

## RESEARCH ARTICLES

### Pharmacy Student Perspectives on Classroom Education About Herbal Supplements

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Submitted November 8, 2004; accepted March 3, 2005; published December 9, 2005.

**Objectives.** To assess students' perspectives on including education about herbal supplements in the curriculum.

**Methods.** A 17-item questionnaire was distributed during regularly scheduled classes to third-, fourth-, and fifth-year pharmacy students.

**Results.** A majority of the students perceived their knowledge of herbal supplements was inadequate. Almost all (95%) students reported a need to learn more about herbal supplements, primarily from pharmacy courses and books. Attitudes towards safety and efficacy of herbal supplements varied. Almost half agreed that herbal supplements should only be sold in pharmacies. Providing information on herbal supplements was viewed as the pharmacist's responsibility.

**Conclusions.** Students perceive their knowledge about herbal supplements to be inadequate and desire more information through didactic courses. While pharmacy associations should establish guidelines for herbal education in pharmacy curricula, pharmacy schools should work towards developing a structured approach to teaching about herbal supplements.

**Keywords:** herbal supplements, alternative medicine, curriculum, natural products

## INTRODUCTION

Americans are increasingly using dietary supplements to maintain or improve their health. In 2003, expenditures on dietary supplements were estimated at \$1.4 billion, a 5% increase from 2002.<sup>1</sup> Despite the relative lack of scientific evidence for the safety and efficacy of dietary supplements, almost 15 million American adults are believed to use herbal supplements, high dose megavitamins, or both in combination with prescription drugs.<sup>2</sup> Of all the different types of dietary supplements, herbal supplements have received the most attention from the media, the public, and regulatory agencies. Herbal supplements are a type of dietary supplement that contain botanicals, some of which may have therapeutic properties.<sup>3</sup> Although increased regulation and lack of evidence regarding the safety and efficacy of herbal supplements have led to a decline in their sales, these supplements can be easily purchased from pharmacies, a variety of other retail outlets, and Internet web sites. The general

public often perceives herbs as safe for use because of their natural origins.<sup>4</sup>

By the nature of their practice and the extent of their knowledge, pharmacists play an important role in patients' medication use and disease management. Yet pharmacists' role in patients' use of herbal supplements has been limited, partly because of their lack of knowledge about herbal supplements.<sup>5-10</sup> Pharmacists have attained low scores on herbal supplement medication knowledge score tests.<sup>7,8</sup>

In general, pharmacists lack knowledge of the appropriate use and adverse effects associated with commonly used herbal products. The same is true of pharmacy students. In one study, fewer than half of the participating students were able to identify the appropriate use and adverse effects of 12 commonly used herbal supplements.<sup>10</sup> This may reflect the nature and extent of herbal education in pharmacy curricula. Few schools have courses designed to review the safety, efficacy, and use of herbal supplements. Indeed, only 7 schools offer courses exclusively devoted to teaching about herbal supplements.<sup>11-13</sup> Another 57 schools offer a single course in which a little more than one third of the content is devoted to herbal

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supplements. Thirteen of 70 pharmacy schools have no instruction on herbal supplements.<sup>11-13</sup> As a result, the main sources of herbal information that have been cited by pharmacists and pharmacy students are the Internet, lay people, media, and product labels.<sup>8,14</sup>

The American Association of Colleges of Pharmacy (AACP) has recognized that gaps exist in pharmacy education with regard to the teaching of herbal supplements. The Association has identified complementary and alternative medicine as a target area for educational change.<sup>15</sup> Additionally, other professional organizations have also identified the need. The American College of Clinical Pharmacists' (ACCP) White Paper on dietary supplements highlighted the significance of herbal remedy education.<sup>16</sup> The National Association of Boards of Pharmacy (NABP) has published competency statements that serve as a blueprint for the topics to be covered in the North American Pharmacist Licensure Examination (NAPLEX). One such topic tests whether pharmacists can provide information about the documented uses, adverse effects, and toxicities of dietary supplements<sup>17</sup> including herbal supplements. The literature addresses proposed methods and considerations for implementing herbal education into pharmacy curricula.<sup>11,12,14</sup>

