The number of inhalant anesthetics available to practicing veterinarians has increased over the last 15 years. Although not all are labeled specifically for a veterinary species, desflurane, enflurane, halothane, isoflurane, methoxyflurane, nitrous oxide, and sevoflurane are used in clinical and laboratory settings. These drugs have variable physical, chemical, and clinical properties and should be delivered by individuals knowledgeable of their pharmacological and clinical effects. To promote efficiency and safety for both patients and personnel, anesthetic equipment, including anesthesia machines, breathing systems, vaporizers, anesthesia ventilators, and ancillary equipment, appropriate for the particular inhalant anesthetic and patient should be employed. The following discussion reviews some of the latest innovations in inhalant anesthetic machines, ventilators, and equipment (especially instruments designed specifically for veterinary use) and is not intended to endorse products that are mentioned or to diminish equipment that may not have been included.

ANESTHESIA MACHINES

Many anesthesia machines, breathing systems, vaporizers, and anesthesia ventilators designed for both human and veterinary patients have been described in detail. Essentially, all anesthesia machines, breathing systems, and vaporizers intended for human application can function appropriately for one or more veterinary species. Equipment for human
anesthesia must be manufactured and maintained according to standards set by the American Society for Testing and Materials (ASTM); these standards are revised and published regularly. Presently, no standards exist for the manufacture and maintenance of veterinary anesthesia equipment, and the assurance of safety resides with the manufacturers and users. Many veterinary anesthesiologists have adopted standards set for equipment designed for man to ensure that veterinary anesthesia equipment is safe for their patients.

Even if aged and obsolete equipment is disregarded, quality and sophistication vary greatly among the contemporary human and veterinary anesthesia machines. By way of comparison, a relatively simple veterinary anesthesia machine with one vaporizer may cost about $5000, although an advanced machine with multiple vaporizers and monitors intended for human application may sell for approximately $100,000. Nevertheless, a complete anesthesia machine includes a gas source, regulator, and flowmeter for each medical gas (oxygen on all machines, nitrous oxide on some machines); a vaporizer for each volatile liquid inhalant anesthetic; and a breathing system.

Anesthesia machines are fitted for the delivery of one or more medical gases (oxygen on all machines, nitrous oxide on some machines) which are supplied in compressed gas cylinders. The cylinder valve bodies and their corresponding hanger yokes continue to be designed with incorporation of the pin index safety system to prevent inadvertent interchange of gases. Most anesthesia machines have pipeline inlets with diameter-indexed safety system connections for central sources of medical gases used for the same purpose. Regulators on anesthesia machines reduce and regulate the pressure of gases supplied to the components (e.g., flowmeters) located downstream. Some changes have occurred in pressure regulators on modern anesthesia machines. Older anesthesia machines usually had regulators set to reduce the pressure of medical gases to approximately 50 pounds per square inch gauge (psig). With the increased use of central gas supplies and pipeline systems for delivery of medical gases at a pressure of about 50 psig to multiple station outlets throughout a hospital, regulators on anesthesia machines may be set to lower pressures (e.g., 47 psig). This allows the central gas source to supply the anesthesia machine preferentially, preventing the depletion of the small cylinders (e.g., E cylinders) that should be reserved for emergencies. Current ASTM standards mandate the adjustment of regulators to allow preferential use of pipeline gases. Newer anesthesia machines, especially those designed for application to man, may have two or more automatic pressure-reducing regulators in a series, which results in the delivery of medical gases to the flowmeters at relatively low pressures (e.g., 12–16 psig).

Flowmeters on anesthesia machines should be manufactured and arranged according to ASTM standards. The current standard for anesthesia machines for human beings requires that there be only one flow adjustment control for each gas delivered to the common gas outlet. This guideline is not followed in all contemporary veterinary anesthesia
machines, and two flow adjustment controls for oxygen may be present, one servicing a flowmeter with a low range of flow (e.g., 0–1 L/min) and another controlling a flowmeter with a high range of flow (e.g., 0–5 L/min). Although the rationale for two ranges of flow may be more accurate delivery of oxygen when using closed circle systems in small patients, the likelihood of error in selection of the flow rate for oxygen increases. The same purpose can be accomplished by having a double-taper flowmeter or two flowmeters (the first for fine control or lower flow and the second for coarse control or higher flow) in a series served by the same flow adjustment control. An interesting innovation in some modern anesthesia machines is a mechanism to prevent the flow of oxygen from being completely turned off, ensuring that 200 to 450 mL/min of oxygen is flowing to the patient at all times if the machine is attached to an appropriate oxygen source.  

