

RESEARCH

Appraisal of the Availability of Veterinary Pharmacy Didactic and Experiential Learning Opportunities at Pharmacy Programs

Carolyn Elaimy, PharmD,^a Brittany Melton, PharmD, PhD,^b Gigi Davidson, BSPHarm,^c Adam Persky, PhD,^{d,e} Emma Meyer, PharmD^f

^a Dedham Pharmacy & Medical Supply, Dedham, Massachusetts

^b University of Kansas School of Pharmacy, Kansas City, Kansas

^c Pharmacist/CEO at VetPharm Consulting LLC, Pittsboro, North Carolina

^d University of North Carolina at Chapel Hill, Eschelman School of Pharmacy, Chapel Hill, North Carolina

^e Associate Editor, *American Journal of Pharmaceutical Education*, Arlington, Virginia

^f University of Missouri Kansas City, School of Pharmacy, Kansas City, Missouri

Corresponding Author: Emma Meyer, University of Missouri Kansas City, School of Pharmacy, 2462 Charlotte St, Kansas City, MO 64108. Tel: 816-235-2420. Email: egmeyer@umkc.edu

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Objective. To explore the availability of veterinary pharmacy didactic and experiential learning opportunities in pharmacy programs.

Methods. A 23-item questionnaire was sent to subscribers of the American Association of Colleges of Pharmacy “Curriculum” and “Pharmacy Practice” listservs reaching 2,098 participants and 141 ACPE-designated pharmacy programs. Fisher’s Exact Test was used to evaluate the association of offering a didactic course and accepting credit from an outside program for veterinary pharmacy course and between pharmacy programs offering a veterinary didactic course and being affiliated with a Doctor of Veterinary Medicine program. All analyses were conducted using SPSS v. 26, and an a-priori alpha of 0.05.

Results. Questionnaire response rate was 61% (86/141). Twenty seven percent (23/86) of pharmacy programs reported offering a didactic veterinary pharmacy course and 60% (52/86) reported having experiential rotation opportunities. Pharmacy programs that do not offer a veterinary pharmacy course, were not more or less likely to accept outside credit to gain didactic knowledge. Pharmacy programs geographically associated with a veterinary school were more likely to offer didactic as well as experiential opportunities.

Conclusion. Pharmacy programs were twice as likely to have experiential opportunities in veterinary pharmacy compared to didactic opportunities, leaving room for curricular development. With most graduating pharmacists choosing to work in the community pharmacy setting and the growth of veterinary pharmacy at several national corporate pharmacy chains, it would be advisable for pharmacy programs to expose students to veterinary pharmacy whether as a didactic course and/or an experiential rotation.

Keywords: veterinary medicine, veterinary pharmacy, experiential education, PharmD curriculum

INTRODUCTION

After graduating from an Accreditation Council for Pharmacy Education (ACPE) accredited pharmacy program, more than half of practicing pharmacists in the US work in a community pharmacy setting where they are expected to fill prescriptions for human and non-human patients, despite learning predominately only human pharmacology and pharmacotherapy.¹ However, studies have found that pharmacists feel less than confident in their ability to verify veterinary prescriptions likely due in part to the limited amount of veterinary pharmacy education available in pharmacy programs.^{2,3} In 2014, the National Association of Boards of Pharmacy (NABP) recognized the need for veterinary pharmacy education with resolution 110-5-14 that “encourage(s) the development and availability of veterinary pharmacology education in collaboration with schools of veterinary medicine” and that “pharmacists dispensing medications for veterinary patients possess competence and have access to resources necessary to appropriately dispense and provide care”.⁴ The American Veterinary Medical Association (AVMA) issued a similar resolution, Resolution #8, in 2012 stating AVMA’s commitment to engage proactively with pharmacy stakeholders to ensure the health and welfare of animals receiving prescription drugs dispensed by licensed pharmacists. In that resolution, the AVMA emphasized a need to “promote best practices in dispensing to animal patients, such as licensed pharmacist training in veterinary pharmacology”.⁵ Finally, the American Pharmacists Association has also begun the process of redefining the term

