OVER-THE-COUNTER STIMULANT, DEPRESSANT, AND NOOTROPIC USE IN VETERINARY MEDICAL STUDENTS

by

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(Under the Direction of Jessica Muilenburg)

ABSTRACT

Over-the-counter medications (OTC) can cause problems due to overuse (caffeinism) or may be indicative of other lifestyle problems (i.e. sleep behavior). the purpose of this investigation is to characterize the use of OTC substances and compare energy drink and OTC use with affect in a veterinary student population. A survey was distributed to 1st-3rd year veterinary students at the University of Georgia to gather information about their use of OTC substances, energy support substances (ED), and depression, anxiety, and stress. 35% were OTC Users, 43% were ED Users. OTC Users had higher stress scores and ED users had higher anxiety scores than non-users. Educating veterinary students about the consequences of OTC and ED use and providing counseling support may be of benefit.

INDEX WORDS: Student Characteristics, Student Stress, Caffeine, Depression, Anxiety

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

Chapter 1

INTRODUCTION

Veterinary students in the United States are subject to significant stress throughout their veterinary education.[1] Sixty-eight percent of veterinary students in one study reported feeling overwhelmed 6 or more times in the preceding year, and 38% indicated they had felt depressed at some point in the preceding year.[1] Twenty-four percent of veterinary students reported that stress adversely affected their grade on an assignment.[1] Stress adversely affects student performance, decreases attentiveness, and impairs decision-making skills.[2] Although some students may make use of effective coping strategies, such as socializing or recreation, other students may engage in destructive coping strategies, such as drug or alcohol use.[2] Although the use of illicit substances in medical students has been investigated,[3] the use of over-the-counter agents which students may use as a coping strategy have not been evaluated in medical or veterinary students.

Veterinary students also report difficulties with sleep habits. Sixty-three percent of veterinary students report having sleeping difficulties and, of these, 24% reported that sleeping difficulties adversely affected their academic performance.[1] Veterinary students have also reported feeling exhausted, with 67% reporting feeling exhausted not from physical activity 6 or more times in the past year.[1] Approximately 30% of veterinary students reported feeling very sad 6 or more times in the past year.[1] The psychological distress that these domains illustrate: stress, poor sleeping habits, exhaustion, and depression, can have serious physical and mental health consequences.

Over-the-counter stimulants (OTCS), depressants (OTCD), energy drinks (ED), and nootropics are readily-accessible substances commonly used by university students to address a variety of problems.[4] OTCS include caffeine, energy boosters such as 5-Hour Energy, and pseudoephedrine, which are taken in different forms and may have different pharmacology than ED.[4] OTCD include allergy medications (diphenhydramine), melatonin, kava, St. John's wort, and valerian.[4] ED include products such as Vault, Monster, Rockstar, Red Bull, Amp, Full Throttle, etc. These products contain caffeine and varying concentrations of taurine, ginseng, L-carnitine, B vitamins, guarana, gingko biloba, milk thistle, acacia, careb bean gum, and patothenic acid. Nootropics supposedly improve learning and memory and include substances such as phosphatidylserine, choline, piracetum, vinpocetin, acetyl-L-carnitine, and antioxidants (Vitamin E, gingko biloba).[5]

OTCS and ED are intended to provide a "boost" of energy to the user. Users report a subjective feeling of arousal after drinking ED compared with placebo, and this has been ascribed to the presence of caffeine in the ED.[6] Excessive caffeine use has been associated with psychological disorders, cardiovascular disease, and birth defects.[7] Up to 16% of college students have reported signs consistent with caffeinism, physical and psychological effects of a high dose of caffeine.[8] In one study, moderate and high caffeine consuming university students reported greater depression and anxiety and poorer academic performance compared with caffeine abstainers.[9] Like ED, which contain small amounts of similar substances, it is believed that any perceived increase in energy from energy boosters is due primarily to caffeine.[6] Pseudoephedrine can be used as a stimulant,[10] and its use has been associated with greater degrees of anxiety in university students.[4] Any of the OTCS or ED products may be used by veterinary students to maintain arousal in an attempt to improve study conditions or performance

on examinations. People with deviations in their sleep pattern have higher overall mortality and may be at increased risk for obesity and diabetes mellitus.[11]

OTCD are often used as sleep aids in university students.[4] Diphenhydramine causes drowsiness, impedes performance on mental cognition tests, and slows physical reaction time.[12,13] Diphenhydramine use has been associated with greater degrees of anxiety in university students.[4] Melatonin is an endogenous hormone that seems to be related to the body's response to light and dark (notably circadian rhythms).[14] In humans, exogenous administration of melatonin appears to shift the sleep sleep-wake cycle.[15] Its use has been associated with improved quality of sleep in adult volunteers.[15] Kava is prepared from the roots of kava (Piper methysticum) and may act via the effects of kavapyrones on the gamma amino butyric acid (GABA) receptor.[16] Kava is one of the most studied alternative treatments for anxiety, and a systematic review found evidence for a beneficial effect of kava in anxiety disorders.[17] St John's wort (Hypericum perforatum L) is used in the treatment of clinical depression, and has a controversial mechanism of action.[18] The herb appears effective in the treatment of mild to moderate depression, as it is superior to placebo and comparable to conventional drug therapy.[19] In one study, St John's wort was the most commonly used OTC in university students, and 86% of the respondents believed that it was effective for treating or preventing depression.[20] Valerian (Valeriana officialis L) has been used as a sedative throughout the world and purportedly acts on GABA receptors, similar to the effect of benzodiazepines.[18] A systematic review found no evidence for any beneficial effect of valerian in the treatment of sleep disorders.[21] Clearly, there are a variety of OTCD products available to veterinary students, with varying degrees of evidence of efficacy, which may be used as sleep aids or in self-treatment of anxiety disorders.

