. Whether regular PS use confers any additional metabolic advantages or disadvantages for warfighters when nutrition requirements are met has not been determined.

Combat rations are the primary source of food during military field training and when conducting missions in remote areas. The nutritional standards for operational rations specify nutrient content requirements for different types of rations and serve as the basis for feeding policies that establish the allowable duration that the ration can be used as the sole source of nutrition (26). General-purpose rations, of which the most commonly used and best known is the C-1 ration, can be used as the sole source of nutrition (26). The military feeding policies that establish the allowable duration that the ration can be used as the sole source of nutrition (26). General-purpose rations, of which the most commonly used and best known is the C-1 ration, can be used as the sole source of nutrition (26).

Operational Stress and Potential Metabolic Benefits of PSSs

The metabolic cost of military operations is largely dependent on occupation and the type of training being performed. Many military occupations are relatively sedentary. Moreover, during nonoperational, garrison conditions, most soldiers likely consume sufficient energy to match energy expenditure and maintain body weight (29). In fact, many soldiers now overconsume, because overweight and obesity rates in military personnel have been increasing (30). In contrast, soldiers in the SF, U.S. Army Rangers, and infantry expend more energy than do combat support and combat service support soldiers due to sustained periods of physical activity. For example, soldiers engaged in various dismounted combat missions may expend 3500–4600 kcal · d$^{-1}$ (10). At the extremes, total energy expenditures for
most warfighters consuming a normal, ad libitum diet meet their energy and the recommended dietary protein requirements without the need for consumption of PSs.

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Literature Cited


