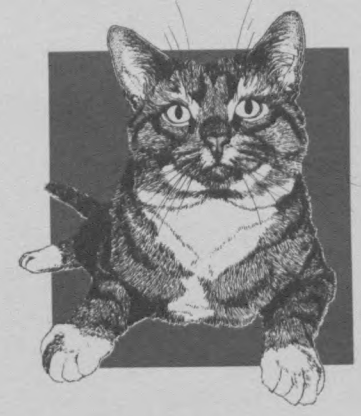

Feline Health Topics

for veterinarians

January-March 2001

Volume 16, Number 1

2000 Report of the AAFP/AFM Advisory Panel on Feline Vaccines — Part 1

Editors Note: This is the first excerpt of the 2000 Report of American Association of Feline Practitioners and the Adacemy of Feline Medicine Advisory Panel on Feline Vaccines. The 1998 Report of the American Association of Feline Practitioners and Academy of Feline Medicine Advisory Panel on Feline Vaccines *was developed to help veterinary practitioners formulate vaccination protocols for cats. This report updates information, addresses questions, and speaks to concerns raised by the 1998 report. In addition, it reviews vaccine licensing, labeling, and liability issues and suggests ways to successfully incorporate vaccination protocol changes into a private practice setting. To view the entire report, including the appendices and references, visit the web site — www.aafponline.org.*

Liability Related To Vaccination

In the United States, licensed vaccines are subject to the Virus, Serum, and Toxin Act (VSTA) of 1913 (9 CFR § 101.2(w) [1991]). Consequently, use of animal vaccines is regulated by the United States Department of Agriculture (USDA), not the Food and Drug Agency (FDA). Regulations incorporated in the Animal Medicinal Drug Use Clarification Act (AMDUCA) do not apply to animal vaccines, so using a vaccine in a manner other than stated on the package insert is not considered extralabel use; a more appropriate term is "discretionary" use. The VSTA applies only to the preparation, sale, barter, exchange, or shipment of biologics. It does not regulate use of vaccines by veterinarians. Although there are usage guidelines within specific state or federal eradication and control programs and perhaps as isolated rules within some state practice acts, there are no overarching federal regulations concerning the after-sale use of licensed animal vaccines by veterinarians or lay persons in the United States.

Even so, many veterinarians rely on the vaccine label to protect them. In the past, this was not an unreasonable approach, because by adhering to label instructions, veterinarians could, in most cases, shift the focus of litigation to the vaccine manufacturer. However, in 1996 the United States Supreme Court refused to review the Seventh Circuit Court's decision in Lynbrook Farms vs. SmithKline Beecham Corp (117 S.Ct. 178). In that decision, the Circuit Court upheld the contention by the USDA Animal and Plant Health Inspection Service (APHIS) that the VSTA preempted all state court tort remedies that would have the effect of imposing requirements different from or in addition to those imposed by the USDA regarding the safety, efficacy, potency, or purity of a product. In effect, this action eliminated vaccine manufacturers as defendants in all state vaccine tort cases unless it was alleged that the vaccine was improperly manufactured. However, professional negligence and breach of warranty claims against veterinarians using these products were not preempted. As a result, future

Inside this issue ...

consumer claims involving vaccines will, in all likelihood, be centered around veterinary malpractice or the failure of veterinarians to adhere to prevailing standards of practice in selecting and administering vaccines, as well as claims that vaccines were given without the proper informed consent.

If, in a court of law, the quality of care provided by a practitioner is being called into question, the practitioner's actions will likely be compared with the prevailing "standard of care," a legal term of art that, simply defined, is the care a practitioner of equal experience and training would deliver under the same or similar circumstances. The prevailing standard of care regarding the use of vaccines is in a state of flux, as exemplified by the recommendation of an increasing number of veterinary virologists, veterinary colleges, professional organizations, and practitioners to extend the revaccination interval for certain vaccine antigens. However, by and of themselves, a few published articles or stated opinions of recognized experts do not define a new standard of care; rather, it is their adoption and utilization by a substantial portion of the veterinary community. Vigorous debate within the profession will undoubtedly result in a new standard of care in the selection and use of vaccines. Although many veterinarians will, for various reasons, resist and delay adoption of new protocols, they should know that adherence to old protocols may, in the light of new knowledge, not protect them as "...conformity to custom is not in itself an exercise of care as a matter of law" (30 AmJur2nd Evidence § 1123). In this uncertain atmosphere, questions about a veterinarian's actions will likely focus on the following types of inquiry: Did the animal need the vaccine? If so, did the veterinarian select the proper agent? Was it in the proper form? Was it given in the proper manner and location? Was the vaccine handled properly? Was it administered aseptically? Was it administered at the proper interval? Did the client give informed consent before the veterinarian vaccinated the animal? Except in the case of herd or population medicine, the answers to these kinds of questions will be unique to the animal being treated.

