

VIRGINIA-MARYLAND
REGIONAL COLLEGE
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VETERINARY MEDICINE



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Extension Veterinarian

ANESTHETIC COMPLICATIONS: VENTILATORY AND RESPIRATORY INSUFFICIENCY

The ultimate manifestation of ventilatory insufficiency (i.e.: ventilatory arrest or cessation of breathing) is usually readily recognized and treated during anesthesia. In contrast, ventilatory/respiratory insufficiency may often be overlooked even though they are common anesthetic complications and often precede cardiac arrest.

On the basis of initiating causes as well as therapy, ventilatory/respiratory insufficiency may be divided into:

Inadequate Ventilation - decreased gas movement through the airways to alveoli, and

Inadequate Respiration - decreased exchange of gases (O_2 and CO_2) between alveoli, blood, and tissues.

Common causes of the latter which may be encountered in animals presented for anesthesia include atelectasis, pneumonia, pulmonary edema, and intrapulmonary hemorrhage. Alveolar-blood gas exchange (predominantly O_2) is reduced and arterial hypoxemia results. Cyanosis which may be evident while the animal is breathing room air is only rarely observed when inhalant anesthetics in oxygen are used. Shivering in the post-operative period also causes reduction in tissue oxygenation due to the increased metabolic demands and oxygen consumption. In general, insufficient respiration can be successfully treated by administering supplemental oxygen (via endotracheal tube, mask or oxygen cage). Carbon dioxide accumulation is not usually a problem with these conditions, and, therefore, ventilatory assistance may not be necessary.

Ventilatory insufficiency or inadequate gas movement (as evidenced by reduced thoracic excursion, breathing rate, or both) frequently accompanies anesthesia and is typically the result of the CNS depressant action of anesthetic drugs. Barbiturates, opiates, and inhalants are the usual culprits, but ventilatory depression has been reported with dissociatives (ketamine) and some tranquilizers (xylazine) as well. The degree of pharmacologic-induced ventilatory inadequacy generally parallels anesthetic depth and may be moderately tolerated by normal healthy animals during reasonable levels of surgical anesthesia. However, if it is severe or if the animal has pre-existing pulmonary dysfunction, breathing should be assisted.

Other causes of ventilatory insufficiency include airway obstruction from respiratory tract secretions, kinks in the endotracheal tube, or marked flexion of the neck. Increased mechanical deadspace which usually results from anesthetic machine misconnections, excessive protrusion of the endotracheal tube, exhausted CO_2 absorbent, or too low fresh gas flow with non-rebreathing systems (Norman Elbow, Ayre's T-Piece, Bain circuits, etc.) is another often overlooked cause of ventilatory insufficiency. Finally, decreased chest and/or lung compliance accounts for inadequate ventilation in a relatively large number of patients. Common causes of reduced compliance include obesity, head-down body position, use of sandbags in positioning, and excessively snug thoracic or abdominal bandages. Conditions such as diaphragmatic hernia, pneumothorax and hemo/hydrothorax also markedly reduce compliance.

Reduction in breathing bag or chest excursion and/or decreased breathing rate are hallmark diagnostic features of inadequate ventilation. Cyanosis may occasionally be observed in animals that are breathing room air, but it is rarely seen when inhalation anesthetics are used. For this reason, supplemental oxygen is only moderately beneficial in these cases, whereas, manual or mechanical ventilatory assistance is essential to permit adequate CO₂ elimination.

General guidelines for providing adequate ventilation in small animals include tidal volume of 10-15 ml/kg which usually requires an airway pressure (as measured at the manometer on the anesthetic machine) of 15-20 cm H₂O (12-15 mmHg). A breathing rate of 8-10 breaths per minute is usually adequate at this tidal volume.

In summary, diagnosis of both respiratory insufficiency and ventilatory insufficiency as well as distinguishing between the two conditions is important for therapeutic considerations. Administration of supplemental oxygen (with or without ventilatory assistance) is indicated for the former, while assisted ventilation (with either room air or oxygen) is mandatory for the latter.