Nootropics is a term used to describe a variety of different agents which have numerous mechanisms of action.[5] Fundamentally, nootropics are purported to help improve cognitive functions such as memory and learning, provide neuroprotection against various insults, and have minimal to no adverse effects.[5] Agents often classified as nootropics include Ginkgo biloba, phosphatidylserine, vinpocetin, acetyl-L-carnitine, piracetum, choline nutrients (i.e. phosphatidylcholine), and antioxidants (i.e. vitamin E).[5] Companies which market such supplements often boast of the value and use of the supplements, but there is fairly weak evidence in support of the effect of nootropics on preserving or recovering lost cognitive function.[5] In spite of this weak evidence, Ginkgo biloba use was ranked fourth in one study of students' OTC medication use.[20] It is possible that veterinary students, under pressure to perform well academically, may use nootropics in an attempt to improve their academic standing.

Given the potential adverse health effects of some OTC medications (caffeine, diphenhydramine), knowledge of their use in veterinary students may be beneficial for improving health in veterinary students. Furthermore, if students are using OTC medications as a coping mechanism for stress or poor sleep habits, it may indicate a need to direct resources towards providing other means of stress or sleep management for veterinary students. Therefore, the purpose of this investigation is to characterize the use of OTC substances and compare ED and OTC use with affect in a veterinary student population.

Chapter 2

MATERIALS AND METHODS

Sampling Method

Two-hundred eighty-eight professional veterinary students enrolled at the University of Georgia were approached for inclusion in the study. Students' ages ranged from 19 to 50 years, with a median of 24 years. Twenty-eight percent of the population is male. Study participation was completely voluntary. No identifying information was gathered. Two-hundred thirty-one students replied to the survey. Of these, 4 were incomplete and the data was removed for analysis, leaving 227 records for analysis.

Administrative Procedures

The survey was approved by the University of Georgia's Human Subjects Office. Students were approached as a group in one lecture period, where the purpose of the study was explained. An email was then distributed to each member of the class of 2010, 2011, and 2012, soliciting their participation and providing a link to an online survey form. Each class was comprised of 96 students. The survey form took approximately 10 minutes to complete, and was downloaded into a spreadsheet for analysis. A reminder email was distributed 1 week later, and the online form was closed after 2 weeks from the initial email. Incentive was provided in the form of a $300 award, which would be allocated to the three classes according to their proportionate responses.

Instrument/Measures

A new survey instrument was required, as no previous instrument was available which investigated the type of information being sought in this study. The instrument consists of demographic and academic standing questions, questions about type and frequency of drug, alcohol, OTCS, ED, OTCD, and nootropic use, questions about reasons for use and side effects of agents used, questions about sleep and exhaustion experiences, questions about perceived susceptibility and severity of adverse effects, and an established instrument to collect information on depression, anxiety, and stress.[22] The instrument was based on a synthesis of previous instruments asking questions in a similar fashion from university students.[1,4,19,23]

For questions relating to quantity of drinks (such as coffee), if the respondent provided a range, the average of the two values was taken. Total caffeine consumption per day was calculated by multiplying the respondent's number of coffee cups by 200mg, tea cups by 50mg, soda drinks by 50mg, and energy drinks according to the reported amount of caffeine in each energy drink.[24] Those providing data allowing for calculation of a daily caffeine consumption were then stratified into caffeine non-drinkers (0mg caffeine/day), low drinkers (200 mg or less), moderate drinkers (201-400 mg), or high drinkers (401 mg or more). Body mass index was calculated using the height and weight of the respondent according to the formula (weight * 703)/height^2.

Respondents were classified as OTC Users if they indicated they had ever used any of the following: antihistamine, kava, St. John's wort, melatonin, pseudoephedrine, valerian, or gingko biloba in the past month. Respondents were classified as ED Users if they indicated they had ever used any of the following: energy drinks, energy boosters, or taken something for energy support or fatigue in the past month. Each of these were then substratified into Regular Users,

who indicated they used a substance more than once a week, and Nonregular Users, who indicated they used a substance once a week or less. Values for responses to susceptibility/severity questions were transformed into a 0-4 numeric and treated as non-normally distributed data. Values for susceptibility/severity were also summed for each substance which made up either OTC or ED Users to arrive at a total susceptibility/severity score for OTS Users and ED Users vs. Nonusers.