**VAPORIZERS**

Advanced vaporizers are included on newer anesthesia machines designed for both human and veterinary patients. Although certain veterinary anesthesia machines can be purchased with nonprecision vaporizers located within the circle breathing system (in-system vaporizers; e.g., Stephens Universal Vaporizer, Schein, Port Washington, NY), most manufacturers of anesthesia machines rely on precision out-of-system vaporizers. In the United States, manufacturers of anesthesia machines for man incorporate “concentration-calibrated” out-of-system vaporizers. At this time, no in-system vaporizers are being manufactured in the United States for anesthesia machines designed for human patients, primarily because of resistance to gas flow and unpredictability of output. The Ohio #8 vaporizer (Ohio Medical Inc., Madison, WI) which was used for many years in human and veterinary anesthesia is generally considered to be obsolete. One author states that “the delivered concentration (with an Ohio #8 vaporizer) is unknown and changes unpredictably with use.” Also, it is difficult to fill in-system vaporizers as currently designed without substantial pollution of the work environment with inhalant anesthetic vapors.

Although they are no longer being manufactured, unused Ohio calibrated vaporizers and Tec 3 vaporizers are available to veterinarians through various distributors of veterinary anesthesia equipment; these vaporizers are described fully in the medical and veterinary anesthesia literature. The Tec 3 vaporizers (Ohmeda, Liberty Corner, NJ) and Ohio calibrated vaporizers function well on veterinary anesthesia machines, and service for recalibration, cleaning, and replacement of worn parts is readily available. When contracting for service on these vaporizers, one should be certain that a complete recalibration is to be done. This means that the recalibration should include evaluation of output at variable carrier gas flows and operating temperatures.

More advanced “Tec-type” vaporizers are sold with some veterinary anesthesia machines; Tec 4, Tec 5, and Tec 6 vaporizers (Ohmeda, Liberty
Corner, NJ) are available. All are concentration calibrated. Tee 4 (Fig. 1) and Tee 5 (Fig. 2) vaporizers are classified as variable-bypass, flow-over with a wick, temperature-compensated, agent-specific, and out-of-circuit vaporizers. These vaporizers may be designed for halothane, enflurane, isoflurane, or sevoflurane, and a separate vaporizer is required for each anesthetic. Within limits, these vaporizers compensate for variations in carrier gas flow, temperature, and back pressure. The functional characteristics of these vaporizers are available in operations manuals that can be obtained from the manufacturer. The output of a Tee 4 vaporizer does not change if it is not in a directly upright position (e.g., vaporizer is tipped), and the Tee 5 has an internal system of baffles that prevents liquid anesthetic from reaching the outlet even if the vaporizer is inverted. Both Tee 4 and Tee 5 vaporizers were intended for use on a manifold with two or more similar vaporizers in a series, the interlocking design of which prevents the inadvertent use of two vaporizers simultaneously. Tee 4 and Tee 5 vaporizers on veterinary anesthesia machines are not typically used with a manifold or interlocking system. When fully charged, the capacity of a Tee 3 or Tee 4 vaporizer is 125 mL of liquid anesthetic, and the wick retains about 35 mL of liquid; the Tee 5 with dry wicks requires 300 mL of liquid to be fully charged, and the wicks retain about 75 mL of liquid. The larger capacity of the Tee 5 limits the need for frequent refilling. The manufacturer's recommendation for

Figure 1. Isotec 4 Vaporizer for administration of isoflurane. The vaporizer is fitted with a screw-cap filler port, and the control dial is set in the off position.
Figure 2. Sevotec 5 Vaporizer for administration of sevoflurane. The vaporizer is fitted with a keyed filler port with instructions for use shown on the diagram next to the filler port. The control dial is set in the off position.

complete servicing of the Tec 5 is 3 years, although it is 1 year for the Tec 3 and Tec 4.

The Tec 6 vaporizer is electrically heated and pressurized, and it was designed specifically for the administration of desflurane. Desflurane has a low blood-gas solubility coefficient (0.42 at 37°C), which promotes rapid induction and recovery and ready control of depth of anesthesia. A special vaporizer is required for desflurane because of its unique physical characteristics. Desflurane has a high vapor pressure (664 mm Hg at 20°C); it boils at 23.5°C, which is close to room temperature. Desflurane’s minimum alveolar concentration value is approximately 7%. Compared with other popular inhalant anesthetics, a higher range for the vaporizer control settings is required for desflurane. Simplistically, desflurane vapor originates in a heated sump (temperature, 39°C; vapor pressure, 1500 mm Hg), and output from the vaporizer is controlled by the operator, who adjusts the concentration control dial. Tec 6 vaporizers are quite expensive and require regular maintenance.

