VI. OTHER AVIAN SPECIES

A. LABORATORY BIRDS

1. Birds in Research

a. Common Laboratory Species

The several species of birds dealt with in this chapter readily lend themselves to domestication, breed without difficulty in captivity, and are in most instances obtainable from commercial sources. It is in view of these considerations that budgerigars, Japanese quail, and various other psittacine and cage bird species have frequently been used as animal models in biological research.

Domestic fowl (*Gallus domesticus*), though widely used for research purposes, have not been included in this volume as guidelines for their utilization, under both commercial and experimental conditions, may be found in Volume 1 of this Guide (CCAC, 1980), as well as in several other general laboratory animal management publications (Harry and Cooper, 1976; ILAR, 1966).

b. Wild Birds

Procedures for the capture, restraint, and masking of wild birds for use in field studies are discussed in the chapter on Wild Vertebrates in the Field and in the Laboratory. When avian species brought in from the wild must be maintained in an animal facility, they should be housed separately from other species and be provided, insofar as is possible, with conditions that approximate those of their natural habitat. Such factors would include food, temperature, humidity, perches, cover, and access to water (ILAR, 1977).

2. Reproduction

a. Breeding in Confinement

The breeding, hatching, and rearing of birds in confinement for research purposes. May be undertaken either by parental (natural) or artificial methods. A vast number of widely divergent reproductive modes exists amongst the thousands of species of birds. Specific information on reproduction in confinement particularly using artificial methods, is largely limited to a few gallinaceous species, waterfowl (Ward and Batt, 1973) and Japanese quail (Cooper, 1976). General information and guidelines on reproduction in wild species in confinement have been recently summarized (ILAR, 1977) and the commercial rearing of pigeons has been described in some depth (Levi, 1969).

Neither pigeons nor most wild species of birds are suited to incubator production due to the essential role of the parents in feeding their hatchlings. Domestic fowl (particularly bantam hens) and canaries have often been successfully used as surrogate parents for incubating wild bird

eggs, although in many instances it will prove necessary to remove the young at hatching for hand raising (ILAR, 1977).

Commercial incubators may be variously equipped with tray modifications to facilitate hatching. Special care must be taken to ensure absolute cleanliness of the hatching tray in order to minimize the chances of infection to the newly hatched young. A range of humidity from 80 to 90% should be provided at hatching, as this will assist the emerging chick to break through the shell membranes. Hatching temperatures should be 1-2°C below those for incubation; the newly hatched birds should remain in the incubator until completely dry and may remain there as long as 24 hours (ILAR, 1977; Ward and Batt, 1973).

b. **Rearing**

Avian species in general, particularly the domesticated breeds, grow very rapidly. As a consequence, constant care must be taken to assure that space provisions are adequate and that overcrowding does not occur.

Brooders are essential for the proper rearing of young incubator hatched birds. The optimal temperatures required within the brooder will vary with the age and species. The initial temperatures required by the newly hatched will invariably be fairly high and will reduce gradually to the species optimum for adults. A generally suitable procedure to follow with incubator hatched birds is to allow for a range of temperatures to be provided by a heat lamp. The young will quickly learn to find the temperature which is most comfortable for them.

Newly hatched birds should be raised in isolation, separated from adult birds and protected, insofar as is possible, from sudden noises and other intrusions that might frighten them. Brooder pen corners should be gently curved, or the brooder area around the heat lamp circular so that the chicks cannot pile upon each other when frightened.

Fresh water and an appropriate diet should be provided ad libitum. For proper development, some species, notably waterfowl, require sunlight and sufficient water in which to swim.

Proper sanitation is essential to the successful raising of young birds by artificial methods. This will include careful attention to the cleanliness of equipment, eggs, and the brooder environment.

Certain avian diseases are transmitted through the egg; however, in the poultry industry, breeder flocks may now be serologically tested for freedom from such diseases. When feasible, hatching eggs and day old chicks should be obtained from flocks certified as free from these diseases.

3. **Health Considerations**

   a. **Zoonoses**

   Both domestic and wild birds have been implicated as carriers in the spread of a number of zoonotic diseases such as cryptococcosis, histoplasmosis, psittacosis, and salmonellosis. However, of the more than 30 zoonoses reported to involve birds, only a very few are considered a serious hazard to man (Herman, 1982). Nevertheless, as the excreta of birds provides a medium for the growth and spread of pathogenic bacteria and parasites that may infect man, it is extremely important that the standards of hygiene amongst personnel working with birds should always be high. Not the least reason for the strict adherence to hygienic standards of husbandry is the protection of the birds themselves from contagion.

