VIII. CATS

A. INTRODUCTION

1. General Characteristics

The domestic cat (*Felis catus*) is a small member of the genus *Felis* which, in common with the other members of that group, is both carnivorous and predatory.

Cats are fast moving over short distances, with well developed capabilities for climbing and leaping; however, they are by inclination sedentary and do not need extensive or regular exercise to maintain good health.

The cat has managed, through several thousand years of close cohabitation with humans, to maintain its strongly territorial, independent and essentially asocial nature. Although valued as companion animals and for their usefulness in mouse control, cats have not been consistently subjected to selective breeding or intensive domestication and, as a consequence, have managed to preserve their preference for being alone or, at most, for operating in small, very loosely knit groups.

The social order establishment amongst cats is rudimentary and communications are poorly developed, being limited essentially to body posture warnings to others to stay away (Beaver, 1981). Because of this lack of a social hierarchy requirement, cats can generally be housed together without difficulty, provided provision is made for sufficient places and space for them to exercise the option of getting away from each other.

2. Research Uses

Cats have been very widely used in acute experiments in the neurological sciences, particularly in the areas of impulse transmission, perception and the mechanisms involved in the reaction of various body systems to exposure to chemical stimuli (drugs, pollutants, etc.). They have also been extensively employed in long-term behavioral and neurological research. The value of cats as models for these sorts of physiological experiments is, in part, also a reflection of their ability to withstand prolonged anesthesia and the fact that they appear to be physiologically more akin to man than the standard laboratory rabbits and rodents. Their usefulness has been further enhanced because of the extensive biomedical and behavioral research data that have accumulated from past studies on the domestic cat, much of which has been compiled and cross-indexed (Berman, 1976).

B. THE CAT COLONY

1. Procurement and Initial Examination

Cats should always be procured from reputable and, where legally required, licensed dealers and suppliers. Most of the cats used in research are random bred animals, often strays obtained from pounds.

The use of specific pathogen free (SPF) cats, bred specifically for research purposes and, therefore, of known pedigree, quality, age, etc., is becoming increasingly common (Povey, 1979; Bruhin, 1980). This trend has much to commend it, even though the animals are more expensive and sources of supply are still somewhat limited (ILAR, 1979).

Regardless of source, the preferred cat for most research purposes will be one that is overtly healthy, short haired, originating from a farm or rural area and, if possible, previously vaccinated against panleukopenia.

Upon delivery, an immediate, thorough examination should be carried out by a veterinarian, animal technician or other similarly competent and trained person. Only cats that are apparently healthy should be accepted for research purposes. Senile, vicious, pregnant, lactating, unweaned, obviously sick or maimed animals should automatically be rejected before admittance to the colony area.

The initial examination should include a scrutiny of the animal's general appearance, taking particular note of the skin, coat, eyes, oral cavity and other body openings. An estimate of the nutritional state of each animal should also be made at this point and taken into account.

Healthy cats destined for acute experiments may, if for immediate use, be transferred directly to the laboratory following initial examination; however, all others should undergo a period of quarantine and conditioning.

Care should be taken to obtain as much information as may be available on the sources from which random cats may have been derived. This is of particular importance where a cat appears to be in good condition and of a particular breed (Siamese, etc.); occasionally, such animals may prove to be stray pets. Animals of this sort should never be assigned to acute experiments, but should be held for conditioning. If they are lost pets, this will provide an opportunity for identification and retrieval by their owners.

2. **Quarantine**

Cats should be separately caged during quarantine to avoid territorial dominance behavior, with its consequent stress on those of inferior status.

All animals must be properly identified and individual records maintained.

Quarantine areas should be thoroughly washed and disinfected before a new group of cats is admitted.

A quarantine period of at least 10 days and preferably four weeks should be established, during which time the animals are treated for any obvious minor infections and ailments. These will include treatment of some of the respiratory infections, providing they have not become too severe. If a severe respiratory condition is present the animal should not have been accepted, and should be euthanized.

Incoming cats should be vaccinated against feline panleukopenia and feline respiratory complex (*rhinotracheitis*, *calicivirus*, etc.). Vaccination against rabies is not necessary in most situations, but may be considered for cats that are to be housed communally over extended periods in open colonies (ones to which additions may be made).