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PARVOVIRUS VACCINATION OF PUPPIES

Several veterinarians have called to ask directions for the best immunization of puppies from immune mothers. One method suggested by Dr. C. Clain of the James Baker Institute for Animal Health is to check the H1 titer of the bitch at whelping. The half-life of parvovirus antibody is approximately 9 days. Divide the titer by 2 and continue to divide the answers by 2 until the result is 10 or less. Then total the number of times the numerator was divided by 2 and multiply that total by 9. The result gives the approximate number of days the puppy will be protected. For example: The bitch has a titer of 1:1280:

$$\frac{1280}{2} = \frac{640}{2} = \frac{320}{2} = \frac{160}{2} = \frac{80}{2} = \frac{40}{2} = \frac{20}{2} = 10$$

There are seven divisions, thus 7 x 9 = 63 days. Therefore, the puppies probably should be vaccinated by 8 weeks, 10 weeks and 12 weeks.-- New Mexico Vet. News, May, 1983. --As reported in North Dakota State University Veterinary News, June, 1983. -- As reported in Veterinary Medicine Newsletter, Univ. of Florida, July, 1983.

FELINE HYPERTHYROIDISM

Since its recognition in the eastern United States several years ago, the number of cases of feline hyperthyroidism has been steadily increasing. Many practitioners now include T-4 as a part of routine health screens on feline

patients. In those cats displaying symptoms compatible with hyperthyroidism, T-4 is often found to be in the range of 10-15 ug/dl. Thyroid disease seems to manifest itself differently in dogs and cats. Dogs are rarely hyperthyroid while cats are rarely hypothyroid.

Hyperthyroid cats display symptoms similar to those of hyperthyroid humans. Hyperactivity is the most common change observed. Other symptoms are increased appetite with weight loss, frequent defecation, thirst, polyuria, moderately elevated temperature, enlargement (not massive) of one or both lobes of the thyroid gland, tachycardia, heart enlargement, murmurs, and arrhythmias.

Hyperthyroidism in cats can be identified with currently available thyroid tests. Analysis for T-3 and T-4 can be done but T-4 seems to be the most popular test. In normal cats, T-4 ranges from 1 to 5.0 ug/dl and T-3 is 60 to 200 ng/dl. Hyperthyroid cats often have T-4 values as high as 15 ug/dl and T-3 values as high as 400 ng/dl. Liver-related enzymes such as SGOT, SGPT, and alkaline phosphatase may also be significantly elevated.

Chemical treatment of these patients has been unrewarding. Propylthiouracil (50 mg. b.i.d. or t.i.d.) has been used but did not seem to produce measurable results. Surgical excision remains the treatment of choice. Surgical exposure usually reveals both of the lobes to be involved. In cases where only one lobe is enlarged, the opposite lobe may be atrophied and difficult to identify because of feedback inhibition related to high levels of thyroid hormones. If possible, the parathyroid glands should be salvaged; unfortunately, visualization of the glands is often not possible. This situation may not be as serious as it seems since most animals have sufficient ectopic parathyroid tissue to resume normal function within days. Atrophied thyroid glands also respond in a very short time and are able to supply adequate hormones almost immediately. In patients where both lobes of the thyroid gland are removed, T-4 must be given daily at the dosage of 0.2 mg. Serum levels can be monitored to help achieve an effective maintenance dose.

In cats, thyroid enlargement is not always associated with neoplasia. In addition to adenomas and adenocarcinomas, hyperplasia is often found. Any mass excised should be submitted for a histopathologic evaluation and some prognostic advice. --Veterinary Reference Laboratory, Inc. Newsletter, January/February, 1983.--As reported in Veterinary Medicine Newsletter, Univ. of Florida, May, 1983.

