the subset of UKPDS patients with uncontrolled diabetes and hypertension. The Steno-2 follow-up study found that intensive control of BP, HbA1c, and LDL-C among patients with diabetes and persistent microalbuminuria reduced cardiovascular-related adverse event and death rates 5.5 years after trial completion. It is also possible that resource use declined because GMC patients learned to address health concerns directly with their usual physicians; GMC patients self-reported significantly greater confidence in managing diabetes at the completion of the trial compared with usual care.2

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Caffeine Content of Dietary Supplements Consumed on Military Bases

Excessive caffeine consumption, particularly when combined with other stimulants, may increase the risk of hypokalemia, rhabdomyolysis, and other heat-related injuries among athletes and military personnel.1-3 Caffeine is consumed in a wide range of popular items including coffee, teas, sodas, energy drinks, energy gels, chocolate, gums, and over-the-counter medications. Dietary supplements, which are commonly consumed by military personnel,4,5 are a poorly characterized source of caffeine. Only with accurate information about the quantity of caffeine in dietary supplements can consumers and clinicians be assured of safe use. As part of an ongoing multidisciplinary collaboration to promote dietary supplement safety, we analyzed some of the most popular supple-

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ments sold on military bases to determine the accuracy of information available to military personnel and their health care providers regarding caffeine content in dietary supplements.

Methods. We identified the most popular dietary supplements sold as capsules, powders, and tablets (excluding drinks and gels) on military installations labeled as containing either (1) caffeine or (2) 1 or more herbal ingredient known to naturally contain caffeine but without “caffeine” listed on the label. Supplements were purchased at a large, local retail store selling dietary supplements. The quantity of caffeine per serving in the supplements was determined by high-pressure liquid chromatography with UV (HPLC-UV) absorbance after solvent extraction. If the caffeine level was below the limit of quantitation by the HPLC-UV method, liquid chromatography with tandem mass spectrometry detection was used. The results obtained were compared with the caffeine content listed on the product label. All analyses were performed by NSF International.

Results. Thirty-one supplements met our inclusion criteria. Twenty products listed caffeine on the label, and 9 of these products’ labels (45%) listed an accurate amount of caffeine (within 10% more or less than the amount listed on the label). Caffeine amounts listed on the label of 5 of the 20 products (25%) varied widely from chromatographically determined levels, with ranges from 27% to 113% of the labeled quantity. Of the 20 products, 6 (30%) listed caffeine as an ingredient without providing an amount on the label. All 6 of these products contained high amounts of caffeine, ranging from 210 to 310 mg per serving.

See Editor’s Note at end of letter

Eleven supplement labels listed an herbal ingredient that naturally includes caffeine but did not list “caffeine” on the label. Green tea leaf extract was listed on all 11 labels, with 3 labels also including a second caffeine-containing ingredient (black tea leaf [n = 1], white tea leaf extract [n = 1], and kola nut [n = 1]). Our analyses revealed that these products contained no to minimal amounts of caffeine (range, 0-3 mg of caffeine per serving).

Comment. The law regulating the manufacturing and sales of dietary supplements in the United States has loopholes that allow manufacturers to avoid listing the quantity of caffeine on the label.6 Our chemical analyses of the caffeine content in dietary supplements popular on military bases found that less than half (9 of 20 [45%]) of the analyzed supplements’ labels provided clinically useful information regarding caffeine content. Of the 20 product labels listing caffeine, 5 (25%) failed to meet the minimal legal requirements in that they listed a “per serving” amount of caffeine that was inconsistent with what our analyses detected. In addition, 6 of the 20 product labels (30%) were compliant with legal standards, yet failed to provide clinically useful information about caffeine content even though they each contained more than 200 mg of caffeine per serving. For comparison, soft drinks are prohibited by law to contain more than 71 mg of caffeine per 12 fl oz.

A limitation of our study was that we tested only 1 sample of each supplement. Future research would need to determine if our findings are representative and if caffeine content varies from one sample to another. However, our findings are consistent with prior research demonstrating that commercially available dietary supplement labels do not provide sufficient information in respect to caffeine content.7,8

Given the lenient legal framework and inaccurate labels, military personnel are unable to determine if a supplement can be safely combined with other products or foods containing caffeine. This is of increasing concern, as caffeine intake in the form of energy drinks has significantly increased over the past decade, and a recent Centers for Disease Control and Prevention study found that 45% of service members consume energy drinks on a daily basis.9 In addition, physician reports of adverse reactions are a cornerstone of monitoring supplement safety in the United States, but even after careful review of the label, clinicians are unable to determine if an adverse reaction may be associated with the caffeine contained in an individual supplement. To ensure consumer safety, accurate information on caffeine content should be provided on all dietary supplement labels.

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MAA consumption of drinks high in caffeine\(^1\) remind us that substances that are safe and even beneficial at usual doses (how many of us would have survived residency without caffeinated beverages?) may be harmful when consumed to excess. As demonstrated by the authors of this provocative Research Letter, consumers cannot be certain how much caffeine they are consuming in dietary supplements. The authors tested 20 different supplements sold at military installations: 5 had levels very different from what was advertised on the label, and 6 did not even state on the label the amount of caffeine in the product. This report contributes to other reports in this journal\(^2\) and other journals indicating that to protect the public we need tighter regulation of dietary supplements.

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