   Psittacosis (chlamydiosis, ornithosis, or parrot fever) is caused by *Chlamydia psittaci* and is the most serious of the avian zoonotic hazards. The greatest risk is from psittacine birds and pigeons, although a wide variety of birds (including turkeys) and mammalian species are susceptible. The disease is also reported to be on the increase (laboratory confirmed cases) in Ontario and Alberta and several U.S. states (Hunter and Pettit, 1981).

   b. **Infectious and Parasitic Diseases**

   Newcastle disease, infectious laryngotracheitis, infectious bronchitis, and Marek's disease are amongst the numerous diseases common in domestic breeds of poultry, some of which are readily transferable to other avian species. Vaccines are available for many of these avian diseases; however, control through isolation, sanitation, and preventative chemotherapy are preferable prophylactic procedures in most instances, as these vaccines are usually live products and captive birds do not generally react well to handling and injection.

   Coccidiosis and other parasitic diseases of young birds can usually be kept under control through good husbandry practices. Coccidia are not generally considered to present a serious problem except in gallinaceous species and pigeons (Steiner and Davis, 1981). However, recent reports suggest that this may not necessarily be a correct assumption, and that coccidiosis and giardiasis may be more common in young parakeets (Panigrahy, Craig and Glass, 1981) and budgerigars (Scholtens, New and Johnson, 1982) than previously thought. Among other internal parasites, Ascaridia platyceri was the most common ascarid species to be identified frequently in Psittaciformes imported into Canada (Webster, 1982).

   c. **Dealing with Health Problems**

   Cannibalism is a common behavioral problem in many avian species reared under artificial conditions. The vice can sometimes be kept under control by modifying the lighting, as well as by reducing population density. Feather picking may also occasionally occur in isolated birds,

probably from boredom or stress; alleviating the emotional cause will usually stop the habit (Galvin, 1979).

Whenever an outbreak of disease occurs amongst birds in the laboratory, the advice of a specialist in avian diseases should be sought. Proper diagnosis is essential to rational disease treatment. The latter will, as in other animals, generally consist of administering an appropriate chemotherapeutic agent and instituting proper hygienic and nursing procedures. It should always be remembered that very sick birds rarely respond well to individual treatment, as the added stress of handling and drug administration will often result in shock and death.

Whenever possible, mass preventive treatments of all the exposed birds should be practised by administering the appropriate antibiotic or other prescribed medicines in the feed or water (Steiner and Davis, 1981). When calculating the amounts of medicaments to add to the desired vehicle (water or feed) to achieve a desired dosage, it must be remembered that domestic poultry will usually drink double the weight of water to that of food consumed. Thus, to convert a prescribed water dose to a food dosage, 2 kg water is equivalent to 1 kg feed. Therefore, for this class of bird to consume the equivalent of 100 g medication per 1000 L (1000 kg) water will necessitate mixing the agent at 200 g medication per 1000 kg of feed.

Different classes of birds will vary in the ratio of water to food consumed (for example, in pigeons this is approximately 1:1) and this ratio should be established for the species being treated if medication dosages are to be converted from one vehicle to another for administration.

Cage birds, as a general rule, should not receive medication in their drinking water as many varieties drink very little and irregularly.

4. **Restraint and Anesthesia**

   a. **Capture**

   Capture and handling, even of the domesticated breeds of birds, will very frequently involve the imposition of physical restraint. Birds are by disposition easily frightened and "flighty," relying heavily on rapid escape when disturbed. Consequently, it will almost always be found necessary that they be securely immobilized prior to commencing even the most minor manipulation.

   It is of prime importance to realize that physical restraint is not well-tolerated even by domesticated birds. The small, wild breeds of birds are particularly hypersensitive to being handled; an improper or rough approach may well lead to traumatic injury and even to death from shock (Gandel, 1969). While cage birds and domestic breeds may be less susceptible to sudden shock and death following careless capture, they are nonetheless prone to injury and to the detrimental effects of extreme fright (Cooper and Eley, 1979). It follows that if capture is stressful to

healthy birds, it may be assumed to be even more detrimental to ones that are sick.

A simple means of minimizing excitation and thus facilitating capture and restraint of most laboratory birds that are not nocturnal, is to approach them at night or under simulated nocturnal conditions. The latter will involve blacking out the room, rack, or cage in some appropriate way for a brief period prior to capture. The bird(s) may then be approached and picked up in the dark. If any light is needed for this purpose, a small flashlight should be used.