The current informed consent standard is the "reasonable patient standard." Under this standard, the scope of disclosure is not measured by the physician's standards, but rather by the patient's needs and whether the information is material to the patient's decision (material information is that which a reasonable person in the client's position would use to make an intelligent decision to accept or reject vaccination). Under this standard, a veterinarian should disclose the nature of the condition being vaccinated against along with any reasonable dangers within the veterinarian's knowledge that are incident to or may result from vaccination. When vaccination inherently involves a known risk of death or serious harm to an animal, it is the veterinarian's duty to disclose to the client the possibility of such outcomes and to explain in lay terms any significant potential complications that might occur. The veterinarian is also expected to provide information to the client regarding all reasonable alternatives to vaccination. It is the client's decision, not the veterinarian's, to approve or disapprove of vaccination. Once the veterinarian has provided the appropriate information and effectively communicated it to the client, he or she should specifically ask for and obtain the client's consent to the proposed vaccination. In fact, the failure to specifically obtain the client's informed consent could itself be negligent and result in legal liability. For this reason, veterinarians should consider developing consent forms to be signed by owners prior to vaccination of their animals.

Veterinarians should be cautious in their statements regarding the safety or effectiveness of vaccines. If a veterinarian guarantees that a particular vaccine product is safe or effective, the veterinarian, not the manufacturer, may be liable for breech of warranty. This cause of action may not be covered by veterinary malpractice insurance.

The ultimate purpose of the Cornell Feline Health Center is to improve the health of cats everywhere by developing methods to prevent or cure feline diseases, and by providing continuing education to veterinarians and cat owners. All contributions are tax-deductible.

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The lack of specific rules regarding use of animal vaccines by veterinarians leaves them especially vulnerable to litigation. A veterinarian's exposure to legal liability will be specific to the facts of the case, and though there is no absolute safeguard from litigation, practitioners can go a long way towards protecting themselves by conforming to the standards of practice as they apply to the use of vaccines, by closely adhering to the doctrine of informed consent, and by not providing undue warranty regarding the vaccines they administer.

Vaccine Licensing

The VSTA grants authority to the USDA to approve animal vaccines for interstate sale. To be approved, a vaccine must meet requirements for efficacy, purity, potency, and safety.

Efficacy: Efficacy is a measure of a vaccine's ability to stimulate a protective immune response. Vaccine efficacy is an in vivo measurement, and depending on USDA policy for the disease of interest, it is usually determined by direct challenge exposure of test animals or by measuring serologic responses to vaccination. The USDA has published its approved efficacy determination procedures in the Code of Federal Regulations (9 CFR Part 113). The manufacturer must follow USDA codified procedures whenever they exist. The procedures are usually quite specific, regulating the number and species of animals involved in the test, and the method of challenge exposure and evaluation of efficacy.

Codified procedures for evaluating efficacy of different products are similar in many regards. In general, for vaccines to be approved on the basis of measurement of serologic responses, at least 75 percent of vaccinates must have an antibody titer greater than a set limit when measured a short time (usually two weeks) after vaccine administration. For vaccines approved on the basis of challenge exposure studies, in most cases at least 80 percent of the non-vaccinated controls must develop evidence of disease after challenge exposure, whereas 80 percent of vaccinates must have evidence of protection (the 80:80 efficacy guideline). Animals are usually challenge exposed 3 to 4 weeks after vaccination. In addition, the number of animals required by either method of efficacy assessment is usually small (eg, at least 20 vaccinates and five controls for modified-live feline parvovirus [FPV] vaccines).