'patient' to include human and non-human species since pharmacists are considered the only health care professional capable of providing care to human and veterinary patients.⁶

Veterinary pharmacy is a growing sector of pharmacy with national corporate pharmacy chains advertising their ability to fill veterinary prescriptions without subsequently expanding pharmacist training to effectively verify these prescriptions.⁷ Since veterinary prescriptions are not bound by traditional insurance limitations and reimbursements, including Direct and Indirect Remuneration (DIR) fees, they represent a 'cash' business for pharmacies. Therefore, some corporate pharmacy chains and other organizations have backed the Fairness to Pet Owners (FTPO) Act (H.R. 1607), which would require veterinarians to give pet owners a paper copy of all prescriptions so they have the choice of where they would like to fill their pet's prescription(s).⁸ If the FTPO Act passes, community pharmacies would be expected to see an influx of veterinary prescriptions namely due to the availability of low-cost generic lists and the better buying power of community pharmacies compared to small veterinary clinics. Veterinarians have routinely expressed concern about sending prescriptions to community pharmacies due to the lack of appropriate veterinary pharmacy training.⁹ This concern is not unfounded—a questionnaire conducted by the Oregon Veterinary Medical Association found that 35% of responding veterinarians experienced a pharmacist changing a dose or medication for a patient without consulting them.¹⁰ Although interprofessional collaborations have long been an encouraged part of pharmacist training, relationships with veterinarians seems to lag behind relationships built with physicians and other human health care professionals. A 2013 study surveying over 700 veterinarians across the US found that they interacted the most with pharmacists and that respondents felt they could positively affect pharmacists by explaining specific challenges in treating veterinary patients.¹¹ Pharmacists dispensing veterinary prescriptions are bound by corresponding liability, which the Drug Enforcement Agency (DEA) via 21 CFR.1306.04 defines as a responsibility upon the prescriber for proper prescribing and dispensing but "a corresponding responsibility rests with the pharmacist who fills the prescription". Notably, the DEA's Controlled Substances Act applies to all controlled substance prescriptions—regardless of the patient's species. Ethically, it is important that pharmacists have enough knowledge of veterinary pharmacology to correctly verify veterinary prescriptions.¹² However, the availability of veterinary pharmacy didactic and experiential offerings at pharmacy programs in the US has not been described but would be important in understanding the training pharmacists may have received in order to correctly verify veterinary prescriptions.

The objective of this study was to evaluate the availability of current didactic and experiential opportunities in veterinary pharmacy for students at pharmacy programs with an ACPE designation (accredited, candidate, pre-candidate, probation).

METHODS

A 23-item Google-based questionnaire was sent to members of the American Association of Colleges of Pharmacy (AACCP) via their "Curriculum" and "Pharmacy Practice" listservs. Google-Forms is a software used to create surveys and is sent as a link to a webpage that respondents can fill out. The Google-Form was sent out on September 10, 2020 and closed to responses on December 1, 2020. Binary (yes/no), multiple choice, select all that apply, and free response type questions were used in this questionnaire and respondents were told to estimate about 10 minutes for response time. Questions included the presence or absences of didactic courses in veterinary pharmacy, the respective credit hours, credentials of instructors, class resources, presence of experiential opportunities, the location of these opportunities, and opportunities for outside credit in veterinary pharmacy course(s) among other questions. Following completion, any duplicate submissions (ie, multiple faculty members at the same program submitted a response) for a pharmacy program were reconciled. Any incomplete responses were investigated by contacting the program directly and if the program did not respond, the data was excluded from analysis. Investigators followed up with any pharmacy programs that had not responded via email to encourage questionnaire completion. In total, the questionnaire was sent to 2,098 participants. Only responses from pharmacy programs with one of the four ACPE designations (accredited, candidate, pre-candidate, probation) were included for analysis. In some cases, inconsistent reporting occurred (eg, two faculty members from one program reporting different information) but investigators reconciled the data by using the pharmacy program's website as well as contacting a representative from the respective pharmacy program prior to data analysis. If information could not be verified or obtained, data was excluded from analysis.