Birds will not generally struggle in the dark, tending to settle down and relax. As a corollary to this fact, it follows that once a bird is captured and under physical restraint, it struggles and fright may be minimized by keeping it in the dark as much as possible. This may be achieved in larger birds by covering their heads with an opaque cover. The latter must, of course, be porous and/or provide adequate ventilation.

b. **Physical Restraint**

The three body regions that must be immobilized for successful physical restraint and safety in handling birds are the head, the wings, and the legs. Insofar as is possible, movement of all three should be restricted simultaneously when the bird is first picked up.

Cage birds, particularly psittacine ones, have sharp beaks designed for their protection. A very painful wound can be inflicted, even by a small bird such as a budgerigar; therefore, care must always be taken when handling them.

The claws of birds can cause painful injury and a raking with the talons of some species (raptors) can inflict a serious wound. The nails of small caged birds will not usually be worn down and will thus tend to be particularly sharp. Peck or scratch wounds from birds should always receive proper and prompt first aid treatment.

The wings of all birds are relatively very strong although, with the exception of very large birds such as geese, they will not cause injury to the handler. An insecurely held wing will make immobilization impossible, give rise to prolonged struggling, and may lead to either escape or injury.

Under no circumstances, when picking up or attempting to restrain a bird, should the hold be restricted to a single appendage (either leg or wing). If this should accidentally occur, the bird should immediately be released and a fresh approach made. Bird bones are both light and brittle and may be very easily fractured as the animal struggles to escape.

Small breeds, if caged and accustomed to being handled, may be restrained by grasping the neck between forefinger and thumb, or forefinger and index finger, so that the back is against the palm of the hand and the legs are anchored between the ring and little finger. With

somewhat larger birds, it will be necessary to use the other hand to hold and extend the legs so that the thumb and small fingers can be used to gently and firmly press the wings against the body. Once secured by one or other of these means, the bird may be brought into a supine position for examination or treatment. It should be kept in mind, however, that the bird's respiration and tidal air flow may be impeded in this position, probably due to visceral pressures on the dorsally located abdominal air sacs (King and Molongy, 1971).

Larger domesticated and caged birds, if fairly tame, may be held by using both hands so that the thumbs are over the wings, the palms pressed firmly around the pectoral region and the legs restrained between the interlaced fingers of both hands.

It will often be found both necessary and expedient to introduce a protective barrier between beak/claws and hand when approaching a caged bird. For this purpose, a towel or cloth of appropriate size and texture may be used to enfold the bird's head and wings, preferably when approached under subdued lighting. As a general rule, it is better to use a cloth or towel as an aid to initial restraint, than to use gloves. The latter, to afford protection, will need to be heavy and will, therefore, be conducive to feather damage. It is also difficult to judge and adjust pressure through a heavy glove and, therefore, easy to unintentionally inflict pain.

Particular care should always be taken to avoid interference with free movement of the bird's sternal region, as adequate inspiration of air depends on expansion of the thoraco-abdominal cavity which, in turn, is dependent on the unimpeded movement of the sternal-coracoid complex (ILAR, 1977; King and Molongy, 1971).

The common means of capturing of birds that are free in an aviary is by netting. Once in the net, birds may be picked up in the ways discussed above.

A number of other devices, in addition to wrapping in a towel, have been suggested for use in prolonged restraint, particularly of small birds, following initial capture. These restraining devices are generally used to facilitate the administration of an anesthetic and to help guard against self-injury during recovery from surgery and anesthesia. All involve enclosing the animal, with head and tail protruding, in some form of snug and reasonably rigid tube (ILAR, 1977).

c. **Chemical Restraint**

Chemical restraint is used on birds to reduce the likelihood of shock and collapse resulting from excessive and prolonged fright. Various levels of narcosis may be induced to lower the pain threshold to a point permitting manipulations such as catheterization and other minor surgical procedures. Full general anesthesia or appropriate local anesthesia must be used if painful surgical procedures are to be undertaken.

The response of birds to painful stimuli varies greatly in different parts of the body, with all of the head region, leg scales, and vent region being particularly sensitive; the rest of the cutaneous areas of the body are relatively insensitive, exhibiting remarkably little motor response to stimuli (Arnall, 1964).

d. **Anesthetics**

Local anesthetics, such as procaine hydrochloride, if used, must be administered carefully by injection and/or topical application to the desired site of anesthetization. It is important to adhere strictly to recommended dosages, as these agents, in excess, may prove toxic, particularly to smaller birds (ILAR, 1977; Armand, 1977; Klide, 1973).