Although North American Drager (Telford, PA) discontinued its line of veterinary anesthesia machines several years ago, many of these anesthesia machines and vaporizers are still used in veterinary anesthesia practice. The Vapor 19.n series of vaporizers (North American Drager) can be serviced, and many remain functional in veterinary hospitals. The Vapor 19.1 has been the workhorse for Drager’s line of
anesthesia machines for human beings, and agent-specific vaporizers are available for enflurane, halothane, isoflurane, and sevoflurane.

**VETERINARY ANESTHESIA MACHINES**

Several anesthesia machines have entered the veterinary market over the last 5 years. Examples are those that are available from Anesco (SurgiVet, Waukesha, WI), Delmarva Laboratories (Midlothian, VA), and Hallowell Engineering and Manufacturing Corporation (Pittsfield, MA). Of particular interest are the newer machines for large animal use and innovative machines for small patients and laboratory animals.

Delmarva Laboratories produces a small animal anesthesia machine (Fig. 3), and Anesco promotes a full line of anesthesia machines and ventilators for both small animal (Fig. 4) and large animal patients. Anesco's large animal anesthesia machines are compact in design, and a large animal anesthesia machine and ventilator combination is avail-

![Figure 3. Delmarva Small Animal Anesthesia Machine. (Courtesy of Chuck Tracy, Delmarva Laboratories, Midlothian, VA.)](image)

![Figure 4. Anesco Small Animal Anesthesia Machine. (Courtesy of Jeff Baker, SurgiVet, Inc, Waukesha, WI.)](image)
Figure 5. Anesco Large Animal Anesthesia Machine and Ventilator. Two vaporizers, the circle breathing system, and the bellows of the ventilator are shown. The stacked inspiratory and expiratory breathing valves are shown in greater detail in Figure 6.

able (Fig. 5). A notable difference in the configuration of the circle breathing system of these machines compared with the large animal circle systems of other manufacturers is the “stacked” unidirectional valves (Fig. 6).

Special anesthesia machines for laboratory animal use have been developed to meet the need for simultaneous inhalant anesthesia in multiple small animals (e.g., rats) with one basic anesthesia machine and vaporizer. Laboratory animal personnel have developed homemade anesthetic apparatuses for this purpose, and commercial units are becoming available. The controllability of depth of anesthesia in multiple patients anesthetized simultaneously using only one vaporizer has been debated. Nevertheless, Anesco has developed a multistation (for two, four, or six animals) anesthesia delivery system (Fig. 7). The system is designed to allow control of depth of anesthesia in individual animals. The machine delivers a specific concentration of anesthetic in a specific carrier gas (oxygen) flow, with each station receiving at least 1 L of oxygen per minute. At each station, a separate flowmeter delivers oxygen to dilute the anesthetic concentration to the percentage necessary to provide the appropriate depth of anesthesia for each patient.

To provide an anesthetic machine-ventilator system for smaller pa-
tients, Hallowell has produced its "Anesthesia Work Station" (Fig. 8), which is described by the manufacturer as “a compact convenient system for use on animals under 7 kg.” The system can be used with a vaporizer for inhalant anesthesia or without a vaporizer as a ventilator for animals being maintained with injectable anesthetics. According to the manufacturer, the ventilator is capable of displacing a tidal volume of 0 to 100 mL, can produce respiratory rates of 4 to 80 breaths per minute, and has an adjustable high-pressure limit of 10 to 30 cm of water.

BREATHING SYSTEMS

Breathing systems for anesthetized veterinary patients have remained essentially unchanged with regard to essential components and basic structure. The circle breathing system is commonly used in veterinary anesthesia, and a traditional circle system includes a fresh gas inlet, a Y-piece, inspiratory and expiratory breathing hoses, inspiratory and expiratory one-way valves, a reservoir or breathing bag, a canister for carbon dioxide absorbent, and an overflow (“pop-off”) valve which can adapt to a waste gas scavenging system.

In recent years, some manufacturers of veterinary anesthesia machines have changed the approach to designing circle systems and have incorporated a “block” of material with appropriately machined channels and adapters for attachment of all components of a basic circle system in a rather compact manner (Figs. 3, 4 and 9).