Demographics of the responding programs were evaluated using descriptive statistics. Fisher's Exact test was used to evaluate the association between 1) offering a didactic course and accepting credit from an outside program for a veterinary pharmacy course and 2) between pharmacy programs offering a veterinary didactic course and being geographically associated with a veterinary program. All analyses were conducted using SPSS v. 26, and an a-priori alpha of 0.05. This study was approved by the University of Missouri-Kansas City Institutional Review Board (Protocol #: 2026247).

RESULTS

This study received 126 responses from 86 pharmacy programs in the US. Duplicate responses were reconciled prior to data analysis for a final total of 86 responses from ACPE-designated pharmacy programs. At the time the questionnaire was deployed (September 2020), there were 141 ACPE-designated pharmacy programs.¹³ Of these programs, 96% (n=135) were accredited, 2.8% (n= 4) were candidate schools, 0.7% (n= 1) was pre-candidate, and 0.7% (n= 1) was on probation. As of March 2021, an additional school is seeking pre-candidate status but was not included in our analysis. Therefore, our response rate was 61% (86/141) with 27% (23/86) of responding programs offering a didactic veterinary pharmacy course while 60% (52/86) offer an advanced pharmacy practice education (APPE) rotation in veterinary pharmacy.

Twenty-three responding programs confirmed that they have a dedicated didactic course for veterinary pharmacy. Additionally, twenty-three responding pharmacy programs said that they allow their students to take a veterinary pharmacy course outside of the school for credit (these respondents were not necessarily the same 23 schools offering a dedicated didactic elective although some overlap did occur). Notably, pharmacy programs that do not offer a didactic veterinary pharmacy course were not more or less likely to accept outside credit for a veterinary pharmacy course ($p = .655$). An additional twelve respondents indicated that they historically offered a veterinary pharmacy didactic course, although it is not currently offered.

Course coordinator credentials for didactic veterinary pharmacy courses varied widely with pharmacists [defined as having a Doctorate in Pharmacy (PharmD) or Bachelor of Pharmacy (BSPharm) but no other doctoral degrees, with or without board-certification in veterinary pharmacy] being the most common (60%, n=12/20) Notably, of all course coordinators with pharmacist credentials (including dual-credentialed), only 40% (n=6/15) are board-certified in veterinary pharmacy, signified as a Diplomate of the International College of Veterinary Pharmacists (DICVP). Of respondents, 15% had DVM degree (n=4 with or without another degree) and 20% had a PhD (n=4 with or without another degree).

Most pharmacy programs offer only one course in veterinary pharmacy (22/23; 96%) with a median of one credit hour. Twenty-one responding pharmacy programs indicated the range of veterinary pharmacy elective class size with 48% (n=10) accommodating only 11-20 students per course offering. The most commonly reported resource used in veterinary pharmacy didactic courses was Plumb's Veterinary Drugs (34%, n=12/35), which is available as an electronic resource. Other resources that respondents reported as primary resource were Pharmacotherapy for Veterinary Dispensing and Saunderson's Handbook of Veterinary Drugs. Interestingly, 29% (n=10/35) of respondents listed 'none' or 'unknown' as their course reference. Pharmacy programs located in the South and Midwest regions of the US had the greatest concentration of veterinary didactic courses, encompassing over 60% of all available courses (Table 1). Sixteen of the 33 (49%) veterinary schools have a pharmacy program located on the same physical campus and pharmacy programs associated with a veterinary school were more likely ($p = .007$) to offer a veterinary pharmacy course (Figure 1).