The merits of elective versus required courses for teaching about herbal supplements have generated spirited debate.<sup>11</sup> Of particular interest are the appropriate topics for inclusion and the need to incorporate scientifically evaluated information.<sup>18-20</sup> All of these activities highlight the need for pharmacy schools to evaluate their current curricula regarding herbal supplements education and the need to make any appropriate curricular changes.<sup>21</sup>

Unfortunately, clear guidelines on course content, teaching methods, and structure (elective or core) have not been given by the Accreditation Council on Pharmacy Education (ACPE). Without clear guidance from ACPE, most schools have adopted the minimalist approach of integrating teaching about herbal supplements into existing courses. Little is known about the effectiveness of this approach. There is a need to evaluate the framework for integrating education about herbal supplements in various courses. Students' perception of the adequacy of their knowledge gained through various courses on herbal supplements and their need for practice-related information might provide us with insight about the effectiveness of our current approach. This study focused on pharmacy students' perceptions about the adequacy of their own knowledge gained through classroom education and understanding their attitudes towards herbal supplements in general. A central assumption made was that for students to adopt a pharmaceutical care role for herbal supplement education for their future practice, they needed to perceive

their knowledge to be adequate and to have a positive attitude about herbal supplements.

The study assessed pharmacy students' perception of the adequacy of their knowledge of herbal supplements, asked them to identify their need for practice-related information and to identify the best available source from which they could obtain that information. The study also assessed students' attitudes towards herbal supplements, including attitudes about safety and efficacy. Attitudes about where herbal supplements should be sold as well as the pharmacist's responsibility to provide relevant information on herbal supplements were also investigated.

## **METHODS**

The study was conceptualized and carried out at the University of Toledo College of Pharmacy (UTCP). Instruction on herbal supplements at UTCP is integrated into several courses. The teaching efforts are uncoordinated and the content depends on the instructor's interest in herbal supplements. Required courses in pharmacy administration address complementary and alternative approaches and devote less than one class period to herbal supplements. A required course in pharmacology addresses natural products as they relate to the current topic of classroom discussion. For example, a lecture on analgesics may mention that willow bark contains salicylates. Mention of such plants is at the instructor's discretion, is limited to botanical products, and may vary from one topic to the next. In medicinal chemistry, 2 elective courses are taught. The first elective introduces students to natural remedies, including their history, source, clinical constituents, documented therapeutic activity, and toxicity. The second elective is a lecture/field study course that concentrates on botanical products common in the Toledo area. Both botanical and non-botanical products are covered. Both of these electives are offered in the summer when there are fewer students on campus. On average, fewer than half the students in the class take either of the courses. It is unclear whether the content of the instruction in these courses is adequate for practice, or whether there is a need to make modifications in the existing curricula to better educate pharmacy students on herbal supplements.

A cross-sectional survey design was used for data collection. Professional division pharmacy students (in their P1, P2 and P3 years of instruction) at the UTCP were selected as the study population. These 3 academic years constitute the core of the didactic instruction years. During these years, students are introduced to alternative medicine and herbal supplements and they attain practical experiential training in pharmacies, many of which sell

herbal supplements. Students were recruited during their classes and were asked to fill out a survey. The confidentiality and privacy of their responses were ensured. The Institutional Review Board at the University of Toledo approved the study.

A 17-item questionnaire was developed for the study. The questionnaire was divided into 5 areas: (1) recall of when students first encountered herbal supplements in the curriculum and their adequacy of knowledge based on the information obtained, (2) ability to apply knowledge to practice, (3) need for information, (4) attitudes towards the safety, efficacy, and sale of herbal supplements in a pharmacy, and (5) attitude towards provision of information as the pharmacists' responsibility. Demographic variables collected included age, gender, academic year in the program, and practice site. Experts at the University reviewed the questionnaire for face and content validity.