Anesco incorporates unidirectional valves of the center-mounted
flap type into its small animal circle system (Fig. 10) instead of traditional dome valves with rigid discs. The flap valve contacts a valve seat oriented in a horizontal position as opposed to the vertical orientation of traditional dome valves. Flap valves of varying designs have been incorporated into the nonrebreathing valves used in manual resuscitators.\textsuperscript{3, 4} The flap valve is less expensive and appears to function well in circle systems for small animals.

Delmarva anesthesia machines for small animals include an overflow (pop-off) valve that is designed differently from those on most veterinary anesthesia machines. The pop-off valve can be opened and closed in the traditional manner, and the user has the option of closing the valve by pushing downward on a "plunger" which emerges from the top of the valve housing; releasing the plunger opens the valve automatically (Fig. 11). This design permits the operator to assist or control ventilation without continually having to open and close the valve.

The carbon dioxide absorbent canister varies in some of the anes-
sia machines. Variations in design can be seen in Figures 3 and 4. Some designs direct gases through the canister in only one direction (e.g., top to bottom), although others canisters are designed with two chambers and channel gases down one side of the canister and up through the other (see Fig. 10).

The Universa F® rebreathing circuit (King Systems, Noblesville, IN) (Fig. 12) is a relatively new option as a replacement for the standard Y-piece and corrugated inspiratory and expiratory breathing tubes of an adult or small animal circle system. The apparatus is a tube within a tube, with the inner (inspiratory) tube being 15 mm in diameter and the outer (expiratory) tube being 25 mm in diameter. The manufacturer indicates that the circuit can be used for patients weighing as much as 136 kg (300 lb).

"Nonrebreathing" systems continue to be used in veterinary anesthesia primarily for small patients. The body weight at which one should change from a circle breathing system to a nonrebreathing system remains controversial, with some authors recommending nonrebreathing systems only for extremely small patients (<3 kg), although others recommend the systems for patients weighing less than about 7 kg. The
Figure 9. Delmarva Small Animal Anesthesia Machine Diagram. The channels for the inhalation and exhalation sides of the circle breathing system are shown. On the diagram from left to right are the exhalation one-way valve, pop-off valve, inhalation one-way valve, pressure manometer, and two flowmeters. (Courtesy of Chuck Tracy, Delmarva Laboratories, Midlothian, VA.)

Figure 10. Anesco Unidirectional Valves on a small animal circle breathing system. The unidirectional valves are shown attached to the block of material used to support the canister for carbon dioxide absorbent.
Figure 11. Delmarva Pop-Off Valve. The pop-off valve is situated between the unidirectional valves on this small animal circle breathing system. The pop-off valve is closed by making the adjustment shown by the arrow. The pop-off valve can be closed temporarily by pressing down on the spring-loaded plunger. (Courtesy of Chuck Tracy, Delmarva Laboratories, Midlothian, VA.)

Figure 12. Universal F Circuit. This system that uses tube-in-a-tube design to replace conventional breathing tubes is shown with the connector for the endotracheal tube at the bottom of the photograph. The connector to the inspiratory unidirectional valve is at the top, with the connector (left, center) for the expiratory unidirectional valve on the end of the short piece of clear corrugated tubing.
primary arguments for nonrebreathing systems are a slight reduction in
dead space compared with an adult circle system’s Y-piece, a reduction
in the volume of gas that the animal must circulate through the breathing
system, and a decrease in resistance to ventilation based on the absence
of one-way valves and fewer contortions of the pathway for gas flow.
These considerations are more important for spontaneously breathing
patients than for patients maintained with controlled ventilation. Many
nonrebreathing systems are modifications of Ayre’s T-piece system (An­
esthesia Associates, Inc., San Marcos, CA), and Bain systems (Kendall
Co., Mansfield, MA) have become quite popular. Whether the system is
a Bain circuit or of another design, the development of disposable units
made of plastic materials provides a system that is lightweight and easy
to manipulate. These systems are designed for a single use in man;
veterinarians using these disposable systems multiple times should
avoid reusing contaminated systems and should be certain that the
system is intact and passes standard pre-use checkout procedures; these
checkout procedures have been described in detail.4-6