All animals should be examined on arrival for both internal and external parasites. External parasites may be treated by dusting with a suitable insecticidal powder; aerosol sprays should be avoided. Detailed screening for dermatomycosis ("ringworm") is essential, as it is of fairly frequent occurrence and its signs are not necessarily obvious in the cat. Ringworm constitutes a zoonotic risk to human handlers as well as to other animals in the facility, particularly where group housing is to be practised.

During the quarantine period, daily observations on each animal are essential, to make sure that all cats are alert and healthy. Any deviations from the expected normal in eliminating, eating and drinking should be noted by the attendant and immediately reported to the appropriate supervisory or veterinary authority.

Where indicated, the prophylactic treatment of an intake group with broad spectrum antibiotics may head off the onset of infections associated with the stresses of transportation confinement, etc.

Cats should be quarantined in segregated groups until overtly clear from disease. New cats should not be introduced into an existing quarantine group. Respiratory diseases are enzootic in cat populations; consequently, the introduction of new animals into established groups and the moving of animals between groups should be avoided.

3. **Conditioning**

During the conditioning period, cats should be fed a nutritious diet, including a vitamin supplement, since the nutritional state of the animal, in most cases, will be unknown. Random cats may have been vitamin deficient for some time and standard commercial diets often do not contain sufficient vitamin levels to make up and overcome these deficiencies quickly.

Frequent observations and handling are important during this period. Further physical examinations, including follow-up fecal examinations, should be carried out prior to the animal being assigned to an experiment.

The conditioning period should be of sufficient duration to allow the cats to adjust to the caging arrangements under which they will subsequently be kept. If this is to be group housing, then they should be set up and conditioned as a group (see below under Housing: Group Pens).

Conditioning will, in fact, start during the period of quarantine and the two procedures may be undertaken concurrently, particularly if cage housing is to be used throughout and if no sickness develops during quarantine.

4. **Breeding**

Cats are seasonally polyestrous, with cycles occurring in late winter through spring, summer and into the fall, followed by anestrus which usually lasts from two to three months. The breeding season can be prolonged over the 12 month period by providing 12 to 14 hours of artificial light each day. Estrus will usually last four to six days, during which time the tom will be accepted; this period may, however, extend over eight or more days if no male is present. Estrus will recur following a variable 10 to 15 day interval, giving rise to an irregular 14 to 21 day cycle. Ovulation usually occurs about 25 to 27 hours after copulation. Cats do not ovulate spontaneously and, in the absence of coitus, the queen's cycle is an ovular and, therefore, lacks a luteal phase (Lofstedt, 1982). Stages of the cycle can be determined by vaginal smear, and the onset of estrus by estrogen-dependent behavior.

Fertilization normally occurs during the first half of the second day after mating, with implantation about 12 to 14 days later. Gestation lasts 59 to 65 days.

Pseudopregnancy will invariably follow sterile matings and will last about six weeks.

Feline breeding systems, reproduction and the rearing of kittens under laboratory conditions have been the subject of detailed reviews (Lofstedt, 1982; Scott, 1976). A breeding colony consisting of from five to 15 females to one male will generally prove to be satisfactory. Some breeders have found that two to three males can be group housed with 12 to 15 females; fighting rarely occurs, but the dominant male will be responsible for about 90% of the matings. In either situation overcrowding must be avoided.

In order to avoid aggression, irritability and the unpleasantness of excessive urine marking, as well as to conserve on the number of males that need to be kept, it is often preferred to keep the tom(s) completely separate. If this is done, a good tom (only about one in three will be a vigorous breeder) can serve as many as 20 queens. Each tom must be allowed his own breeding territory, with which he is familiar and which he can mark. The tom should be placed in his breeding territory first, before the queen, in estrus, is brought to him (Beaver, 1981; Michael, 1961).

C. **HOUSING**

1. **Cages**

All caging should be comfortable, clean and secure. Individual cages must be large enough to provide for normal posturing, allowing the cat the opportunity to stretch fully both horizontally and vertically. Resting boards are necessary, particularly where wire mesh floors are utilized in the cage. Scratching posts or boards should be supplied. Cats, being somewhat fastidious in their habits, should be provided with a litter box which should be located as remotely from the resting area as possible. Cats appear to become psychologically stressed if forced to sit amongst their own excrements.