IVERMECTIN AGAINST DIROFILARIA IMMITIS MICROFILARIAE

In dogs, ivermectin given as a single oral dose six weeks after they were treated with thiacetarsamide was highly efficacious against the microfilariae of *Dirofilaria immitis*. A dose of 0.2 mg of ivermectin/kg of body weight or 1 dose of 0.05 mg/kg appeared to completely clear microfilariae from the blood. A dose of 0.0125 mg/kg cleared microfilariae from two of three dogs, and even a dose of 0.00313 mg/kg resulted in substantial reduction of the microfilaremia.--AJVR 44:475, as reported in Utah State University Veterinary Newsletter, March, 1983. As reported in Veterinary Medicine Newsletter, Univ. of Florida, June, 1983.

ACUTE EQUINE DIARRHEA SYNDROME

A meeting of northern Virginia equine practitioners, Extension agents, Virginia Department of Agriculture, and veterinary college representatives was held at Frying Pan Park, Fairfax County on August 24, 1983 to discuss the incidence and management of "Potomac Fever" in Virginia. Discussion by all groups represented brought forth the following information:

- the syndrome is apparently seasonal (June-September)
- climatic conditions (hot, humid weather) are a factor
- depression, fever and depressed WBC are the most common early symptoms, followed by a profuse, watery, fetid diarrhea
- laminitis is a common sequella
- the syndrome was first observed and continues to occur predominantly in Montgomery County, Maryland
- cases have been diagnosed in Fairfax, Loudoun and Prince William counties in Virginia
- veterinary clinicians and epidemiologists from the University of Pennsylvania, University of Maryland and Virginia Tech are investigating the disease
- inadequate financial support is hindering the investigation.

Following the discussion of the syndrome it was agreed to set up a reporting system in Virginia. Any veterinarian called to treat a case in Virginia believed to be Acute Equine Diarrhea Syndrome should report the case to Dr. Jerry A. Wilson, Veterinary Supervisor, Warrenton Regional Laboratory, 234 West Shirley Ave., Warrenton, Virginia. Telephone (703)347-3131.

Necropsies will be performed at the Warrenton laboratory when referred by a veterinarian if at all possible.

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PHARMACOLOGIC BASIS OF GLAUCOMA THERAPY

In management of glaucoma, cholinergics, hyperosmotics, carbonic anhydrase inhibitors and adrenergics reduce intraocular pressure (IOP) by reducing aqueous production and/or increasing aqueous outflow. Cholinergics (miotics) contract the iris, allowing aqueous drainage from the anterior chamber; pilocarpine is an example of a direct-acting cholinergic. Carbachol, a direct-and indirect-acting cholinergic, can be used if the eye becomes refractory to pilocarpine. Isofluro-pate (Floropryl: MSD), echothiophate (Phospholine Iodine: Ayerst), and demecarium bromide (Humorsol: MSD) are indirect-acting miotics.

Hyperosmotics such as mannitol, glycerol and urea are used systemically to decrease IOP by moving water from the eye to the vascular system. Mannitol is most popular for treatment of acute glaucoma; the primary contraindication is the poorly compensated cardiac patient. Carbonic anhydrase inhibitors, e.g., acetazolamide (Diamox: Lederle), dichlorphenamide (Daramide: MSD), and methazolamide

(Neptazane: Lederle), lower IOP by decreasing production of aqueous. They may cause hypokalemia, which can be corrected by oral supplementation.

Topical adrenergics, e.g., epinephrine HCl (Epifrin: Allergan), epinephrine bitartrate (Epitrate: Ayerst), and epinephrine borate (Epinal: Alcon), lower IOP by increasing aqueous outflow and decreasing production. Used alone these will not maintain normal IOP; they are best used in conjunction with cholinergics. Timolol (Timoptic: MSD) is a synthetic adrenergic that decreases aqueous production.