Analysis

Normality was determined using the Kolmogorov-Smirnov test. For subgroup analysis of two groups (i.e. men vs. women), normally distributed continuous data were compared using a two-way t-test and non-normally distributed continuous data and ordinal data were compared using a Mann-Whitney U test. The Kruskal-Wallis test with post-hoc testing with Dunn's Multiple Comparison Test was used to compare continuous data among freshmen, sophomores, and juniors. Categorical data was analyzed using the χ^2 test. Cronbach's alpha was calculated for the elements of the DASS and for the elements combined to arrive at the ED and OTC perceived susceptibility and severity variables. Significance was set at $\alpha < 0.05$.

Chapter 3

RESULTS

Thirty percent of respondents had used an energy drink in the past month, 15% an energy booster, 20% something for fatigue, 9% smoked, 80% drank alcohol, 4% used illicit drugs, 22% an antihistamine, 0% kava, 1% St John's wort, 7% melatonin, 12% pseudoephedrine, 2% valerian root, and 4% a nootropic. Fifty-two percent of respondents did not use OTC or ED products.

Thirty-five percent of respondents were classified as Over-the-Counter (OTC) Users, with 36% of those being classified as Regular Users. OTC Users were significantly more likely to report feeling exhausted more frequently ($P<0.02$), were significantly less likely to be single ($P<0.02$), and had higher stress scores ($P<0.008$) compared to non-OTC Users (Tables 1 & 2). OTC Regular Users were significantly more likely to be classified in a higher caffeine consumption category ($P<0.04$) compared to OTC Nonregular Users (Tables 3 & 4).

Fort-three percent of respondents were classified as ED Users, with 47% of those being classified as Regular Users. Energy Drink (ED) Users were significantly more likely to be classified in a higher caffeine consumption category ($P<0.04$), were significantly more likely to be equine or large animal focused ($P<0.02$), had higher caffeine consumption values after controlling for the contribution of the energy drink caffeine ($P<0.04$), reported fewer hours of sleep ($P<0.02$), and had higher anxiety scores compared to non-ED Users ($P<0.05$; Tables 1 & 2). ED Regular Users were significantly more likely to report feeling rested less frequently ($P<0.03$), were significantly more likely to report feeling exhausted more frequently ($P<0.04$),

were significantly more likely to be classified in a higher caffeine consumption category ($P<0.04$), were significantly more likely to be female ($P<0.05$), and had higher stress scores ($P<0.008$) compared to ED Nonregular Users (Tables 3 & 4). Comparing ED Users and OTC Users, ED Users were more likely to have a large animal or equine species focus ($P<0.05$), were more likely to be single ($P<0.03$), and consumed more caffeine ($P<0.05$).

Of the 144 respondents who indicated they used over-the-counter stimulants, the reasons provided were to help studying (63%), to remain awake during the day (60%), to wake up in the morning (52%), to help drive for a long period (32%), to get more energy during the day (30%), to improve mood (13%), to mix with alcohol (7%), to cope with stress (6%), to help treat a hangover (6%), to help with weight loss (3%), and to help manage anxiety (2%). Of the 84 respondents who indicated they used over-the-counter depressants, the reasons provided were to fall asleep at night (48%), to help stay asleep at night (30%), to cope with stress (7%), to help manage anxiety (5%), to improve mood (5%), and to prevent or treat depression (4%). Of the 29 respondents who indicated they used over-the-counter nootropics, the reasons provided were to improve memory (21%), for general health benefits (14%), to improve learning (7%), to help study (7%), to cope with stress (7%), to improve mood (7%), and to help manage anxiety (3%).

Perceived susceptibility to adverse reactions and perceived severity of adverse reactions to using products were significantly different between Users and Nonusers for almost every substance (Table 5). The perceived susceptibility to adverse effects was highest with illicit drugs and lowest with nootropics in the Nonusers. The perceived susceptibility was highest with alcohol and lowest with melatonin in the Users. The perceived severity of adverse effects was highest with illicit drugs and lowest with energy drinks in the Nonusers. The perceived severity was highest with alcohol and lowest with melatonin in the Users.

Cronbach's alpha was 0.856 for depression, 0.699 for anxiety, and 0.819 for stress. Cronbach's alpha was 0.867 for ED adverse effects susceptibility, 0.903 for OTC susceptibility, 0.915 for ED severity, and 0.934 for OTC severity. Juniors reported significantly higher scores for depression compared with freshmen (9.5 vs. 6.7, $P<0.05$). Juniors were significantly older than freshmen (26 vs. 24, $P<0.001$) and sophomores (26 vs. 25, $P<0.01$). There were no significant differences among classes with respect to other continuous or categorical variables.

Chapter 4

DISCUSSION

This data confirms that a significant proportion of veterinary students use over-the-counter medications and energy boosting products. The most common OTCs used were diphenhydramine, a sedative, and pseudoephedrine, a stimulant. Respondents indicated they used these substances to modulate their sleep-wake cycle and to help with studying. This confirms that students are using pharmacologic means to adjust their habits in the face of a challenging academic environment. These agents have side-effects which may adversely affect student health, altering the sleep cycle has adverse health effects, and avoiding proper management of psychological distress may lead to mental health problems.