An aggressive interaction will sometimes occur between cats housed in adjacent cages, as well as among group housed animals. In either case, the subordinate cat will feel continually threatened and stressed. Relief can be provided by placing a box or even a paper bag in the cage or pen to provide a dark hiding place (Beaver, 1981).

2. **Group Housing**

Territorial defence is strong in cats and has been modified only slightly by domestication; therefore, some care should be taken when establishing group pens to watch out for subjugation, fighting and rejection of members. These problems can be minimized by providing at least three to four square feet per cat. This affords the individual with the opportunity to identify with its own private "mini territory". Nesting boxes, benches, shelves and cat trees are essential for a peaceful, healthy coexistence. The resting boards should be placed at varying heights or incorporated in an artificial tree. There should be at least one shelf or perch per cat. There should be adequate numbers of sanitary (litter) boxes (AWI, 1979). Once established, group housing appears to suit this species very well indeed.

3. **Environment**

Cat holding room temperatures are usually maintained at from 20 to 22 C, although cooler temperatures are well-tolerated to 15^{o}C or less, provided the level is fairly constant. Ventilation that provides approximately 15 air changes per hour is usually adequate, and humidity should be maintained to 40 to 65%. Humidity and ventilation control are especially important because cats are so prone to respiratory disorders. Lighting should be readily adjustable to provide a proper ratio of light to darkness, particularly in the breeding colony, as anestrus in this species can be controlled by varying the light to darkness ratios.

D. **NUTRITION**

1. **Feeding**

Cats will do well on most commercial semi moist or dry pelleted cat foods, but are fussy feeders, sensitive to aroma, noise, strange surroundings and, particularly, to palatability. Cats will, in fact, often starve rather than eat a food they do not like, regardless of nutritional value. Most cats will take to a dry food more readily if it is lightly sprayed with water just prior to presentation. In practice it is probably advisable to use mixtures of different types and brands of commercial cat foods to assure a complete and balanced diet, always paying close attention to label claims (Kronfeld, 1983).

Cats normally eat small amounts frequently and they will, therefore, benefit from free access to their food. The healthy cat will have extensive reserves of body fat and so can withstand considerable periods of food deprivation.

Kittens require a high protein diet providing from 200 to 250 kcal/kg body weight daily. Adults also have high and rather unique protein requirements (see below) and require approximately 80 kcal/kg body weight daily (Scott,

1976). Dietary deficiencies are particularly insidious in the cat and, therefore, great care should be taken to feed a proper diet and to ensure that each animal in the group is eating. Cats must always have access to clean, uncontaminated drinking water, which should be supplied in a non-spill bowl, as it is difficult to train cats to use automatic watering devices.

Cats do not need milk and, in fact, will often have loose bowel movements if milk is incorporated in their diet.

2. Nutrient Requirements

Compared to other domestic species, knowledge and understanding of the nutritional requirements of cats have been slow to develop. Much of the information that has been accumulated through the years has been summarized to 1978 and published by the U.S. National Research Council (U.S. NRC, 1978). Recent advances in our understanding of nutrition and feeding in cats have also been reviewed and should be consulted (Kronfeld, 1983; Brewer, 1982).

Cats have been considered to have a dietary protein requirement of around 30% (U.S. NRC, 1978). This is, in part, a matter of palatability and thus the protein requirement may be reduced to 20-25% when concentrated on the outside of pelleted dry food (Kronfeld, 1983). It has also been reported that kittens will do well on a 15% protein ration, if the correct quality and amino acid balance is provided (Anderson, Baker, Sherry *et al.* 1980). In this regard, taurine and arginine appear to be essential amino acids for Felidae, with a deficiency of the former giving rise to a degenerative retinopathy and the latter to a fatal ammonia toxicity (Kronfeld, 1983; Brewer, 1982; Anderson, Baker, Sherry *et al.* 1980).