The use of codified procedures has the potential to simplify comparisons of the efficacy of vaccines, but unfortunately the USDA does not have codified standards for all of the currently available feline vaccines (eg, feline leukemia virus [FeLV] vaccines). If a manufacturer desires to produce a vaccine for which there are no codified efficacy standards, it must submit to the USDA a test procedure it believes adequately demonstrates effectiveness; if the test procedure is approved, the manufacturer may then use that procedure to demonstrate vaccine efficacy. Although the flexibility of this method allows new and novel vaccines to enter the marketplace more quickly than might otherwise be the case, it hampers comparisons of vaccine efficacy, because different manufacturers may have gained approval using different test procedures.

How closely do results of vaccine efficacy trials reflect real-world effectiveness? For most diseases, experimental results compare favorably with what veterinarians experience in practice. As examples, efficacy tests of FPV vaccines indicate that vaccine-induced immunity is sufficient to completely protect most cats against challenge exposure. Similarly, tests of the efficacy of feline herpesvirus-1 (FHV-1) and feline calicivirus (FCV) vaccines demonstrate protection from serious disease in most vaccinated cats. Both of these results parallel the experience of most practitioners. However, many variables influence a cat's response to vaccination, so efficacy trials may not tell users how vaccination will affect a specific animal or population of animals.

Purity: Pure cultures of an infectious agent (master seed stocks) are used to produce a vaccine. An extensive array of tests are conducted to be as certain as possible that the organism in these cultures is indeed the intended agent and that no adventitious agents are present. The cells used in establishing and manufacturing the master seeds (master cell stocks) undergo similar stringent testing to ensure that they have been correctly identified and are themselves free of contamination. Once a manufacturer has established a master cell or master seed stock, the USDA performs its own confirmatory testing; if results are acceptable, the USDA releases the master stock for use by the manufacturer. To produce a vaccine, the manufacturer then creates working cells and seeds from the master stocks, which subsequently are frozen and stored in liquid nitrogen.

Although purity testing is extensive, it is not without potential error. Contaminants that are closely related to the intended infectious agent are occasionally missed, and adventitious agents that are present at levels below the thresh-

old of detection may not be identified. This is particularly important if an adventitious agent is pathogenic—a major risk associated with manufacturing of modified live vaccines. Improvements in test methodologies have made creation of master stocks more difficult but also more precise, and have allowed detection of contaminates missed by previous testing methods.

Potency: Potency testing determines the quantity of antigen in a vaccine. Potency and efficacy are closely related, but there are important differences. Potency is usually an in vitro assessment made during the manufacturing process, whereas efficacy is an in vivo assessment of how a vaccine performs in animals. The USDA must approve all potency test procedures, and requires that the manufacturer demonstrate a correlation between potency test results and vaccine efficacy. Each batch of vaccine manufactured is tested for potency, and once the potency exceeds a predetermined limit, the vaccine can be sold.

One factor that makes in vitro potency testing attractive is that prior to use of potency testing, each batch of vaccine had to be tested for efficacy—an expensive requirement that cost the lives of many thousands of animals. Unfortunately, the correlation between potency and efficacy is not always strong. First, potency tests are usually comparisons between production batches of vaccine and a reference vaccine. Because of the way reference vaccines are made and approved, subsequent reference vaccines may contain more antigen mass than previous batches, with a resulting upward shift in the potency of manufactured vaccines. Increased potency may raise safety concerns. Second, vaccines of unequal efficacy may receive equivalent potency tests results. For instance, although a heated or frozen vaccine may maintain potency, its efficacy may be compromised. Third, potency tests tend to ignore the role that an adjuvant plays in vaccine efficacy. As an example, a vaccine adjuvant may be adversely affected by storage, yet potency test results may remain unaffected. For these reasons, potency test results parallel efficacy only under the limited set of conditions under which they were originally approved.

Safety: Vaccine safety is demonstrated by monitoring vaccinates for clinically significant problems. Both laboratory safety data (eg, reversion-to-virulence studies, evaluation for local or systemic reactions, and shedding of live vaccine antigens) and field safety data must be generated. A standard field safety test must include a number of animals vaccinated at various geographic locations, usually multiple veterinary practices. Historically the requisite number of test animals has been relatively small (no fewer than 300 animals), but recently the number has been increased, with 1000 animals now being the common standard. In most instances, test animals are vaccinated by a veterinarian and observed for a brief period, usually 30 minutes. The owners are then instructed to monitor the animals at home and to report any unusual signs to the veterinarian. Other vaccines or medications are often administered simultaneously with the test vaccine, a practice that often complicates data analysis, but which more accurately reflects the way the product will be used.