Fifty-two out of 86 responding pharmacy programs reported having an Advanced Pharmacy Practice Experience (APPE) opportunity in veterinary pharmacy (60%), which was more prevalent than didactic course offerings (27%, n=23). The most common rotation sites for APPE opportunities were at veterinary teaching hospitals and compounding pharmacies (Table 2). Those that responded that compounding pharmacies were their only source of experiential veterinary pharmacy did not specify the percentage of veterinary compared to human compounding that occurs at that rotation site.

Similar to didactic offerings, pharmacy programs associated with a veterinary school were more likely to offer an experiential opportunity in veterinary pharmacy ($p = .044$; Fisher's Exact). Geographically associated veterinary schools and pharmacy programs can be seen in Figure 1.

DISCUSSION

Pharmacists are expected to fill prescriptions for all species in the course of their professional responsibilities. Although studies have reported on both the importance as well as examples of veterinary pharmacy course implementation at pharmacy programs, widespread evaluation of the availability of didactic and experiential opportunities for pharmacy students is lacking.¹⁴⁻¹⁷ There has not been a study to evaluate the demand, current availability, or current course-design of veterinary pharmacy courses in the US and evaluation of this data is an important step to determining the pharmacy graduate's ability to therapeutically evaluate veterinary prescriptions as well as establishing standardization for didactic courses. Despite the NABP and AVMA resolutions encouraging pharmacists to have competence in providing pharmaceutical care to veterinary patients, a mere 27% of responding ACPE-designated pharmacy programs offer a didactic course in veterinary pharmacy.^{4,5} The result of this deficit is leaving practicing pharmacists unprepared to clinically evaluate veterinary prescriptions or provide evidence-based pharmaceutical care to non-human species. Moreover, many pharmacy programs list "veterinary pharmacy" as a career option for graduates on their webpage, recognizing that it is an important way for programs to differentiate their graduates in the face of dwindling employment opportunities and prepare them for the real-world community setting where they may be faced with veterinary

prescriptions daily.¹⁸ With national corporate pharmacy chains expressing interest in pet prescriptions and even pet insurance, training of pharmacy students to be competent in veterinary pharmacy would be of value to potential community pharmacy employers.¹⁹

Nationally, there is no current standardization of the content or delivery of veterinary pharmacy coursework at pharmacy programs. In this study, we observed a wide variety of credit hours, required resources, as well as instructor credentials. Since the North American Pharmacist Licensure Examination® (NAPLEX) exam does not include veterinary pharmacy questions despite the NABP's resolution, pharmacy schools have little motivation to include these topics in their standardized curriculum. It would be of interest to the pharmacy profession to encourage the standardization and mandatory incorporation of veterinary pharmacy into pharmacy curricula by ACPE and subsequently, include veterinary pharmacy questions on the NAPLEX. Based upon the statistically significant (but not surprising) correlation between veterinary school geographical association and the availability of veterinary pharmacy education ($p=.007$), pharmacy programs interested in developing veterinary pharmacy didactic offerings should collaborate with geographically associated veterinary schools as a starting point for developing a course. Based on our research of physical addresses of pharmacy schools and veterinary schools in the United States, sixteen of the 33 (49%) veterinary schools have a pharmacy program located on the same physical campus.²⁰ Despite the relationship between veterinary school and pharmacy program co-location, many state-funded veterinary schools are often found at a different state-institution than the pharmacy program. It is possible that the geographic separation of pharmacy programs from the remaining 52% of veterinary schools has created an intellectual separation responsible for the lower incidence of veterinary pharmacy didactic courses at these programs. The next logical step is a standard curriculum so that all programs have valid, effective veterinary pharmacy didactic offerings and this is a current focus of the professional veterinary pharmacy organizations, the Society of Veterinary Hospital Pharmacists (SVHP) and the American College of Veterinary Pharmacists.^{21, 22} Although SVHP does currently offer board-certification in veterinary pharmacy through their International College of Veterinary Pharmacists, it is recommended that the Board of Pharmacy Specialties eventually house this board-certification process for veterinary pharmacy. Future studies should also evaluate post-graduate training including certifications, continuing education, and workplace training requirements.