Another dietary peculiarity of the cat is its remarkable capacity to tolerate and utilize fats. Indeed, fat and protein are a cat's main energy sources and, in the wild state, they obtain most of their carbohydrates by conversion from these sources. Fat, like protein, is essential to palatability. Requirements for fat, as with protein, will vary with concentration and distribution from 4%, if on the surface, to 20%, when mixed throughout the dry food pellets (Kronfeld, 1983). A cat can consume up to 30 gm of fat daily without apparent ill effects. While finding high fat diets the most palatable, cats are nevertheless extremely sensitive to even small traces of rancidity. This may explain their rejection of some commercial foods even though they appear to contain adequate amounts of fat.

The vitamin content of the diet should be carefully assessed, as thiamine deficiencies in cats receiving commercial cat food have been reported (Baggs, deLahunta and Averill, 1978; Loew, Martin and Dunlop, 1970). The cat appears to be one of the few animals that is unable to utilize beta-carotene as a source of Vitamin A, and in which the breakdown of tryptophane is so rapid that it precludes its use for the synthesis of niacin. Consequently, rations formulated as being complete for dogs, do not necessarily meet the vitamin requirements of the cat. Liver, which is rich in both these vitamins will, if included in the diet, prevent these deficiencies from occurring.

Cats require exceptionally high levels of dietary iodine which, unfortunately, are not present in unsupplemented meat. They are also seemingly sensitive to excesses of magnesium, an element that has been associated, along with dry food and excessive fecal water excretion, with the development of the urinary calculi, cystitis and urethritis that make up the so-called feline urological syndrome (Scott, 1976; Jackson and Tovey, 1977).

E. RESTRAINT

1. Handling

Cats are naturally nervous, cautious animals, suspicious of strange people and strange surroundings. They will, however, usually respond to a quiet, gentle approach by people who like cats. They are particularly sensitive to changes in routine and environment and, if changes are necessary, sufficient time should be allowed for the cat to adjust prior to involving it in further studies.

Care should always be taken in picking up a cat. Difficulty will rarely be experienced if the animal is handled in a firm, competent, but gentle way. One should always speak to a cat as one approaches it to pick it up.

2. Physical Restraint

Occasionally, a cat may be quite difficult to handle and fail to respond to gentleness. Such an animal can usually be restrained by spreading a large towel or blanket over it and then picking it up. Cats that prove to be constantly intractable may be housed in primate squeeze cages and tranquillized with ketamine prior to being picked up (see below). Cats of this temperament, however, should either have been rejected at the time of initial examination, or designated for use on an acute, terminal experiment.

Canvas restraint bags are available and may, on occasion, prove useful in handling cats in the laboratory.

3. Chemical Restraint

Cats often resent physical restraint and may prove to be extremely difficult to handle unless a tranquillizer or sedative is administered. If it seems impossible to handle an animal without undue stress and risk, the use of temporary physical restraint by means of a canvas bag or rolling the animal up in a towel will allow time for the injection of a sedative. Ketamine hydrochloride at a dosage of 10-20 mg/kg body weight, i.m., will produce a state of sedation which should last approximately 30 minutes. The margin of safety with this is very wide, and a rough approximation of the animal's weight will suffice. Additional means of restraining and tranquillizing cats are described in the literature (Scott, 1976; Green, 1979).

F. ANESTHESIA

1. General Precautions

The induction of anesthesia in cats may present problems in some animals and can only be accomplished with safety and assurance when proper preliminary precautions have been taken. Prior to administering a general anesthetic to members of this species for the first time, the investigator should consult the detailed information on feline anesthesia available in the veterinary literature (Green, 1979; Lumb and Jones, 1973; Sawyer, 1982).

Several very satisfactory anesthetic agents are available for use in cats; however, the anesthetic of choice should usually be the one with which the operator is most familiar; if in doubt, expert veterinary advice should be sought.

Only normal, healthy animals, free of any respiratory disorders, should be subjected to general anesthesia. Particular attention should be paid to the cardiopulmonary systems at the pre-induction examination.

The animal should be carefully monitored, not only during the induction, but also throughout the anesthetic and recovery periods. Particular attention should be paid to the rate and depth of respirations and to the various reflexes that give an indication of the level of anesthesia attained (Green, 1979).