OTC Users were more likely to be exhausted and had higher stress scores, suggesting that students may be using OTC medications to manage exhaustion and stress. OTC Regular Users were more likely to be in a higher caffeine class, suggesting that students who used OTCs more frequently also used more caffeine. This may be because students were seeking an additive effect between the OTC and caffeine, or may be due to the personal characteristics of a Regular OTC User which cause them to consume more caffeine.

ED Users consumed more caffeine than non-Users, even after controlling for the effect of their energy drink caffeine consumption. This suggests that ED Users consume high amounts of caffeine independent of their ED consumption. ED Users may resort to ED products because they have become tolerant to the effects of other caffeine sources. More large animal and equine-focused students used ED than other species-focused students. Also, ED Users were

more likely to have a large animal or equine focus compared with OTC Users. This may be a cultural phenomenon, where students with a focus in large animal or equine are exposed to ED use through role models because of the type of work or personalities of individuals drawn to treating these species. OTC products, in contrast, are not often associated with the lifestyle of large animal or equine veterinarians. ED Users reported getting fewer hours of sleep on an average night. Whether this is due to the caffeine consumed leading to alterations in sleep behavior or because these students stay up late and then feel the need for a boost of energy is unknown. ED Users reported higher anxiety scores. Although the OTC stimulant pseudoephedrine has been associated with greater anxiety in students,[4] no evaluation of psychological state in ED Users has been performed before. It is possible that ED Users are generally more anxious, thus staying up late studying or worrying more, which necessitates ED products. Alternatively, the higher caffeine content in the ED products may cause or exacerbate existing anxiety.[25]

Regular ED Users suffered from greater exhaustion and less restfulness than other ED Users. Again, this may be due to an effect of the ED on sleep-wake cycles or as a consequence of the student altering their own cycles and relying on the ED to maintain alertness, either of which could lead to exhaustion and less restfulness. Regular ED Users in this sample were more likely to be female, which is consistent with previous findings.[23] Regular ED Users had significantly higher stress scores. It may be that these students suffer from higher stress and push themselves harder, staying up late to study, and therefore require more regular ED consumption.

The most common reasons for using stimulants were to help study, remain awake, or wake up in the morning. This is in contrast to a study in general university students, where

helping with studying was the third most common reason provided.[23] It is likely that veterinary students have a greater pressure to perform academically, and therefore would use stimulants more regularly for academic purposes. Compared with a previous study in college students,[26] fewer veterinary students used stimulants with alcohol. This is a positive finding, as consumption of energy drinks with alcohol may lead to greater alcohol consumption, resulting in injuries or other morbidities.[26] It is possible that the difference between this sample and previous reports is due to normal age and life-stage changes, since the median age of the sample was 24 years, whereas in the previous study the mean age was 20 years.[26] Most students who used depressants did so to alter their sleep cycle, either to help fall asleep or to help stay asleep. Given that the average number of hours of sleep in this sample was 6, it is likely that the students are not getting enough natural sleep, thus requiring pharmacologic manipulation to try and improve their sleep.

For every substance, Users reported significantly lower scores for perceived susceptibility to adverse effects compared with Nonusers. This is consistent with the Health Belief Model (HBM), where individuals with lower perceived susceptibility to disease will be less likely to alter their behavior. In this study, we considered an adverse effect the 'disease' so as to apply the HBM to an established behavior of taking a medication which may not be to treat any particular illness or problem. Most substances also had Users reporting significantly lower scores for perceived severity of adverse effects compared with Nonusers. This is consistent with the principle that individuals would be less likely to use a substance if they believed an adverse effect would be more severe.

Although OTC use tended to increase with each class year, this result was not significant. Juniors reported significantly higher depression scores than freshmen. This is consistent with

findings in medical students, where persistent emotional distress causes cumulative increases in depression scores.[27] More counseling resources should be dedicated to students throughout their veterinary educational career to improve their mental health and prevent this progressive increase in depression.

Limitations

This study involved a survey which was voluntarily filled out by the respondents. Non-responders were more likely to be male ($P<0.003$). The sample was comprised of 76% women, whereas nonresponders were 57% female. Of all possible respondents, 82% of women responded whereas only 65% of men responded. The median age was the same between responders and nonresponders (24 years for each). Since there are differences among the genders in response rate, it is possible that there are other characteristics of nonresponders which may have affected the results. A response rate of 80% is excellent for most veterinary publications, which often have response rates lower than 60%, and should minimize the effect of nonresponders on the results.[1,28] The data in this study is self-reported. Self-reported height and weight are not as accurate as direct measurements, which formed the basis for the BMI calculation in this study.[29] However, self-reported values are closest to actual measurements in people aged 20-29, which included the majority of this sample.[29] Other self-reported variables may have been affected by social pressure or difficulty with recall. We sought to reduce recall bias by limiting the timeframe of the questions (i.e. within the past month). Social pressure was minimized by executing the survey on-line, where respondents could reply at their leisure and in private, and by ensuring anonymity. Moreover, the design of this study is cross-sectional, which

prevents any temporal relationships from being tested. As a consequence, no causal relationships can be made based on this data.