The questionnaire was distributed in class to 208 P1, P2, and P3 pharmacy students during the spring semester of the 2001-2002 academic year. The questionnaire was administered only once to each class. Data were collected and entered into the Statistical Package for the Social Sciences (SPSS) version 10.0 statistical software program. Descriptive statistics and frequencies were calculated for all variables. T tests were conducted to determine the perceived knowledge and attitudes across demographic factors.

## RESULTS

A total of 173 students participated in the study (an 83% response rate). Approximately two thirds were female. The average age was 22 years and ranged from 20 to 45 years. More than half had worked as interns, technicians, or both and were mostly employed in community pharmacy settings. A little more than one third had worked at more than one site (Table 1).

About 46% of the students recalled that they were introduced to herbal supplements in the P1 year of the academic program. Another 43% recalled being introduced to herbal supplements in P2. Only 1% recalled being introduced to herbal supplements in P3. A small number of students (2%) did not recall ever being taught about herbal supplements in class.

### Student Perspectives on Their Knowledge about Herbal Supplements

Only 8% of the respondents felt that they had adequate knowledge about herbal supplements. One in 5 students (20%) was not sure whether he/she had adequate knowledge about herbal supplements. Few students (39%) indicated they could apply their current knowledge

Table 1. Demographics of Respondents to a Survey on Pharmacy Students' Perspectives on Classroom Education About Herbal Supplements (N = 173)

Demographic Variable	No. (%)
Gender	
Male	63 (36)
Female	110 (64)
Academic program	
Bachelor of science in pharmacy	69 (40)
Doctor of pharmacy	93 (54)
Bachelor of science in pharmaceutical sciences	11 (6)
Work Experience	
Technician	5 (3)
Intern	107 (62)
Both	48 (28)
Have not worked	13 (8)
Principal pharmacy training site	
Chain	134 (78)
Independent	11 (6)
Institutional	14 (8)
Have not worked	9 (5)
Other	5 (3)
Have worked at 2 different practice sites	55 (32)
Have worked at 3 different practice sites	5 (3)

of herbal supplements to pharmacy practice. Most students (95%) acknowledged that they needed more information about herbal supplements and would benefit from additional practice-based knowledge about herbal supplements. The preferred sources of information were college pharmacy courses, books, and other literature sources (Table 2).

### Student Attitudes Towards Herbal Supplements

Almost equal proportions of students agreed (34%) and disagreed (32%) that herbal supplements can be used safely with a prescription (Table 3). A little more than 1 in 3 students was unsure whether herbal supplements could be used safely with a prescription. A large proportion agreed (43%) that herbal supplements were effective and a similar proportion (44%) was unsure. A small percentage of students (13%) disagreed or strongly disagreed that herbal supplements were effective. Almost 50% of the students disagreed or strongly disagreed with the statement that herbal supplements should be sold only in a pharmacy. However, most students (71%) agreed or strongly agreed that pharmacists have a responsibility to provide information on herbal supplements to patients.

Table 2. Pharmacy Students' Perspectives on Their Knowledge About Herbal Supplements

Question	%
Do you have adequate knowledge about herbal supplements for practice (n = 71)	
Yes	9
No	71
Not sure	20
Can you apply your knowledge of herbal supplements to practice? (n = 167)	
Yes	39
No	42
Not sure	18
Do you need more information? (n = 173)	
Yes	95
No	5
What are the preferred sources of information? (n = 173)	
Pharmacy courses	49
Books	27
Internet	9
Journals	6
Magazines	5
No source is adequate	4