Temperature should be monitored, as there is a real risk of hypothermia occurring in this species, which should not be overlooked. It may prove advisable, particularly during prolonged periods of anesthesia, to routinely utilize a preventive measure to counteract potential hypothermia. Heat lamps, heating trays and incubator-anesthetic chambers have all proven effective for this purpose, although care must be taken to avoid burns from the use of heating pads (Fulton, Boatfield and Clifford, 1981).

The maintenance of a proper fluid balance is also of concern and, in some cases, intravenous fluid may need to be given, particularly if the anesthetic period is of long duration.

2. Preanesthesia Procedures

Prior to the induction of anesthesia, the animal should be fasted for a minimum of 12 hours; however, access to water is permissible during this period.

Care must be taken to properly restrain the animal in order to administer the preanesthetic, as well as the anesthetic agents. Gentle persuasion is by far the method of choice for this; however, cats that are difficult to handle may need to be more forcibly restrained (see under Physical Restraint above).

Inhalation anesthetic techniques usually require endotracheal intubation. This procedure may present some difficulty in the cat due to its small larynx and

tendency to laryngospasm. These problems can be minimized by a prior injection of atropine, as well as by spraying the larynx with a 2% lidocaine solution, prior to passing the tube. A laryngoscope may need to be utilized; however with practice the tube can be readily passed when the larynx is elevated by external pressure. The mouth may be held open by means of a gag, and a plastic stiffener (or stilette) should be retained in the tube during passage. The tube should be held in position either by tying with a tape around the head or by taping to the mandible.

Preanesthetic therapy, consisting of atropine at a dosage of 0.04 mg/kg s.c., is generally but not universally recommended. This should be administered 30 to 40 minutes before induction if given s.c., and 5-10 minutes in advance if given i.m. or i.v. (doses 0.02 and 0.01 mg/kg respectively). Use of atropine is strongly recommended as an anticholinergic when narcotics or xylazine are to be used and if intubation is to be undertaken.

Acepromazine is a useful preanesthetic tranquillizing agent at 0.5 mg/kg i.m. approximately 10 minutes prior to anesthesia. It should be noted, however, that when using preparations such as acepromazine or ketamine the length of anesthesia is prolonged and, therefore, the dosage level of the general anesthetic agent should be lessened.

3. **Inhalation Anesthesia**

The use of a mask for administering a volatile anesthetic, with or without prior use of a chamber for induction, will generally prove to be quite satisfactory. However, the open drop technique should, if possible, be avoided as difficulties in induction are often encountered due to hypoxia, hypercardia and the cat's ability to withhold breathing for considerable periods of time. Endotracheal intubation is generally recommended and the tube, having been introduced as already described (Preanesthesia Procedures), can be connected to an anesthetic machine which delivers the anesthetic agent in an oxygen or a 1:1 nitrous oxide: oxygen mixture.

Inhalation drugs, such as halothane, may be administered in a concentration of approximately 3-4% with oxygen for induction and then at a concentration of 1 to 1.5% for maintenance. Methoxyflurane has characteristics which are comparable both to halothane and to diethylether, as well as having greater analgesic properties than halothane. Concentrations of 1 to 3% are necessary for induction with this preparation; however, because of its low vapour tension, induction is slow. For this reason, anesthesia is frequently induced initially with an ultra-short-acting barbiturate and then maintained with methoxyflurane.

Ether is still a widely used general anesthetic in animals, and is considered a very safe agent in experienced hands; however, induction and recovery time is longer than with either of the preceding two preparations. In addition, the risks of using so highly flammable and explosive a preparation within the laboratory renders its use questionable. Ether causes profuse salivation in cats, particularly during the induction period; thus, atropine pretreatment is advisable.

4. Injectable Anesthetics

When administering an anesthetic by the intravenous route, the cephalic vein on the foreleg is the most convenient vessel to use. The jugular vein may also be used for this purpose in cats, provided the animal has been suitably sedated. The saphenous and femoral veins are also readily entered and suitable for the placement of indwelling catheters.