Safety testing of this nature is likely to demonstrate problems that occur with considerable frequency during the immediate post-vaccination period; it is less likely to reveal rare or subtle vaccine problems, or those that occur a long time after vaccination. Therefore, safety testing should be considered exclusionary. In other words, if safety problems are encountered during the test period, then the vaccine will probably be unsafe in practice as well. But having successfully completed safety tests does not necessarily ensure that a vaccine will be completely safe—or even adequately safe—in a clinical setting. Safety is never absolute; rather, it is a subjective balance between frequency and severity of adverse events on the one hand and the benefits of disease reduction or prevention on the other.

Vaccine Labels

The set of rules under which a vaccine was developed influences the amount and type of information included on the label. When comparing vaccines, it is important to understand how the information presented on the label was obtained.

The label contains information about the disease that the vaccine is intended to prevent. If the disease produces many clinical syndromes, usually efficacy of the vaccine for only a single syndrome has been tested. Precisely which syndrome for which the vaccine was tested may not be stated on the label of older products, but the USDA now requires that specific disease syndromes be stated on the label of novel vaccines (ie, vaccines with an antigen or antigens not contained in any previously licensed products).

Vaccine labels contain one of three common wordings

describing the level of protection afforded by vaccination. The wording "...prevents infection with (certain microorganism)" may be placed on the label if data demonstrates that the product is able to prevent all colonization or replication of the challenge microorganisms in vaccinated-and-challenged animals. The wording "...indicated for the prevention of disease" normally applies to vaccines that have produced results consistent with the 80:80 efficacy guidelines. The wording "...indicated as an aid in the prevention of disease" is found on vaccines for which efficacy testing demonstrated a statistically significant difference between vaccinates and controls, but not of the level required for the stronger wording. There are several reasons why a reduced level of efficacy might be observed: the vaccine may be less effective, the challenge exposure may have been less severe, or the disease the vaccine attempts to attenuate may create only mild or subtle clinical signs. At any efficacy level, the manufacturer needn't demonstrate that protection induced by the vaccine is clinically apparent or relevant to an individual animal, or in the case of the latter two levels, that use of the vaccine will reduce the prevalence of disease in a population. There is also no requirement that the label state how the vaccine is best used in a preventive medicine program. For additional information on vaccine efficacy studies, see USDA-APHIS CVB Veterinary Services Memorandum No. 800.200 (http://www.aphis.usda.gov/vs/cvb/lpd/memos/VSMemo800.200.PDF).

Label directions usually reflect the way the vaccine was used during the required safety and efficacy testing. For example, the label may contain the following directions: "Administer intramuscularly one ml dose of vaccine. Repeat in 2-3 weeks. Annual revaccination is recommended." There is no requirement to demonstrate that both doses are necessary or that 2 to 3 weeks is the optimal revaccination interval, nor is there a requirement to indicate how to proceed if the second dose is administered more than 3 weeks after the first.

Approximately three decades ago, the paucity of data regarding the duration of protection induced by canine vaccines led experts to recommend annual administration as an attempt to ensure maintenance of protection from disease throughout the life of an animal and to maintain long-term population immunity. However, for the vast majority of animal vaccines currently available, the USDA does not require manufacturers to provide observational data on the label to support the recommendation for annual revaccination. The USDA does require manufacturers introducing vaccines containing novel antigens (ie, vaccines with an antigen or antigens not contained in any previously licensed products) to provide data demonstrating duration of immunity claims stated on the product label, but there is no requirement to determine the maximal or optimal revaccination interval.

The route of administration and dose volume indicated on the label should be carefully heeded, because they were probably the only ones tested for safety and efficacy during the licensing process. The practice of reducing the vaccine dose in an effort to reduce adverse post-vaccination events is unlikely to improve vaccine safety and may compromise effectiveness.