### Class Comparisons on the Efficacy and Safety of Herbal Supplements

A comparison was made between responses given by P1, P2 and P3 students to determine whether class year affected their attitudes towards the safety and efficacy of herbal supplements. When asked about the efficacy of herbal supplements, 53% of P1 students agreed or strongly agreed that herbal supplements were effective compared to 37% of P2 students, and 35% of P3 students (Table 4). In the P1, P2 and P3 classes, a large proportion of students (39%, 47%, and 41% respectively) were unsure of the effectiveness of herbal supplements. With regard to safety, 47% of P1, 25% of P2, and 30% of P3 students agreed or strongly agreed that herbal supplements were safe to be used with prescription. P1 students were

significantly more likely ( $p < 0.05$ ) than P3 students to report higher efficacy for herbal supplements. P1 students' perceptions of the safe use of herbal medicines with prescription drugs differed significantly from students in P4 and P5 ( $p < 0.05$ ). There were no significant differences across class years with regard to student attitudes toward the sale of herbal supplements in a pharmacy only and pharmacists' responsibility in providing information about herbal supplements.

### DISCUSSION

Even though all classes of pharmacy students attended the same courses, there were substantial differences in their recollection of when they were first introduced to herbal supplements in the curriculum. This may be because the curriculum did not include a course dedicated to teaching about herbal supplements. Instead, the information was taught in several courses, which the students may not easily identify as courses in which such information was presented. There was little coordination among the faculty members who taught about herbal supplements. The material they presented may have varied from one academic year to the next. If the material was standardized and coordinated, there would be a greater expectation that all students would recall receiving information in the same academic year.

Few students reported that they had adequate knowledge of herbal supplements for practice and that they could apply their knowledge to pharmacy practice. Students also expressed a need for additional practice-related information on herbal supplements. Thus, the current framework of integrating herbal education in several courses appears inadequate for students with the necessary material for use in their practice. This poses a dilemma for pharmacy educators. While the need for more didactic information is evident from students' preference for more information through college courses, it is unclear whether this information should be provided through elective or core courses. At the same time, most college curricula are already overburdened and cannot accommodate an additional course. Pharmacy associations and the accreditation

Table 3. Pharmacy Students' Attitude Towards Herbal Supplements (N = 173)

Herbal Supplements...	Strongly Agree No. (%)	Agree No. (%)	Unsure No. (%)	Disagree No. (%)	Strongly Disagree No. (%)
Can be safely used with a prescription medication	10 (6)	49 (28)	59 (34)	46 (27)	9 (5)
Are effective	12 (7)	63 (36)	75 (43)	19 (11)	4 (2)
Should be sold only in a pharmacy	10 (6)	48 (28)	35 (20)	55 (32)	25 (15)
Information provision is a pharmacist's responsibility	38 (22)	84 (49)	39 (23)	10 (6)	2 (1)

Table 4. Pharmacy Students' Attitudes Towards the Efficacy and Safety of Herbal Supplements

Questionnaire Item	Response* Mean (SD)	P†
Herbal supplements are effective		
Third year	2.45 (0.83)	
Fourth year	2.73 (0.82)	
Fifth year	3.00 (0.92)	0.06
Herbal supplements can be safely used with a prescription medication		
Third year	2.65 (1.02)	
Fourth year	3.16 (0.89)	
Fifth year	3.22 (1.05)	0.017

\*Responses based on a 5-point Likert-type scale on which 1 = Strongly Disagree and 5 = Strongly Agree

†Alpha = 0.05

body (ACPE) should take a lead in helping pharmacy educators define the nature and content of herbal education in pharmacy curricula.