This study includes data from only one veterinary school. Although previous studies have also relied on data from one veterinary school,[1] it is unlikely that these results accurately represent the population of all 27 American veterinary schools. A random sampling of all veterinary students in the United States would ensure that the results could be generalized to the population of veterinary students.

Chapter 5

CONCLUSION

Over-the-counter medication and energy substance veterinary student users have distinct characteristics different from nonusers. Users suffer from more stress and anxiety and more difficulties with sleep, which may affect their overall health and academic performance. Comparisons with other professional schools, such as law or pharmacy, may provide insight into the specific stresses of veterinary school. Also, collecting information about the knowledge respondents have of the medications they are using may prove insightful. Educating veterinary students about the consequences of OTC and ED use and providing counseling support may be of benefit. Future studies should involve designs which allow hypothesis testing of the questions raised in this publication.

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TABLE 1. Over-the-counter and energy drink user and nonuser categorical characteristics in a sample of 227 veterinary students. Significance tested with the χ^2 test.. * = significant difference between OTC Users and Nonusers. ‡ = significant difference between ED Users and Nonusers. † = significant difference between OTC Users and ED Users. SA – small animal, EX – exotic, EQ – equine, LA – large animal, MIX – mixed animal. Percentages given are comparing User/Nonuser or, for the All Respondents column, the percent of all respondents of that question.

	OTC User (n=80)	OTC Nonuser (n=147)	ED User (n=97)	ED Nonuser (n=130)	All Respondents (n=227)
Year					
Freshman	21 (27%)	51 (35%)	36 (37%)	36 (28%)	72 (32%)
Sophomore	25 (32%)	43 (29%)	30 (31%)	38 (29%)	68 (30%)
Junior	33 (42%)	53 (36%)	31 (32%)	55 (43%)	86 (38%)
Species Focus † ‡					
SA+EX	**36 (51%)**	74 (54%)	**39 (45%)**	**71 (59%)**	110 (53%)
EQ+LA	8 (11%)	30 (22%)	22 (25%)	16 (13%)	38 (18%)
MIX	26 (37%)	33 (24%)	26 (30%)	33 (28%)	59 (29%)
Health Status					
Excellent	22 (28%0	38 (26%)	25 (26%)	35 (27%)	60 (27%)
Very Good	35 (44%)	73 (50%)	46 (48%)	62 (48%)	108 (48%)
Good	19 (24%)	29 (20%)	20 (21%)	28 22%)	48 (21%)
Fair	3 (4%)	6 (4%)	5 (5%)	4 (3%)	9 (4%)
Rested					
Never	15 (19%)	21 (14%)	18 (19%)	18 (14%)	36 (16%)
Once	16 (20%)	24 (16%)	19 (20%)	21 (16%)	40 (18%)

1/week	33 (41%)	49 (33%)	34 (35%)	48 (37%)	82 (36%)
1-6/week	14 (18%)	49 33%)	22 (23%)	41 32%)	63 (28%)
>1/day	2 (3%)	4 (3%)	4 (4%)	2 (2%)	6 (3%)
Exhausted *					
1/week or less	**7 (9%)**	**35 (24%)**	15 (15%)	27 (21%)	42 (19%)
1-6/week	41 (51%)	63 (43%)	49 (51%)	55 (43%)	104 (46%)
>1/day	32 (40%)	48 (33%)	33 (34%)	47 (36%)	80 (35%)
Tired at class					
1/week or less	4 (5%)	15 (10%)	6 (6%)	13 (10%)	19 (8%)
1-6/week	36 (45%)	70 (48%)	43 (44%)	63 (48%)	106 (47%)
>1/day	40 (50%)	62 (42%)	48 (49%)	54 (42%)	102 (45%)
Caffeine Intake ‡					
None	10 (13%)	16 (11%)	9 (9%)	17 (13%)	26 (11%)
Low	20 (25%)	43 (29%)	24 (25%)	39 (30%)	63 (28%)
Moderate	30 (28%)	59 (40%)	34 (35%)	55 (42%)	89 (39%)
High	20 (25%)	29 (20%)	**30 (31%)**	**19 (5%)**	49 (22%)
On Prescriptions					
Yes	7 (9%)	17 (12%)	12 (13%)	12 (9%)	24 (11%)
No	72 (92%)	129 (88%)	83 (87%)	118 (91%)	201 (89%)
Gender					
Male	18 (23%)	36 (25%)	26 (27%)	28 (22%)	54 (24%)
Female	61 (77%)	108 (75%)	69 (73%)	100 (78%)	169 (75%)
Marital Status *†					
Single	**54 (68%)**	**111 (76%)**	**76 (78%)**	89 (68%)	165 (73%)
Married with Kids	2 (3%)	9 (6%)	4 (4%)	7 (5%)	11 (5%)
Married	20 (25%)	27 (18%)	17 (18%)	30 (23%)	47 (21%)
Divorced	4 (5%)	0 (0%)	0	4 (3%)	4 (2%)

Body Weight					
Underweight	1 (1%)	7 (5%)	1 (1%)	7 (6%)	8 (4%)
Normal	57 (75%)	95 (66%)	66 (69%)	86 (69%)	152 (69%)
Overweight	13 (17%)	35 (24%)	24 (25%)	24 (19%)	48 (22%)
Obese	5 (7%)	6 (4%)	4 (4%)	7 (6%)	11 (5%)

TABLE 2. Over-the-counter and energy drink user and nonuser continuous characteristics in a sample of 227 veterinary students. Significance tested using Mann-Whitney U test or t-test.. * = significant difference between OTC Users and Nonusers. ‡ = significant difference between ED Users and Nonusers. † = significant difference between OTC Users and ED Users. DASS – Depression Anxiety Stress Scale, avg – average.