A 1.25% solution of thiapentone or 2% solution thiamylal are satisfactory agents for induction. Approximately half of the full dosage of 10-15 mg/kg can be injected initially and fairly rapidly, with the remainder being given slowly to effect. A period of light surgical anesthesia, lasting approximately five to ten minutes, is produced, which can then be maintained by further injections of the same preparations or by use of an inhalation anesthetic.

Ketamine produces a very useful, though rather unusual, anesthetic state in cats which is particularly valuable in the performance of a variety of painful minor surgical and diagnostic procedures (Sawyer, 1982). The level of insensitivity attained is dose dependent (usual range 15-30 mg/kg, i.m.). Effects are evident within one to ten minutes and anesthesia will last 30 to 45 minutes. Anesthesia may be prolonged and/or deepened by additional injections. The RBC, Hb, and PCV values fall dramatically following the preanesthetic use of ketamine (Frankel and Hawkey, 1980), and this should be taken into account when hematological data are derived from blood samples taken during ketamine sedation or anesthesia.

Ketamine should not be used as the sole anesthetic agent in intra-abdominal or intrathoracic surgery as its analgesic effect probably fails to block visceral pain (Sawyer, 1982).

Other injectable anesthetic agents, with their recommended dosages and routes of administration, have been listed in the appendices of Volume 1 of this Guide and are discussed in the references cited here (Green, 1979; Lumb and Jones, 1973; Sawyer, 19892; Fulton, Boatfield and Clifford, 1981).

5. Recovery

Recovery should be in a quiet, warm environment and carefully monitored. An area specifically designated and suitably equipped for this purpose should be used.

If an intratracheal tube has been utilized, it should be left in place until the swallowing reflex has returned.

It is essential that the animal be kept warm and that its body fluid needs be met.

Recovery from pentobarbital anesthesia will often be accompanied by more or less convulsive movements and the time involved will be variable and often long. Excessive shivering during recovery should be counteracted by supplementary heat and, if cyanosis is present, supplementary O2.

G. HEALTH CARE

1. General Considerations

The maintenance of a healthy cat colony, as with all animal care matters, is primarily dependent upon conscientious observations and prompt reporting by the attending personnel of any deviations from normal in the animals' behavior. The normal, healthy cat will soon establish a rapport with its attendants, particularly if those persons are fond of cats.

An animal's general behavior and condition can best be assessed at feeding time. As with most animals, a change in a cat's health status may most often be noticed first in the eyes, which take on a lacklustre appearance. This, particularly if combined with a disinterested approach to its food, indicates that a more thorough examination must be undertaken.

Ocular or nasal discharges are early signs of illness, particularly systemic infections, in this species.

Excessive salivation is an early sign of disorders of the mouth and teeth.

Cats are particularly sensitive to the organo-phosphate and chlorinated hydrocarbon classes of insecticides. These are frequently used against the external parasites of dogs, but are not generally recommended for felines. Carbamates and pyrethrins are safe to use even on kittens, for control of ectoparasites. Carbamates or malathion (53%) can be used effectively on cats over three months of age (Fadok, 1981).

2. Control of Viral Disease

Control of feline viral infections, particularly those of the respiratory complex and panleukopenia is essential for the successful maintenance of the laboratory cat colony. The degree of freedom enjoyed from these diseases will depend on the source of the cats, effectiveness of quarantine, adequacy of conditioning and the quality of the basic animal care, as well as on prophylactic immunization. Regular, complete health assessments and re-vaccination should be carried out on those animals being held over long periods.

Definitive clinical diagnosis of the viral diseases of cats is extremely difficult and usually requires the support of a clinical pathology laboratory. Cats exhibiting any of symptoms of the specific diseases described below should receive immediate, proper, veterinary attention. There is urgency that respiratory disease be recognized promptly, and that a diagnosis be established as quickly as possible, if serious outbreaks are to be arrested before they spread and devastate the colony.

H. DISEASE CONTROL

Diseases of the respiratory, hemolymphatic and urinary systems are discussed in the following section at some length. The objective is to alert investigators and animal care personnel to the seriousness of these conditions, to facilitate their recognition and to emphasize the importance of prophylaxis. It is not intended to provide a manual on diseases of the laboratory cat. No research cat colony should be maintained without involving the active participation of a veterinary consultant with expertise in feline medicine and surgery. To attempt to do so is to invite justifiable criticism and to court eventual disaster.