Vaccine labels often indicate the ages of animals to which the product may be administered. Age restrictions may exist for safety reasons, as a consequence of regulatory policy, or both. Unfortunately there is no way for the reader of the label to know under which set of rules the vaccine was approved, or why an age restriction is or is not indicated on the label. When in doubt, practitioners should consult with the vaccine manufacturer's technical assistance staff.

Other than warning of the possibility of anaphylactic reactions, vaccine labels have historically provided little safety information. The USDA is beginning to require that manufacturers list vaccine-mediated events (eg, fever, lethargy, or swelling at the injection site) observed during safety testing, but this requirement only applies to newly approved products or to older products for which the manufacturer is submitting changes to the USDA. Currently it is not possible for a reader to know why the label for one vaccine contains safety information not included on the label of a competitor's product. Consequently, labels of products that are nearly identical may list markedly different safety information; the converse is also true. Vaccine users can attempt to clarify the confusion by contacting the manufacturer's technical assistance staff.

Part II (April-June 2001, Vol. 16, No. 2) will cover Adverse Events and Adverse Event Reporting, Use Of Serologic Testing To Monitor Immunity And Assess The Need For Vaccination, and Practice Management Considerations.

Table 1 — American Association of Feline Practitioners and Academy of Feline Medicine Feline Vaccine Panel Recommended Guidelines for Vaccination of Cats

		Primary vaccination		Booster vaccination	
Antigen	**Vaccine types**	**Cats < 12 weeks old**	**Cats ≥ 12 weeks old**		**Comments**
Feline parvovirus*	MLV vaccine for parenteral administration MLV vaccine for topical administration Adjuvanted inactivated-virus vaccine for parenteral administration	If ≥ 6 weeks old, vaccinate at initial visit and every 3 to 4 weeks until ≥ 12 weeks old†	Administer 2 doses, 3 to 4 weeks apart	1 year after primary vaccination, then no more frequently than every 3 years	**Highly recommended for all cats**; in most cats, protection derived following administration of booster vaccination 1 year after primary vaccination is sustained for at least 3 years and probably 5 to 6 years or more; MLV vaccines should not be administered to pregnant queens or kittens < 4 weeks old
Feline herpesvirus-1 and feline calicivirus	Combined MLV vaccine for parenteral administration Combined adjuvanted inactivated-virus vaccine for parenteral administration	If ≥ 6 weeks old, vaccinate at initial visit and every 3 to 4 weeks until ≥ 12 weeks old†	Administer 2 doses, 3 to 4 weeks apart	1 year after primary vaccination, then every 3 years	**Highly recommended for all cats**; MLV vaccine should not be administered to pregnant queens
Feline herpesvirus-1 and feline calicivirus	Combined MLV vaccine for topical administration	If ≥ 6 weeks old, vaccinate at initial visit and every 3 to 4 weeks until ≥ 12 weeks old ƛ	Administer 1 dose	1 year after primary vaccination, then every 3 years	**Highly recommended for all cats**; may be used as an alternative to the parenteral product; may be preferable to parenterally administered vaccines in cats reared in or entering environments in which viral upper respiratory tract disease is endemic (eg, some catteries, boarding facilities, shelters); MLV vaccine should not be administered to pregnant queens
Rabies	Adjuvanted inactivated-virus vaccine for parenteral administration every year‡	Not eligible for vaccination	Administer 1 dose	1 year after primary vaccination, then every year§	**Rabies vaccination is highly recommended for all cats**. Rabies vaccination of cats is required by law in some regions of the country, and veterinarians should comply with state and local statutes regarding type of vaccine to be used and vaccination interval
Rabies	Adjuvanted inactivated-virus vaccine for parenteral administration every 3 years‡	Not eligible for vaccination	Administer 1 dose	1 year after primary vaccination, then every 3 years§	**Rabies vaccination is highly recommended for all cats**. Rabies vaccination of cats is required by law in some regions of the country, and veterinarians should comply with state and local statutes regarding type of vaccine to be used and vaccination interval
Rabies	Canarypox virus-vectored recombinant vaccine for parenteral administration	Administer 1 dose to cats as young as 8 weeks old	Administer 1 dose	1 year after primary vaccination, then every year	**Rabies vaccination is highly recommended for all cats**. The **recombinant** rabies virus vaccine can be used as an alternative to products approved for annual use; this product does not contain an adjuvant.
Feline leukemia virus	Adjuvanted and non-adjuvanted inactivated-virus vaccines for parenteral administration	Administer 2 doses 3 to 4 weeks apart to cats as young as 8 weeks old¶	Administer 2 doses, 3 to 4 weeks apart¶	Annually	**Recommended for cats that are *not* restricted to a closed, indoor, FeLV-negative environment** ; most important for cats < 16 weeks old; not recommended for cats ≥ 16 weeks old with minimal to no risk of exposure to FeLV-infected cats
Chlamydia psittaci	Modified-live vaccine for parenteral administration Adjuvanted inactivated vaccine for parenteral administration	If ≥ 9 weeks old, administer 2 doses, 3 to 4 weeks apart	Administer 2 doses, 3 to 4 weeks apart	Annually	**Not recommended for routine use**; can be considered for use in cats in multiple-cat environments where *C. psittaci* infections associated with clinical disease have been documented
Feline infectious peritonitis virus	MLV vaccine for topical administration	Not approved for cats < 16 weeks old	Administer 2 doses, 3 to 4 weeks apart to cats ≥ 16 weeks old	Annually	**Not recommended for routine use**; at this time, there is insufficient evidence to support the conclusion that the vaccine induces clinically relevant protection
Microsporum canis	Adjuvanted inactivated vaccine for parenteral administration	Not approved for cats < 16 weeks old	First dose administered SC to cats ≥ 16 weeks old; second dose administered SC 12 to 16 days after the first dose; third dose administered SC 26 to 30 days after the second dose	Not stipulated	**Not recommended for routine use**; vaccination may be considered as 1 component of a comprehensive control program in multiple-cat environments in which *M. canis* infection is endemic or as adjunctive treatment to hasten resolution of clinical signs in individual cats
Bordetella bronchiseptica	Modified-live vaccine for topical administration#	Administer 1 dose (0.2 ml) intranasally to cats ≥ 4 weeks old	Administer 1 dose (0.2 ml) intranasally	Not stipulated	**Not recommended for routine use**; vaccination may be considered for cats entering or residing in multiple-cat environments where *B. bronchiseptica* infections associated with clinical disease have been documented
Giardia lamblia	Adjuvanted inactivated vaccine for parenteral administration	Administer the first dose to cats 8 weeks old and a second dose 3 to 4 weeks later	Administer 2 doses, 3 to 4 weeks apart	Annually	**Not recommended for routine use**; vaccination may be considered as 1 component of a comprehensive control program in multiple-cat environments in which *G. lamblia* infections associated with clinical disease have been documented