ANESTHESIA VENTILATORS

An anesthesia ventilator provides a mechanical method of applying
controlled ventilation (intermittent positive-pressure ventilation) to an
anesthetized patient; this gives the anesthetist an “extra pair of hands”
to ensure that ventilation is adequate to maintain arterial carbon dioxide
tensions (P\textsubscript{a}CO\textsubscript{2}) near 40 mm Hg. Most anesthesia ventilators are de­
dsigned as a bellows (bag) in a bellows housing; the bellows is attached
to the reservoir bag port of the circle breathing system, usually through
a piece of corrugated breathing tubing, thus allowing the bellows to
serve as a replacement for the reservoir bag. The bellows is compressed
by driving gas at a specified number of times per minute (respiratory
rate) and a specified rate of inflow (rate of inflow of gas determines the
inspiratory time for each breath). The ventilator’s controls allow the
selection of tidal volume, inspiratory pressure, respiratory rate, and ratio
of inspiratory time to expiratory time, with some variations depending
on the ventilator model.

Although there are exceptions, anesthesia ventilators are “double-
circuit” ventilators and comprise a patient circuit (including the gas
inside the bellows and breathing system, which is supplied from the
flowmeters of the anesthesia machine to meet the metabolic needs of the
patient) and a driving gas circuit (supplied from the ventilator to move
the bellows and control ventilation); gases from the two areas do not
mix with each other.6

Several anesthesia ventilators are discussed in this section. All anes­
thesia ventilators should be used with knowledge of the instructions and
guidelines provided by the manufacturer. Appropriate pre-use checkout
procedures should be performed for the ventilator, anesthesia machine,
and breathing machine before attaching these devices to a patient.

Anesthesia ventilators designed for man can be applied to veteri-
nary patients if those patients fall within the range of body size and weight for which the ventilator was intended. Veterinary anesthesia ventilators are sometimes designed to meet the needs of patients that are quite large (e.g., adult horses) or quite small (<5 kg). Ohmeda manufactures ventilators for human application; these ventilators are satisfactory for small animal patients, and some models have been described. The Ohmeda 7800 ventilator series allows the independent selection of both respiratory rate and tidal volume rather than selecting minute volume, which is a significant advantage for small patients. Both the Ohmeda 7000 and 7800 ventilators allow selection of two sizes of bellows to accommodate patients with smaller (0-300 mL) and larger (100-1600 mL) tidal volumes. The Ohmeda 7900 series of ventilators has been introduced recently and also appears to be applicable to veterinary patients.

Aneesco has produced ventilators for both large and small animals. The large animal ventilator (see Fig. 5) is designed for use with an appropriate large animal anesthesia breathing system. It is described as being pneumatically controlled, pneumatically powered, and time cycled. The bellows descends during expiration, and the bellows housing shows gradations of tidal volume from 4 to 15 L. The inspiratory-to-expiratory time ratio is variable. The ventilator has the following controls: on/off switch, tidal volume (hand wheel mechanism), breaths per minute (variable, from 0–100), inspiratory time, flow, and pressure.

Aneesco's small animal ventilator (Fig. 13), the SAV 2500 Small

![Image of Aneesco SAV 2500 Small Animal Ventilator](image_url)

**Figure 13.** Aneesco SAV 2500 Small Animal Ventilator. The controls from left to right are inspiratory flow, expiratory rate, inspiratory time, manual breath, and on-off switch. (Courtesy of Jeff Baker, SurgiVet, Inc, Waukesha, WI.)
Animal Anesthesia Ventilator, is electronically controlled, pneumatically powered (medical grade oxygen or medical grade air), and time cycled; it is intended for use with a small animal anesthesia breathing system. The bellows ascends during expiration, and the bellows housing shows gradations of tidal volume from 300 to 1500 mL. The ventilator has the following controls: on/off switch, breaths per minute (2–15), inspiratory time, inspiratory flow, manual breath button, pneumatic manual breath (for use in case of electrical failure), and safety pressure relief valve.

Hallowell has developed anesthesia ventilators that are applicable to patients of variable size and body weight, and the Hallowell EMC Model 2000 (Fig. 14) has been described previously. The Hallowell EMC Anesthesia Work Station (see Fig. 8), which includes a ventilator, is described above in the section on veterinary anesthesia machines.