Proper selection and use of medications is essential when treating acute glaucoma, in which a pressure of 50-60 mm Hg for 24-48 hr can permanently impair vision. Acute glaucoma is often treated with a direct-acting cholinergic, hyperosmotic, and carbonic anhydrase inhibitor. After the acute episode, long-term management should begin with a direct-acting cholinergic. If insufficient alone, a carbonic anhydrase inhibitor or adrenergic can be added, and more potent indirect miotics can be used if this fails. Surgery may become necessary if medical management is unsuccessful.--J.E. Thomas, Sch Vet Med, Auburn Univ, Auburn, Alabama. Pharmacological basis of glaucoma therapy in the dog. Auburn Vet 38(3):12-15, 1982. -- As reported in Veterinary Medicine Newsletter, Univ. of Florida, July, 1983.

THOUGHT FOR THE MONTH

What is easy is seldom excellent.

Samuel Johnson

VETERINARY COLLEGE NEWS CLASS OF 1987

	VA	MD	Total
No. of applications	161	97	258
Interviewed	102	70	172
Accepted	50	30	80
Degrees held (accepted students)	None	17	
	Bachelors	49	
	Masters	13	
	PhD	1	
Colleges or Universities represented (accepted students)			34
Virginia Tech		22 students accepted	
University of Maryland		19 students accepted	
Graduate and undergraduate majors (accepted students)			24
Animal Science		20 students	
Biology		31 students	

Average Cumulative Grade Point Average (GPA)	3.44
Average Graduate Record Exam Average (GRE)	1199.5
Sex: Male - 35	Female - 45
Age: Minimum: 20	Maximum: 36 Average: 25

NEW FACULTY

Dr. Paula Modransky, a large animal surgeon, has joined the clinical staff. Paula comes from Washington State University where she recently completed a surgical residency and a masters degree. An Ohio State graduate, she brings a wealth of experience in the surgical management of equine neurology cases to the Teaching Hospital at Virginia Tech.

Dr. Stephen Wikse is the new coordinator of the Ambulatory Health Service. Steve is a University of California-Davis graduate and comes to Blacksburg from his own practice in Fort Jones, northern California. He is particularly well-qualified in herd health management and diseases of the bovine. He is also a boarded pathologist.

Dr. Craig Thatcher received a DVM from Iowa State as well as an MS and PhD in nutritional physiology. He left a mixed practice (primarily dairy) in Liberty, PA to join the staff of the College's Ambulatory Health Service. We welcome his expertise in ruminant nutrition.

Dr. Mark Dallman has joined the clinical staff as a small animal surgeon. He is a graduate of the University of Missouri where he also received a PhD in anatomy while completing his surgical residency. Mark also has special training in anesthesiology.

Dr. Bob Martin, also a small animal surgeon, is an Auburn graduate who spent four years as an Air Force veterinarian. He has recently completed one-year anesthesiology and two-year surgical residencies at Cornell. Bob works in all areas of small animal surgery.

Clinical Investigation

Dr. Larry Booth has become a clinical investigator in a preliminary field evaluation of hyaluronic acid in cooperation with Chesapeake Biological Laboratories, Dr. William Tew, director, and E. R. Squibb and Sons, Inc. The study runs from August 15 to October 15, 1983.

Dr. Booth solicits the help of our readers in referring cases of equine degenerative or traumatic inflammatory joint disease for this study which is restricted to the carpal, fetlock and tibiotarsal joints. There will be no charge for the hyaluronic acid used in these cases.

Dr. Booth can be reached at his work number (703)961-4621 or his home telephone (703)961-2542.

New Service

The Teaching Hospital has recently purchased a pneumatic dermatome for use in split-thickness skin grafting. Dr. Larry Booth, large animal surgeon, announced the availability of this service which is of particular benefit in treating large wounds of the extremities.

EQUINE MEDICAL CENTER DIRECTOR NAMED

The appointment of G. Frederick Fregin, VMD veterinary cardiologist and director of equine research at Cornell University, as the director of the Marion duPont Scott Equine Medical Center in Leesburg has been announced by Richard B. Talbot, D.V.M., Dean of the Virginia-Maryland Regional College of Veterinary Medicine.