Students in this study had varied attitudes about the safety and efficacy of herbal supplements. Many students were uncertain about the safety and efficacy of herbal supplements and this may have been related to student factors or survey methodology. Student factors such as exposure to academic courses, practice-based knowledge attained through internships, and other practical training can affect student attitudes towards safety and efficacy. For example, students who had been exposed to patient concerns about the safety and efficacy of herbal supplements at their practice site would differ in their opinions compared to other respondents who did not have such exposure. In this study, there was evidence that students' class year in the program was related to attitudes towards safety and efficacy of herbal supplements. Future studies should investigate the effect of other student factors relating to students' practice-based knowledge attained through internships and practical training on students' attitudes towards safety and efficacy of herbal supplements. Another important reason why students' may have indicated uncertainty about the safety and efficacy of herbal supplements was that we did not refer to specific herbal supplements such as echinacea or ginseng. As with prescription drugs, safety and efficacy of herbal supplements are contingent on the specific herbal supplements under investigation. In an environment where evidence-based literature on specific herbal supplements such as Saint-John's-wort is being widely debated, we decided to assess general attitudes instead of attitudes towards specific herbal supplements. As research efforts by federal agencies such as the National Center for Complementary

and Alternative Medicine (NCCAM) and the National Institutes of Health's (NIH's) Office of Dietary Supplements and private sources provide us with evidence-based knowledge about herbal supplements, future efforts could be directed towards assessing students' attitudes towards specific herbal supplements.

We were encouraged to find that pharmacy students in this study had a positive attitude towards the pharmacists' role in providing information on herbal supplements to patients. This finding perpetuates pharmacists' educational role in self-care management programs for patients focusing on the use of herbal supplements. In order to enable students to assume such a role in the future, pharmacy schools need to address students' perceptions that their knowledge of herbal supplements is inadequate and alleviate their uncertainty about the safety and efficacy of herbal supplements. To counsel effectively in the future, students should not only be provided with more information about herbal supplements, but also made to think and look critically for evidence-based information related to herbal supplements. A structured approach should be used to enhance student knowledge about herbal supplements and their ability to think critically about available information. To develop such a structured approach to teaching we offer the following recommendations:

1. Professional and pharmacy associations such as Accreditation Council for Pharmacy Education, American Association of Colleges of Pharmacy, American College of Clinical Pharmacy, the American Society of Health-Systems Pharmacists, and the American Pharmacists Association should collaborate to establish guidelines for herbal supplements education in pharmacy curricula. These guidelines would serve as a template for the development of appropriate courses and should also establish the minimum requirements.
2. Current courses that include instruction should be restructured to teach about herbal supplements, including their therapeutic properties and society's beliefs and attitudes about them. Course changes may require curricular review and a quorum vote of the faculty; therefore, the process should be initiated as soon as possible.
3. Instructors should collaborate to identify topics in herbal supplements to cover in their coursework. The topics should be geared towards preparing students for a pharmaceutical care role in practice. Courses on the psychosocial aspects of pharmacy could teach students about patient beliefs and attitudes towards herbal supplements. Pharmacology- and pharmacotherapy-related

courses could cover aspects of safety and efficacy and present an evidence-based approach to herbal supplement use. Courses in pharmacy communication could teach students how to properly and effectively counsel patients about dietary supplements. At a minimum, students should be made aware of the extent of herbal supplement use, patient beliefs about safety and efficacy of supplements, the pharmacologic properties and clinical toxicities of supplements, and how to critically evaluate information on herbal supplements.

4. Extensive discussion sessions should be encouraged between faculty members, students, and practitioners to address students' perceptions about herbal supplements.

The results of this study at the University of Toledo pose several questions that should be asked by curriculum committees at all colleges and schools of pharmacy. For example, how could students be best prepared for a pharmaceutical care role relating to patients' self-care management that includes advice on using herbal supplements; what changes could be implemented in the existing curriculum to impart more information on herbal supplements to pharmacy students; and how can current courses be modified to integrate additional aspects of herbal supplements? From the course instructors' perspective, crucial questions such as what are good sources of information on herbal supplements and is there enough evidence-based data on herbal supplements available to educate the students need to be addressed.

This study has several limitations. The study was conducted at one school at a single point in time. The study results thus may not be generalizable. The survey instrument used was not construct validated, although it was content validated by experts at the school. Finally, the usual limitations associated with self-report surveys such as intentional deception, recall bias, or misunderstanding questions or statements are acknowledged.