*Cause of feline panleukopenia. †For kittens that are orphaned or at high risk of exposure, vaccination when as young as 4 weeks old may be indicated. ƛFor kittens that are orphaned or at high risk of exposure, vaccination when as young as 10-14 days old may be indicated. ‡A specific route of administration may be required; see product information for details. §Most often, the product approved for use annually is given for initial vaccination, followed 1 year later and every 3 years after that by administration of the product approved for use every 3 years; however, vaccination interval must comply with local and state statutes. ¶Feline leukemia virus testing is recommended prior to vaccination; infected cats do not derive any benefit from vaccination. #This product is **not** the same as the *B. bronchiseptica* vaccine approved for use in dogs; the product approved for use in dogs should not be used in cats.

Parenteral vaccines should be administered subcutaneously or intramuscularly.

MLV = modified-live virus.

Weekend Short Course

CORNELL UNIVERSITY

Cornell University Feline Study Programs

Solving Feline Behavior Problems

March 31–April 1, 2001 • Ithaca, New York

Program

In response to requests from cat breeders and others who work with cats, Cornell University is presenting a two-day seminar on *Solving Feline Behavior Problems.* This course is designed for cat breeders, veterinary-practice staff members, and other people with a serious interest in cats.

Topics to be covered include:

- Behavioral history
- The cat brain and drug therapy
- Feline communication
- House soiling and spraying
- Feline social structure and welfare
- Aggression
- How smart are felines?
- Feeding, sex, and maternal behavior
- Development and temperament testing

Faculty

Dr. Ann Beebe, consultant in companion animal behavior and practicing veterinarian with Veterinary Behavioral Services, based in Pennsylvania.