1. Respiratory Diseases

The complex of respiratory diseases affecting cats include: feline viral rhinotracheitis (FVR), feline caliciviral disease (FCD) and a pneumonitis caused by *Chlamydia psittaci*.

FVR is the most important single factor in infectious upper respiratory disease (URD) of the cat and, together with FCD, is responsible for over 80% of the respiratory disease outbreaks. URD can occur in any age group, with younger cats experiencing higher morbidity and mortality (Ford, 1979).

The viruses of all these diseases are readily transmitted by direct contact with oral, nasal or ocular discharges. They may also be indirectly transmitted on the hands and clothing of handlers or by contaminated utensils. Airborne transmission of natural aerosols of these viruses may occur over short distances.

Signs of a developing acute respiratory infection in the cat will include an intermittently elevated body temperature (fever), sneezing, conjunctivitis, lacrimation and possible conjunctival edema (chemosis) in either one or both eyes. The ocular and nasal discharges will soon become purulent due to secondary bacterial infection. Later, as the upper air passages become clogged, oral breathing will develop and ulceration of the tongue and palate may occur, accompanied by excessive salivation and anorexia.

The justification and effectiveness of treatment of these diseases in most laboratory colony situations is questionable, as recovery does not necessarily confer immunity and recovered animals, although asymptomatic, become chronic virus carriers (Ford, 1979; Gaskell and Wardley, 1978).

Vaccination is effective in reducing the incidence and severity of the disease on a long-term basis (Pickering, 1981). Other prophylactic measures that may be practical, along with vaccination and good management, in helping to reduce virus concentrations in the colony environment, flare-ups and transmission, are:

a. Minimizing population density; maximizing ventilation (above 12 changes/hour).

b. Providing segregated caging (prevent direct contact).

c. Providing separate kittening accommodation.

d. Weaning early (five to six weeks).

e. Ensuring that those handling the cats and their utensils use and disinfect gloves between cages.

2. **Hemolymphatic System Diseases**

a. **Feline Panleukopenia (FPL)**

FPL is a highly infectious and ubiquitous disease characterized by a panleukopenia and a destructive enteritis. The FPL virus is very stable, can survive outside a cat for as long as one year, and exhibits a remarkable resistance to heat and disinfectants.

Clinical signs of the disease include: profound dullness, an initial high fever which later becomes subnormal, rapid dehydration with vomiting, anorexia, diarrhea, and an apparent thirst, but refusal to drink.

Panleukopenia in laboratory cats is not usually treated, as this necessitates intensive, continuous nursing and, even then, the chances of full recovery are not good. Prevention of outbreaks through vaccination has proven quite successful. Combined vaccines against FVR, FCD and FPL are available commercially and have been shown to be efficacious (Povey, 1979).

Disinfection of premises, following a panleukopenia outbreak, should be by formaldehyde gas. This may be generated by adding a tablespoon of potassium permanganate to 250 ml of formalin. Fumigation should be followed, after 12 hours, by thorough ventilation and washing. It is essential to ensure that the room is completely sealed before this procedure is undertaken (Scott, 1980).

b. **Feline leukemia**

The disease is caused by a rather labile virus that can survive in the environment for only one or two days, can withstand freezing, but is sensitive to detergents and formaldehyde. Transmission is by direct contact and possibly transplacentally to the fetus. The incidence of feline leukemia virus in pound-source cats in the USA has been reported to be nearly 5% (Ladiges, Digiacomo, Wardrop *et al.* 1981).

The leukemogenic virus has been implicated in the occurrence of both proliferative disease (lymphosarcoma, leukemia) and non-proliferative conditions in cats (anemia, immunosuppression, thymic atrophy in kittens, etc.) (Ladiges, Digiacomo, Wardrop *et al.* 1981; Colter, Hardy and Essex, 1975).

Signs of the infection are nonspecific, involving the gradual onset of a depressive illness with inappetence, loss of condition and pale mucous membranes. Since the virus can suppress the normal immune response,

other diseases, such as respiratory infection and infectious anemia, will often be present concurrently.