## CONCLUSIONS

Pharmacy students believe they have a responsibility to provide information on herbal supplements to their patients. However, they perceive their knowledge of herbal supplements to be inadequate for application to pharmacy practice. Doubts over safety and efficacy of herbal supplements further compound the problem. Pharmacy associations should jointly compile guidelines for developing courses on herbal supplements. Additionally, colleges and course instructors could benefit from using a structured approach for teaching students about herbal supplements.

## REFERENCES

1. Johnsen M. Despite controversy over credibility, dietary supplement sales surge. *OTC/Natural Health. Drug Store News.* August 18, 2003.
2. Eisenberg DM, Davis RB, Ettner SL, et al. Trends in alternative medicine use in the United States, 1990-1997. *JAMA.* 1998;280:1569-75.
3. NCCAM. Herbal Supplements: Consider Safety, Too. Available from: <http://nccam.nih.gov/health/supplement-safety/>. Accessed on January 21, 2005.
4. Shah BK. Evaluation of the association between patients' use of herbal remedies and their satisfaction in the therapeutic relationship with their physicians. Unpublished Master's Thesis. University of Toledo, 2002.
5. Klepser TB, Klepser ME. Unsafe and potentially safe herbal therapies. *Am J Health-Syst Pharm.* 1999;56:125-38.
6. Chang ZG, Kennedy DT, Holdford DA, et al. Pharmacists' knowledge and attitude towards herbal medicine. *Ann Pharmacother.* 2000;34:710-5.
7. Rickert K, Martinez RR, Martinez TT. Pharmacists knowledge of common herbal preparations. *Proc West Pharmacol Soc.* 1999;42: 1-2.
8. Clauson KA, McQueen CR, Shields KM, et al. Knowledge and attitudes of pharmacists in Missouri regarding natural products. *Am J Pharm Educ.* 2003;67:1-8.
9. Howard N, Tsourounis C, Kapsunik-uner J. Dietary supplement survey of pharmacists: personal and professional practices. *J Alternative Complementary Med.* 2001;7:667-80.
10. Kemper K, Amata-Kynvi A, Dvorkin L, et al. Herbs and other dietary supplements: healthcare professionals' knowledge, attitudes and practices. *Alternative Ther Health Med.* 2003;9: 42-9.
11. Mackowiak ED, Parikh A, Freely J. Herbal product evaluation in united states pharmacy schools: core or elective program? *Am J Pharm Educ.* 2001;65:1-6.
12. Miller LG, Murray WJ. Herbal instruction in United States pharmacy schools. *Am J Pharm Educ.* 1997;61:160-2.
13. Shields KM, McQueen CE, Bryant PJ. Natural product education in schools of pharmacy in the United States. *Am J Pharm Educ.* 2003;67:Article 10.
14. Mackowiak ED. Natural product education. *Am J Pharm Educ.* 2003;67:Article 6.
15. Smith RE. AACP Chair Report of the 1997-98 Academic Affairs Committee. *Am J Pharm Educ.* 1999;62:8S-13S.
16. Miller LG, Hume A, Harris IM, et al. White Paper on Herbal Products. *Pharmacotherapy.* 2000;20:877-91.
17. NAPLEX Blueprint. The NAPLEX Competency Statements. Available at: <http://www.nabp.net/ftpfiles/NABP01/updatednaplexblueprint.pdf>. Accessed on January 8, 2005.
18. Zlatic TD, Nowak DM, Sylvester D. Integrating general and professional education through a study of herbal products: an intercollegiate collaboration. *Am J Pharm Educ.* 2000;64:83-94.
19. Frenkel M, Arye E. The growing need to teach about complementary and alternative medicine: questions and challenges. *Acad Med.* 2001;76:251-4.
20. Grollman AP. Alternative medicine: the importance of evidence in medicine and medical education. *Acad Med.* 2001;76:221-3.
21. Sampson W. The need for educational reform in teaching about alternative therapies. *Acad Med.* 2001;76:248-50.