	OTC User (n=80)	OTC Nonuser (n=147)	ED User (n=97)	ED Nonuser (n=130)
Mg Caffeine/day ‡ †	**256 ± 226**	250 ± 245	**297 ± 284**	**205 ± 174**
Hours sleep/night ‡	6.0 ± 0.8	6.2 ± 1.0	**5.9 ± 0.9**	**6.3 ± 0.9**
DASS Depression	8.5 ± 7.8	7.5 ± 7.5	8.6 ± 7.8	7.4 ± 7.5
DASS Anxiety ‡	5.8 ± 5.4	5.7 ± 5.8	**6.4 ± 5.5**	**5.2 ± 5.7**
DASS Stress*	**14.7 ± 7.9**	**11.9 ± 7.9**	13.6 ± 8.0	12.4 ± 8.1
Age	25.4 ± 3.6	25.1 ± 4.1	25.1 ± 4.4	25.3 ± 3.5
Body Mass Index	23.4 ± 3.0	23.2 ± 3.5	23.6 ± 3.4	23.1 ± 3.4
Grade Point Avg	3.4 ± 0.4	3.4 ± 0.4	3.4 ± 0.5	3.5 ± 0.4

TABLE 3. OTC and energy substance users separated into Regular and Nonregular users. *=significant difference between ED Regular and Nonregular User. ‡ = significant difference between OTC Regular and Nonregular User. See Table 1 for remainder of key.

	OTC Regular User (n=29)	OTC Nonregular User (n=51)	ED Regular User (n=46)	ED Nonregular User (n=51)
Year				
Freshman	6 (21%)	15 (30%)	15 (33%)	21 (41%)
Sophomore	8 (28%)	17 (34%)	18 (39%)	12 (24%)
Junior	15 (52%)	18 (36%)	13 (28%)	18 (35%)
Species Focus				
SA+EX	11 (48%)	25 (53%)	23 (50%)	16 (39%)
EQ+LA	2 (9%)	6 (13%)	9 (20%)	13 (32%)
MIX	10 (43%)	16 (34%)	14 (30%)	12 (29%)
Health Status				
Excellent	8 (28%)	14 (28%)	11 (24%)	14 (27%)
Very Good	13 (45%)	22 (44%)	19 (42%)	27 (53%)
Good/Fair	8 (28%)	14 (28%)	15 (33%)	10 (20%)
Rested *				
Never	9 (31%)	6 (12%)	**14 (30%)**	**4 (8%)**
Once	5 (17%)	11 (22%)	9 (20%)	10 (20%)
1/week	8 (28%)	25 (49%)	15 (33%)	19 (37%)
>1/week	7 (24%)	9 (18%)	**8 (17%)**	**18 (35%)**
Exhausted *				
1/week or less	0 (0%)	7 (14%)	**3 (7%)**	**12 (24%)**
1-6/week	16 (55%)	25 (49%)	23 (50%)	26 (51%)
>1/day	13 (45%)	19 (37%)	**20 (43%)**	**13 (25%)**
Tired at class ‡				

1/week or less	**0 (0%)**	**4 (8%)**	3 (7%)	3 (6%)
1-6/week	13 (45%)	23 (45%)	17 (37%)	26 (51%)
>1/day	16 (55%)	24 (47%)	26 (56%)	22 (43%)
Caffeine Intake * ‡				
None	**6 (21%)**	**4 (8%)**	**3 (7%)**	**6 (12%)**
Low	**5 (17%)**	**15 (29%)**	**6 (13%)**	**18 (35%)**
Moderate	**7 (24%)**	**23 (45%)**	**19 (41%)**	**15 (29%)**
High	**11 (38%)**	**9 (18%)**	**18 (39%)**	**12 (24%)**
On Prescriptions				
Yes	3 (10%)	4 (8%)	6 (13%)	6 (12%)
No	26 (90%)	46 (92%)	39 (87%)	44 (88%)
Gender *				
Male	4 (14%)	14 (27%)	**8 (18%)**	**18 (36%)**
Female	24 (86%)	37 (73%)	**37 (82%)**	**32 (64%)**
Marital Status				
Single	22 (76%)	32 (68%)	35 (76%)	41 (80%)
Married with Kids	0 (0%)	2 (4%)	2 (4%)	2 (4%)
Married	7 (24%)	13 (28%)	9 (20%)	8 (16%)
Body Weight				
Normal	23 (82%)	33 (72%)	34 (74%)	32 (67%)
Overweight	4 (14%)	9 (20%)	9 (20%)	15 (31%)
Obese	1 (4%)	4 (9%)	3 (7%)	1 (2%)

TABLE 4. OTC and energy substance users separated into Regular and Nonregular users. *=significant difference between ED Regular and Nonregular User. See Table 2 for remainder of key.