Treatment of this, as of all leukemias, is very discouraging and euthanasia is advised.

c. **Feline Infectious Peritonitis**

This chronic, progressive disease is associated with fever, emaciation, abdominal exudations and the growth of granulomas in various organs. It is caused by a very labile, pleomorphic coronavirus and occurs most frequently in cats under two years old, following incubation periods of UD to four months.

Clinical signs will vary with granuloma sites, but usually involve abdominal enlargement, inappetence, depression, wasting, and a fever that is unresponsive to antibiotics. A high proportion of infected cats will show no apparent illness (sub-clinical) and will not develop the granulomatous disease, but will remain as persistent asymptomatic virus carriers.

The condition is usually fatal within a few weeks in those animals in which a serositis or polygranulomatous reaction occurs. Treatment is not rewarding and euthanasia is advised (Weiss, 1978).

3. **Feline Urological Syndrome (FUS)**

This syndrome is of a complex and so far unresolved etiology, although undoubtedly associated with diet. Signs include hematuria, dysuria, anuria, straining to urinate, enlarged bladder and an increased frequency of urination attempts with only small amounts of urine being passed. Crystalline deposits ("sand") are often present in the urethra and bladder, causing obstruction, particularly in mature male cats. The seeming increase in the incidence of FUS has been associated with high levels of dietary magnesium and increased fecal water excretion, both of which may be, in part at least, attributable to a diet of dry food (Bernard, 1978; Ryan, 1981).

The "sand" is a mixture of struvite calculi (magnesium, ammonium, phosphate, hexahydrate, crystals) with desquamated cystic epithelial cells and leukocytes (Kronfeld, 1980).

Treatment is by immediate relief of the distended bladder, either by mechanical or surgical means. The problem is often repetitive, although the association with dietary magnesium and dry feed is less clear in recurrences than in initial attacks (Ryan, 1981; Kronfeld, 1980). Treatment of laboratory cats is not recommended unless a key experimental animal is involved.

I. SPECIAL CONSIDERATIONS

1. Specimen Collection

a. Blood

Veins suitable for venipuncture have been noted under Injectable Anesthesia. The site over the vein should be clipped, shaved, and disinfected. If the cat has not been tranquillized, and precise hemotology values are required, the use of electric clippers should be avoided as they may frighten the cat enough to distort the blood values obtained (Frankel and Hawkey, 1980).

b. Urine

Catheters are extremely difficult to pass in the cat. Urine may be collected by gentle pressure over the bladder if the cat is tranquil enough or has been sedated. More extensive urine samples may be collected by placing the cat in a metabolism cage.

2. Zoonoses

Cats are not normally afflicted by any of the infectious diseases of man and similarly they do not pose a serious zoonotic hazard. Rural cats in particular may, on rare occasions, contract rabies.

A few cases of plague (*Yersina pestis*) have been recently reported to have been transmitted by cats, probably by fleas, in the USA, Mexico and S. Africa (Kaufman, Mann and Gardiner, 1981).

The bite or scratch of cats has been implicated in a condition of humans referred to as Cat Scratch Disease which, in susceptible individuals, may cause a severe local inflammatory infection, with regional lymphadenitis and occasionally encephalopathy. In view of the above, cat scratches and bites should always receive immediate first aid attention.

Another potential zoonotic hazard associated with cats involves FLV (and the dependent feline sarcoma virus) which causes tumours experimentally in a number of vertebrate species and has been shown to transform human cells in culture (Hardy, 1981; Hardy, 1981).

An antibiotic resistant strain of salmonella, the incidence of which in random source cats in the USA has recently been repotted to be greater than 10% poses a risk to both the other laboratory animals and handlers (Beacage and Fox, 1979).

J. **EUTHANASIA**

Intravenous barbiturate overdose is probably the method of choice for feline euthanasia; however, overdose of any acceptable anesthetic agent is satisfactory.

The intravenous administration of T-61 is also very satisfactory for feline euthanasia, provided it is injected slowly; rapid injection can cause momentary anxiety and stimulation in this species.

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