Mallard Medical (Redding, CA) manufactures ventilators that are appropriate for both large and small animals; the Mallard Medical Rachel Model 2800 Large Animal Anesthesia Ventilator and Mallard 2800V Small Animal Anesthesia Ventilator have been described elsewhere. The Mallard Model 2800B Large Animal Anesthesia Ventilator System (ascending bellows; Fig. 15) and Model 2500 Large Animal Anesthesia Ventilator System (descending bellows; Fig. 16) provide options for complete units for inhalant anesthesia and controlled ventilation in large animals. A pediatric bellows is available for adaptation to Model 2800B, which allows the ventilation of smaller patients such as foals and calves (see Fig. 15).
Figure 15. Mallard Medical 2800B Large Animal Anesthesia Ventilator System. This particular anesthesia-ventilator system is configured with an optional pediatric bellows assembly (upper left), one vaporizer, a large animal circle breathing system, and a large animal bellows assembly. Note that the bellows are designed to ascend during expiration. (Courtesy of Robert Pearson, Mallard Medical, Inc, Redding, CA.)

ENDOTRACHEAL TUBES, MASKS, AND CLOSED CONTAINERS

Endotracheal tubes should be used in essentially all veterinary patients that are to be maintained under anesthesia with inhalant anesthetics. Murphy-style and Cole-style endotracheal tubes are commonly used. A properly selected and placed endotracheal tube with a correctly inflated cuff provides a patent airway, allows application of assisted or controlled ventilation, and helps to prevent contamination of the workplace with inhalant anesthetic gases.

A variety of commercially available endotracheal tubes are useful in veterinary patients. Endotracheal tubes designed for man perform well in most smaller veterinary patients (e.g., dogs, cats, and patients of similar size), and human endotracheal tubes with high-volume low-pressure cuffs are produced in sizes ranging between 3 and 10 mm internal diameter. Smaller uncuffed tubes can be purchased in both Murphy and Cole styles. Cuffed Murphy-type endotracheal tubes de-
Figure 16. Mallard Medical 2500 Large Animal Anesthesia Ventilator System. Positioned from top to bottom on the machine are the ventilator controls, an oxygen flowmeter and two vaporizers, the large animal circle breathing system, and the bellows and bellows housing. Note that the bellows is designed to descend during expiration. (Courtesy of Robert Pearson, Mallard Medical, Inc, Redding, CA.)

Specially designed endotracheal tubes are available in styles intended for both human and veterinary use. Armored tubes contain helical plastic or wire within the walls to prevent collapse of the lumen when the tube is bent, and such tubes are indicated for procedures that require the patient’s head and neck to be maintained in flexion. Other types of endotracheal tubes, including double-lumen tubes for bronchial intubation, are common in human anesthesia and may be applicable to special procedures in veterinary anesthesia.
Face masks are used to facilitate administration of oxygen and inhalant anesthetics to veterinary patients, and they are usually used with a relatively high inflow of fresh gases (commonly 2–5 L/min in small animal patients) to promote oxygenation and induction and to minimize dead space in the mask by diluting exhaled carbon dioxide. A face mask is attached to a breathing system (e.g., the Y-piece of a circle system or the patient end of a Bain system), which provides a reservoir of gases to meet the patient’s tidal and minute volume demands and provides for attachment to a scavenging system for removal of excess gases. Masks should fit snugly to prevent unnecessary contamination of the workplace with waste anesthetic gases; nevertheless, some escape of gas into the environment is inevitable, and masking procedures should be performed in well-ventilated areas. A clear mask with the diaphragm containing a hole to accept the patient’s muzzle allows a good fit in most veterinary patients. Such masks are made and distributed by a number of commercial companies.

Closed containers (induction chambers) are also useful for induction and oxygenation in small veterinary patients, especially those small patients that may be difficult to restrain for intravenous inductions. Such inductions are usually performed with relatively high flows of fresh gases as is the case with masking procedures, and some contamination of the working environment occurs whenever the animal is removed from the container. Inhalant inductions with closed containers are best performed in a fume hood, or at least in a well-ventilated room with a high rate of air exchange. Closed containers are available from several manufacturers and distributors. Clear break-resistant containers with tightly fitting lids with ports for the entry of fresh gases and exit of excess gases into a scavenger system are desirable.

CONCLUSIONS

New developments and improvements in veterinary anesthesia equipment help to increase the quality of care that veterinarians can provide to their patients. The use of anesthesia machines, vaporizers, breathing systems, ventilators, and ancillary anesthetic equipment is essential in the administration of inhalant anesthetics. The equipment should be used responsibly, however, and veterinarians should remain current in their knowledge about the use of such equipment.

References


Address reprint requests to
Sandee M. Hartsfield, DVM
Department of Veterinary Small Animal Medicine
Texas A&M University
College Station, TX 77843-4474