	OTC User (n=29)	OTC Nonuser (n=51)	ED User (n=46)	ED Nonuser (n=51)
Mg Caffeine/day	285 ± 262	240 ± 204	350 ± 275	249 ± 285
Hours sleep/night	6.0 ± 0.6	6.1 ± 0.9	5.8 ± 0.9	6.1 ± 0.9
DASS Depression	7.9 ± 6.1	8.9 ± 8.7	9.2 ± 7.5	8.0 ± 8.2
DASS Anxiety	6.7 ± 5.0	5.3 ± 5.5	7.0 ± 6.4	5.8 ± 4.6
DASS Stress *	16.2 ± 7.1	13.9 ± 8.3	**16.4 ± 8.3**	**11.0 ± 6.8**
Age	25 ± 2	25 ± 4	25 ± 3	25 ± 5
Body Mass Index	23.1 ± 2.8	23.6 ± 3.2	23.8 ± 3.8	23.3 ± 3.0
Grade Point Avg	3.3 ± 0.4	3.4 ± 0.4	3.3 ± 0.6	3.4 ± 0.3

TABLE 5. Likert values for perceived susceptibility and perceived severity to adverse effects associated with different over-the-counter and energy support substances in 227 veterinary students. Significance tested using t-test. OTC – all over-the-counter substances, ED – all energy-boosting substances.

	Perceived Susceptibility			Perceived Severity		
Substance	User	Nonuser	P-value	User	Nonuser	P-value
Energy Drinks	1.8	2.1	<0.03	1.4	1.4	0.55
Energy Boosters	1.8	2.3	<0.02	1.5	1.6	0.73
Fatigue Support	1.8	2.3	<0.005	1.4	1.9	<0.02
Alcohol	2.5	3.1	<0.0001	2.4	3.1	<0.0003
Illicit Drugs	2.0	3.6	<0.0003	1.4	3.3	<0.003
Antihistamines	1.5	2.2	<0.0001	1.3	1.9	<0.006
Melatonin	0.9	2.1	<0.0001	1.2	1.8	<0.004
Pseudoephedrine	1.7	2.4	0.0004	1.5	2.0	<0.005
Nootropics	1.1	1.8	<0.03	1.3	1.6	0.26
OTC	2.9	7.8	<0.0001	2.7	6.7	<0.0001
ED	3.3	5.8	<0.0001	2.5	4.2	<0.0001

Appendix

SURVEY INSTRUMENT

August 29th, 2008

Dear Professional Veterinary Student,

I am a professor in the Department of Small Animal Medicine and Surgery at the University of Georgia. I invite you to participate in a research study entitled, "Over-the-count stimulant, depressant, and nootropic use in veterinary medical students." The purpose of this study is to characterize the use of over-the-counter medications and relate use with stress in a veterinary student population. To participate, you must be 18 years of age and enrolled as a full-time veterinary medical student at the University of Georgia.

Your participation will involve filling out a brief survey and should take only about 15 minutes. Your involvement in the study is voluntary, and you may choose not to participate or to stop at any time without fear of censure or penalty. The survey will only be tracked by a randomly-generated digit sequence, and your name will not be associated with it in any way. In fact, the published results will be presented in summary form only. Your identity will not be associated with the survey by the authors or those involved in the research at any time.

The findings from this project will help provide information on how veterinary students use over-the-counter products so that we may guide their choices and provide education and support in the future. There are no known risks associated with this research. Some questions ask about smoking, alcohol, illegal drug use, and depression, anxiety, and stress, which may make some uncomfortable. You do not need to fill out any questions which make you uncomfortable. There are no direct benefits for participating in this research. Your decision whether or not to participate will not affect your grades or class standing.

A raffle will be held to award $50 to one student in each class. Participation in the research is not required in order to enter the raffle. Please see Dr. Hofmeister to obtain a form to participate in the raffle without participating in the research. In addition, $200 will be divided amongst the three classes according to the number of surveys turned in by each class

If you have any questions about this research project, please feel free to call Dr. Erik Hofmeister at (706) 542-6484 or send an e-mail to kaastel@gmail.com. Questions or concerns about your rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, 612 Boyd GSRC, Athens, Georgia 30602-7411; telephone (706) 542-3199; email address irb@uga.edu.

By completing and returning this questionnaire in the envelope provided, you are agreeing to participate in the above described research project.

Thank you for your consideration! Please keep this letter for your records.