Dr. Fregin is widely known for his expertise in equine medicine and has special interests in cardiology, sports medicine, gait analysis, biomedical instrumentation and telemetry, pharmacokinetics and pharmacodynamics. He was a faculty member at the University of Pennsylvania School of Veterinary Medicine for 17 years following his graduation there in 1964.

Dr. Fregin has recently moved to Leesburg and has started the task of equipping and staffing the new facility, which is located on 200 acres at Morven Park, the Westmoreland Davis estate. A complete equine health program, including conditioning, preventive medicine, treatment, rehabilitation and research, is being planned.

The \$4 million Center, made possible by a gift from Mrs. Marion duPont Scott of Orange County, will accept referrals from veterinarians. A total staff of 30, including four staff veterinarians, will provide service at the Center.

PRIVATE PRACTICE CLERKSHIP 1983-84

The private practice clerkship is one of twelve, four-week clinical rotations which fourth year students complete before graduating from the Virginia-Maryland Regional College of Veterinary Medicine. For the 1983-84 academic year, 23 private veterinary practices--13 in Virginia and 10 in Maryland--are offering clerkships to Virginia and Maryland students.

The purpose of the private practice clerkship is to insure that all students have ample opportunity to participate in routine small animal medical and surgical procedures such as spay and neuter operations, vaccinations, and diagnosis and treatment of internal and external parasites.

In planning the fourth-year rotations, the College's Curriculum Committee considered the small animal focus of the private practice clerkship essential because companion animals referred to the Veterinary Medical Teaching Hospital at Blacksburg, where students complete 10 of the 12 clinical rotations, usually require specialized--not routine--medical and surgical services. Students have ample opportunity to participate in the management of both routine and specialized

medicine and surgery cases with large animals during hospital rotations on the ambulatory health service and the production management medicine service (both on-farm veterinary services) and in-patient services in large animal medicine and large animal surgery.

Over half of the students in the present senior class, which will graduate in June 1984, have expressed a preference for large animal work. Whenever possible, students so motivated are assigned to a mixed private practice, so that they may gain additional exposure to large animal practice when the small animal requirements are met.

The private practices offering clerkships to Virginia and Maryland students are all multi-practitioner businesses with adequate caseload, staff, facilities and equipment to provide an above average clinical experience for the student. The practices in Maryland are selected by the College's Maryland faculty at College Park, and the Virginia practices are selected by clinical faculty at Virginia Tech with assistance from local veterinary associations. Site visits are made before the final selection of practices.

One practitioner in each practice is selected as the preceptor with responsibility for the student's orientation, training and evaluation. The preceptor is appointed an adjunct clinical instructor by the Dean of the College, and the practice is paid \$500.00 for each student accepted for a clerkship. From the student's perspective, housing during the clerkship is a major concern. Understandably, therefore, practices with adequate student housing are popular.

Each year the list of private practices offering clerkships will change. There will be additions and deletions as qualified practices in both states make their contributions to this valuable clinical program.

Practices interested in providing clerkships or in providing practice experience for senior students on vacation, or students on vacation after the first or second year of veterinary training, should contact the private practice course leader.

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SUCCESS IS NO ACCIDENT

Your clinic will never experience a fire, everyone knows that. It is worth noting, however, that more than one practitioner has been literally wiped out by a fire he was not expecting. Who ever is?

You can prepare for this possibility by updating your insurance coverage on building and contents, by placing working fire extinguishers at strategic locations, and by having periodic fire drills for the clinic staff based on a well-conceived evacuation plan.

This might be the time to consider and act on these measures, not after disaster strikes.