Our study has shown that the prevalence of experiential education opportunities (60%) in veterinary pharmacy is more common than didactic offerings (27%) which could be due to the flexibility afforded by experiential program development. Coordination of a course can be tedious and requires the coordinator to oversee many students compared to one or a few APPE students. Most experiential opportunities for pharmacy students are found at veterinary teaching hospitals and in compounding pharmacies that fill prescriptions for animals. Experiential education also has the advantage of being offered at a wider range of geographic locations with access to a more diverse group of practitioners outside of academia. While some pharmacy schools have a very concrete experiential roster to choose from, some schools allow students to arrange their own experiential rotations outside of the regular sites upon an agreement with the experiential education office. Because the experiential curriculum outlined by ACPE allows for greater flexibility of establishing educational experiences, it is possible that this provides a more straightforward means to expose pharmacy students to the field of veterinary pharmacy, which may be one reason for the higher percentage of pharmacy programs offering experiential education rotations compared to didactic courses.²³ With the increase of veterinary prescriptions coming into community pharmacies, students on experiential rotations may also be exposed to veterinary prescriptions while on their ACPE-required APPE community pharmacy rotation. It is important to note that if the community pharmacy preceptor is untrained in veterinary pharmacy, then the student is unlikely to learn a clinically and legally sound approach to evaluating veterinary prescriptions. So, despite the exposure to veterinary prescriptions in a community setting, the pharmacy student may not learn the requisites required for accurate verification of veterinary prescriptions. Although experiential education rotations may provide more flexibility in establishment, didactic course(s) taught by credentialed instructors would be important to ensuring pharmacy graduates are indeed well versed in caring for veterinary patients.

A major limitation to this study is that investigators relied on voluntary reporting. Inconsistent reporting occurred (eg, two faculty members from one program reporting different information) but investigators reconciled the data by using the pharmacy program's website as well as contacting a representative from the respective pharmacy program prior to data analysis. If information could not be verified or obtained, data was excluded from analysis. Due to variation in voluntary reporting and our questionnaire, we limited our study to the availability of veterinary pharmacy stand-alone courses but did not evaluate guest lecturers or other courses, including required courses, that incorporate veterinary pharmacy. We also could not verify that respondents were specifically describing elective didactic courses but since ACPE has not incorporated veterinary pharmacy into the required curricula, it is unlikely that these courses were considered required coursework at responding pharmacy programs. In addition, we allowed compounding rotations to count for some veterinary pharmacy education because most compounding pharmacies offer veterinary prescriptions. For the 12 schools who reported ending their veterinary pharmacy elective, we did not follow up to see the reasoning behind the course ending but this would be of interest when establishing standardized veterinary pharmacy curriculum. Future

studies are needed to determine other sources of veterinary pharmacy education other than stand-alone courses, evaluate the interest of pharmacy students or the reasoning as to why some courses have started or ended, and how veterinary pharmacy courses are designed and implemented at pharmacy schools.

CONCLUSION

Results of this study indicate a minority of respondents offer didactic veterinary pharmacy opportunities (27%) while a majority (60%) offer experiential education opportunities in veterinary pharmacy. Due to NABP and AVMA resolutions as well as future legislative changes, such as the FTPO Act, it is important that pharmacists have competence in providing pharmaceutical care for non-human patients. Pharmacy programs ensuring their graduates have training in veterinary pharmacy allows for diversity in their graduates, which may aid in employment following graduation. The authors encourage the NABP and ACPE to develop competency statements as related to veterinary pharmacy to lead the way in resolving the educational deficits defined by NABP and AVMA. With the leadership of NABP and ACPE, pharmacy schools will be encouraged to create space for veterinary pharmacy curricula and thus graduate pharmacists better prepared to safely and legally dispense prescriptions to all species.