Sincerely,

Dr. Erik Hofmeister
Assistant Professor, Veterinary Anaesthesiology

Over-The-Counter Medication Use in Veterinary Students

Age:_____ **Gender**: Male Female **Year**: Freshman Sophomore Junior

Primary Species of Interest: Small Animal Mixed Equine Exotic Large Animal

Marital Status: Single Single w/kids Married Married w/kids Divorced Widowed

Height:____ feet ____ inches **Weight**:_____ pounds

Estimated GPA:_____ **Estimated Class Rank**:____/____

Considering your age, how would you describe your general health (circle one)?
Excellent Very Good Good Fair Poor Don't Know

During the past month, approximately how often have you:

	Never	Once	1/week	1-6/week	1/day	>1/day
Drank an energy drink?	1	2	3	4	5	6
Used an energy booster?	1	2	3	4	5	6
Taken something for fatigue or long-term energy support?	1	2	3	4	5	6
Smoked cigarettes?	1	2	3	4	5	6
Drank alcohol?	1	2	3	4	5	6
Used illicit drugs?	1	2	3	4	5	6
Taken an antihistamine (i.e. Benadryl) for sedative effects?	1	2	3	4	5	6
Taken kava?	1	2	3	4	5	6
Taken St. John's wort?	1	2	3	4	5	6
Taken melatonin?	1	2	3	4	5	6
Taken pseudoephedrine?	1	2	3	4	5	6
Taken valerian?	1	2	3	4	5	6
Used Ginkgo biloba or other memory enhancer?	1	2	3	4	5	6
Gotten enough sleep so that you felt rested when you work up in the morning?	1	2	3	4	5	6
Felt exhausted?	1	2	3	4	5	6
Attended class and felt tired?	1	2	3	4	5	6

How many 8 oz (1 can) servings of caffeine-
containing soft drinks do you consume on an average day?_____

How many standard-sized (8 oz) cups of coffee do you consume on an average day?_____

How many standard-sized (8 oz) cups of tea do you consume on an average day?_____

How energy drinks do you drink in an average day?_____

If you drink energy drinks, what brand do you typically drink?_____

On a typical occasion of alcohol consumption, how much do you consume?
None 1-3 drinks 4-5 drinks 7-10 drinks 11 or more drinks

How many hours of sleep do you get per night, on average?_____

Are you taking a prescription drug for a medical condition such as anxiety, sleep disorder, or depression?
Yes No

For the following questions, indicate how much you agree or disagree with the statement by circling one response for each question

I think it is likely that I would suffer an ill or adverse effect from using:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
An energy drink?	1	2	3	4	5
An energy booster?	1	2	3	4	5
Something for fatigue or long-term energy support?	1	2	3	4	5
Cigarettes?	1	2	3	4	5
Alcohol?	1	2	3	4	5
Illicit drugs?	1	2	3	4	5
An antihistamine (i.e. Benadryl)	1	2	3	4	5
Kava?	1	2	3	4	5
St. John's wort?	1	2	3	4	5
Melatonin?	1	2	3	4	5
Pseudoephedrine?	1	2	3	4	5
Valerian?	1	2	3	4	5
Ginkgo biloba or other memory enhancer?	1	2	3	4	5

I believe that if I suffered an ill or adverse effect, it would be severe from using:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
An energy drink?	1	2	3	4	5
An energy booster?	1	2	3	4	5
Something for fatigue or long-term energy support?	1	2	3	4	5
Cigarettes?	1	2	3	4	5
Alcohol?	1	2	3	4	5
Illicit drugs?	1	2	3	4	5
An antihistamine (i.e. Benadryl)	1	2	3	4	5
Kava?	1	2	3	4	5
St. John's wort?	1	2	3	4	5
Melatonin?	1	2	3	4	5
Pseudoephedrine?	1	2	3	4	5
Valerian?	1	2	3	4	5
Ginkgo biloba or other memory enhancer?	1	2	3	4	5

If you drink energy drinks or consume over-the-counter stimulants (caffeine, pseudoephedrine), what are your reasons for doing so (circle all that apply)?

I don't consume these products	To wake up in the morning
To remain awake during the day	To help me study for an exam or work on a project
To get more energy during the day	To help me drive for a long period
To mix with alcohol	To help treat a hangover
To help with weight loss	To cope with or manage stress
To help manage anxiety	To improve my mood
To prevent or treat depression	

If you consume over-the-counter depressants (antihistamines like Benadryl, Kava, valerian, St. John's wort, melatonin, etc.), what are your reasons for doing so (circle all that apply)?

I don't consume these products

To fall asleep at night

To help me stay asleep at night

To help me study for an exam or work on a project

To help treat a hangover

To cope with or manage stress

To help manage anxiety

To improve my mood

To prevent or treat depression

If you consume nootropics, such as ginkgo biloba, what are your reasons for doing so (circle all that apply)?

I don't consume these products

To improve memory

To improve learning

To help me study for an exam or work on a project

For general health benefits

To cope with or manage stress

To help manage anxiety

To improve my mood

To prevent or treat depression

Please read each statement and circle a number 0, 1, 2 or 3 that indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Does not apply to me at all
1 Applies to me to some degree, or some of the time
2 Applies to me to a considerable degree, or a good part of time
3 Applies to me very much, or most of the time

1	I found it hard to wind down	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I found it difficult to work up the initiative to do things	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I experienced trembling (eg, in the hands)	0	1	2	3
8	I felt that I was using a lot of nervous energy	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting agitated	0	1	2	3
12	I found it difficult to relax	0	1	2	3
13	I felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3