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MEETINGS

September 29-30, 1983	Bovine Practitioners Seminar Holiday Inn Frederick, MD
October 21, 1983	Equine Practitioners Seminar Ramada Inn Charlottesville, VA
November 4-5, 1983	Soft Tissue Surgery Wet Lab Virginia Tech Blacksburg, VA
November 18-19, 1983	Orthopedic Surgery Wet Lab Virginia Tech Blacksburg, VA
December 4, 1983	Animal Technicians Seminar Critical Care (Small Animal) - Blue Ridge Community College Weyers Cave, VA
For more information contact:	Dr. Kent Roberts Virginia-Maryland Regional College of Veterinary Medicine Virginia Tech Blacksburg, VA 24061

VAGINAL CULTURING

There has been a recent increase in the number of requests from breeders to have vaginal cultures performed on bitches prior to breeding. The impetus seems to come from owners of prospective stud dogs who want to have pathogens identified in the female reproductive tract that could be transmitted to the male during intercourse. There are however, several flaws to this line of reasoning.

First, the vaginal canal of virtually all bitches normally harbors bacteria. Several studies have attempted to delineate the normal flora of the canine vagina and a few attempts have been made to correlate culture results with the presence or absence of disease. One study showed 49-50 normal bitches to harbor bacteria. The types of bacteria present in both fertile and infertile bitches are similar. Another study that isolated only aerobic bacteria found virtually all bitches had bacteria in the posterior vagina. About 1/3 had no aerobic organisms in the anterior vagina. However, other studies have shown nearly 34% of all isolates to be anaerobic. Thus it seems safe to conclude that almost all cultures of the posterior vagina will yield some bacteria. Mixed cultures are common. It is impossible to determine which bacteria are pathogens because those organisms commonly associated with lower urogenital tract infection (*E. coli*, *Pseudomonas*, *Proteus*, *Staph.* and *Strep. spp.*) are among the most commonly found organisms in the lower vagina.

Secondly, the male urethra is a very effective barrier to ascending infection. Such factors as the urethral high pressure zone, urethral peristalsis, prostatic antibacterial fraction, normal micturition, length of urethra, and mucosal defense barriers all serve to keep bacteria from infecting the urogenital tract. There may even be an antibacterial factor present in semen. A recent review of factors influencing infection of the urogenital tract failed to include copulation as a cause. The same organisms present in the posterior vagina are routinely found in the preputial sheath and on the glans penis of the male. Thus, when infection of the male genital tract occurs it seems more likely that there has been a breakdown in his defense mechanisms to organisms normally present in his distal urethra rather than from brief contact with the bacteria normally present in the lower vagina of his sexual partners.

In summary, it appears that routine vaginal culture procedures in the bitch are fruitless.

Cultures in the area of the cervical os during times of cervical patency (i.e., proestrus and estrus) are used to help determine if uterine infection exists. The uterus is normally sterile. Such a procedure should incorporate the use of a sterile speculum to bypass the lower vaginal area. A guarded culture swab, such as Modified Teigland swabs, is used in conjunction with the speculum. The tip of the instrument is placed as close to the cervical os as possible before the swab is exposed. One should culture for both aerobic and anaerobic bacteria. There does seem to be a correlation with the degree of growth and the presence of endometritis - moderate to heavy growth indicating active infection. Light growth generally indicates contamination from normal anterior vaginal flora. Mixed cultures are common and one should treat the major organism(s) and probably not be concerned with those organisms present in small numbers.--Thomas Burke, DVM, Univ. of Illinois, as reported in North Dakota State University Veterinary News, May, 1983 -- As reported in Veterinary Medicine Newsletter, Univ. of Florida, June, 1983.

Virginia-Maryland Regional College of Veterinary Medicine Extension Staff:

- Dr. C. T. Larsen, Extension Specialist - Avians
- Dr. K. C. Roberts, Extension Specialist - Equine and Companion Animals
- Dr. T. P. Siburt, Extension Specialist - Pharmacology and Toxicology
- Dr. H. F. Troutt, Extension Specialist - Cattle and Swine

Mollie Heterick, Managing Editor of Virginia Veterinary Notes

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