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Table 1. Location of Responding Pharmacy Schools

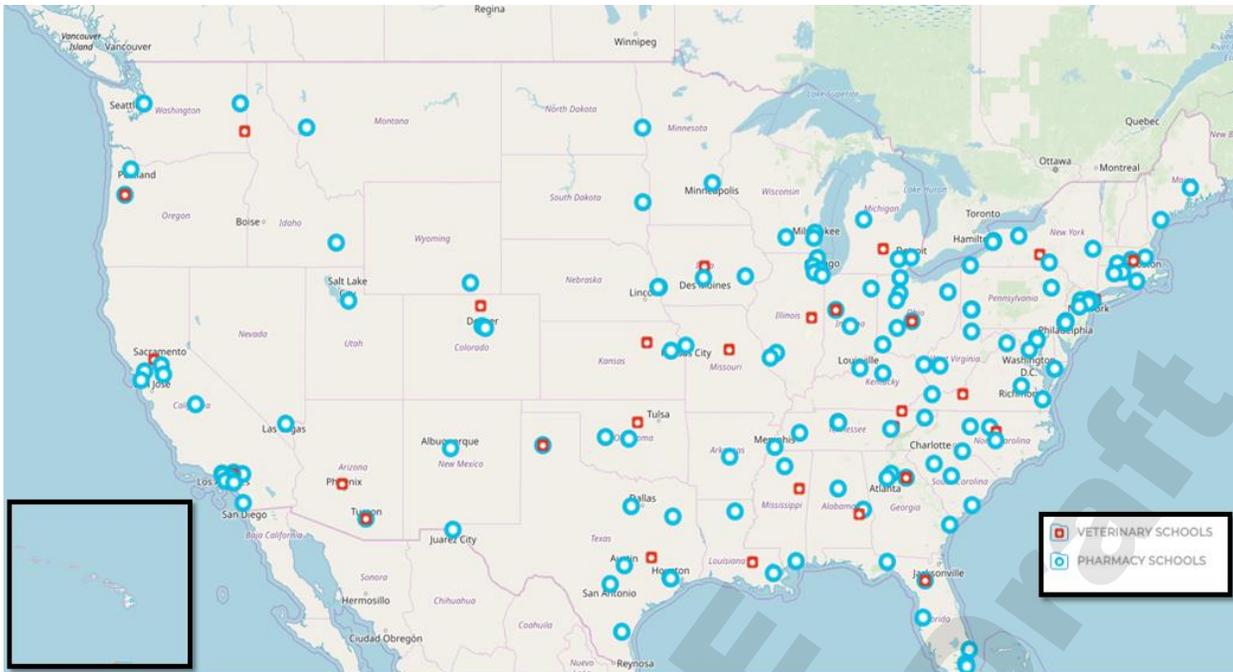
Location of Respondent	23	100%
<i>Northeast</i>	2	9%
<i>South</i>	7	30%
<i>Midwest</i>	7	30%
<i>Southwest</i>	2	9%
<i>West</i>	3	13%
<i>Multiple locations</i>	2	9%

Table 2. Types of Advanced Pharmacy Practice Experiences in Veterinary Pharmacy^a

EXPERIENTIAL OFFERINGS AT ALL RESPONDING SCHOOLS		
	Number	%
<i>Schools Offering APPE rotations</i>	52/86	60%
APPE at Veterinary Teaching Hospital	30/52	58%
APPE in Compounding	15/52	29%
APPE in Industry	5/52	10%
APPE at Veterinary Private Practice	7/52	13%
APPE in Academia (Veterinary focused)	5/52	10%

^a Respondents were able to select multiple resources
KEY: APPE, advanced pharmacy practice experience

Figure 1. Geographical Comparison of Veterinary Schools and Pharmacy Programs



Key: Satellite campuses are not depicted on the map (For example: MCPHS University Worcester has satellite in Manchester, NH not pictured)