Dr. Katherine Houpt, director of the Animal Behavior Clinic and Professor of Veterinary Physiology at the Cornell University College of Veterinary Medicine.

Dr. Tracy Kroll, resident in the Animal Behavior Clinic of the Cornell University College of Veterinary Medicine.

Dr. Vint Virga, president, Behavioral Medicine for Animals and consultant to the Animal Medical Center in NYC.

Accommodations

Rooms have been reserved at the Best Western University Inn, 607 272-6100, $79 single/double. Shuttle service is provided on request. The above reduced rate is available **if you mention the program by name when you make your reservations.** Please make your reservations early; room availability and discount rates cannot be guaranteed after March 2.

Travel Planning

Participants should arrive by 8:30 a.m., on Saturday, March 31. The program will conclude by 4:30 p.m. on Sunday, April 1. For additional travel information, please visit: www.info.cornell.edu/CUHomePage/Visiting.html

Program Charge

The program charge of $300 includes tuition; course materials; a certificate of completion; and lunch and refreshment breaks throughout the program. Persons whose cancellations are received in writing by March 9 will receive a full refund minus a $25 fee. Cancellations received after March 9 are subject to a $100 cancellation fee. Program costs may be tax deductible.

Further Information

Solving Feline Behavior Problems, Cornell University,
B20 Day Hall, Ithaca, NY 14853-2801; phone: 607 255-7259;
fax: 607 255-9697; e-mail: cusp@cornell.edu;
Web: www.sce.cornell.edu/exec

Registration form

Solving Feline Behavior Problems
March 31–April 1, 2001

Please print or type

Name (as you want it to appear on certificate)

Nickname (as you want it to appear on name badge)

Mailing address (to appear on participant list)

( ) Day telephone ( ) Evening telephone

Please indicate your payment preference:

☐ Enclosed is my check for $_____
made payable to Cornell University in U.S. dollars and drawn on a bank located in the United States.

☐ Charge my Visa or MasterCard for $_____

Account number Expiration date
(specify: ☐ Visa ☐ MasterCard)

Cardholder's signature

Cardholder's name (please print)

251

Research Briefs

I. Kiss, S. Kecskemeti, J. Tanyi, and B. Klingeborn, "Preliminary studies on feline coronavirus distribution in naturally and experimentally infected cats," *Research in Veterinary Science* 68: 237-242.

The shedding, tissue distribution and quasispecies composition of feline coronaviruses were studied in naturally and experimentally infected cats. The infection remained subclinical, but the majority of the animals shed the virus via feces throughout the experiment. Sequences corresponding to the viral nucleocapsid region were amplified by reverse-transcription polymerase chain reaction from the cortex, dura mater, pancreas, lungs, third eyelid, and the heart muscle in four cases. Interestingly, the ORF7b viral region - a supposed virulence factor - was detected in fewer organs, raising the possibility that this region can be affected by deletions during virus replication in vivo. It is demonstrated that the composition of the viral quasispecies differs between organs, and that genomic regions with different functions undergo distinct processes of selection, which should be considered during the evolution of feline coronaviruses.

S.E. Peachey, J.M. Dawson, and E.J. Harper, "Gastrointestinal transit times in young and old cats," *Comparative Biochemistry and Physiology A: Molecular and Integrative Physiology* 126: 85-90.

Aging results in a decrease in apparent nutrient digestibility in the gastrointestinal (GI) tract. The aim of this study was to investigate whether the rate of gastric emptying or total GI transit times differed between young (3.0 +/- 0.9 years) and senior (11.6 +/- 1.4 years) cats. Gastric emptying rates were measured using [1-C-13]octanoic acid and total transit times with chromium oxide. No significant differences ($P > 0.05$) were observed in either the rate of gastric emptying or total transit time between young and senior cats although senior cats exhibited a larger variability in total transit time compared to the younger cats (35.71 +/- 14.06 and 26.46 +/- 5.80 hours, respectively). The results of this study indicate that the observed reduction in nutrient digestibility in ageing cats is not due to alterations in the rate of passage of digesta through the GI tract.

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