Inhalant anesthetics always tend to be somewhat hazardous, due to the potential for overdose from the accumulation of anesthetic gas in the air sacs. This risk is enhanced when induction is slow, as with agents such as ether. However, there is no reason why inhalant anesthesia should not be successfully induced in birds by persons experienced in veterinary anesthesia methodology.

Halothane and methoxyflurane are frequently recommended for use in birds as they induce anesthesia rapidly and are conducive to a short period of recovery. Detailed procedures for their administration to various groups and species of birds may be found in books and articles dealing with veterinary practice and anesthesiology (Armand, 1977; Klide, 1973; Franchetti and Klide, 1978; Franchetti and Klide, 1978; Langham, 1981; Lumb and Jones, 1973). Chloroform is definitely contraindicated for use in any birds (Armand, 1977), while halothane/nitrous oxide and oxygen induction is frequently favoured (Camburn and Stead, 1978).

Artificial respiration may, on occasion, have to be resorted to, particularly when inhalant anesthetics are used. This can be successfully achieved, if initiated without delay, by increasing the oxygen in the inhalant mixture and gently pumping the caudal tip of the sternum up and down.

Injectable agents are frequently used in pre-anesthetic procedures and for primary induction, prior to maintenance with an inhalant anesthetic, particularly in the domesticated and tame breeds of birds. However, injectable agents are rarely used as the sole anesthetic as they are more risky and difficult to control than inhalation anesthetics (Franchetti and Klide, 1978; Franchetti and Klide, 1978; Langham, 1981). Their disadvantages have been summarized (Franchetti and Klide, 1978) and include ease of overdosing, difficulty in maintaining surgical depth, and a prolonged recovery time. For light anesthesia and restraint, the dissociative agent, ketamine hydrochloride, has proven useful and safe at low doses (Langham, 1981).

e. **Administration of Anesthetic Agents**

Intramuscular administration of injectable agents is probably best made into the pectoral region, rather than the thigh, as the role of the renal portal system in filtering such agents is unclear.

Ten intravenous injections should be made into the wing vein or, particularly in small birds, into the right jugular vein. The procedure is difficult, as avian veins are thin walled, but should be used if barbiturates are the anesthetic agent as these are safer if given diluted, i.v. to effect (Langham, 1981).

Administration of narcotic agents through the feed has proven a useful aid in the capture of wild birds (Lumb and Jones, 1973).

Birds should not be given a general anesthetic when their crops are full, as regurgitation and aspiration of food substances may occur. Conversely, prolonged starvation, particularly of small birds, should be avoided as it will enhance the likelihood of shock and hypoglycemia (Langham, 1981).

An appropriate state of surgical anesthesia (depth) will have been achieved as soon as respirations become slow and deep, and regular. At this point, corneal and pedal reflexes will still be present, but should be slight, slow and/or intermittent, while palpebral and cere reflexes will be absent. Anesthesia is too deep if all reflexes disappear and breathing becomes shallow (Altman, 1980).

B. BUDGERIGARS

1. Introduction

a. Origin

The budgerigar (*Melopsittacus undulatus*) or "budgie" is a small bird of the psittacine group (parakeets) that enjoys immense popularity as a cage bird pet. It was originally introduced into North America and Europe over 100 years ago from the arid regions of Australia (Steiner and Davis, 1981. During the past 50 years it has been bred extensively in captivity and has become thoroughly adapted to domestication.

b. Research Uses

Budgerigars have not been used extensively as research models by Canadian investigators, although a few do utilize them in behavioral studies. They have also been used occasionally in tumour research, as spontaneously occurring neoplasms are extremely common in this species. Tumour incidences ranging as high as 24.2% have been reported from several different investigations (Keymer, 1976). Parakeet tumours have been described in detail and have been recorded as accounting for 1/3 of all deaths seen at necropsy in these birds (Petrak, 1982).

c. **Biology**

Numerous colour varieties of budgies have been developed through domestic breeding and selection. However, in other physical features the birds are very uniform. Size ranges around 19 cm (7.5 in.) and body weight averages about 45 g (1.6 oz.) although adult birds are said to have reached over 60 g (2.12 oz.). The young grow very rapidly, weighing almost 2 g (0.07 oz.) at hatching and reaching an average of 40 g by three weeks of age (Keymer, 1976).

Average rectal temperature is $41.4^{\circ}C$ (range $41\text{-}42^{\circ}C$ or $105\text{-}108^{\circ}F$), while respirations range from 80 to 100 per minute. The respiration rate may, however, be increased 20 to 50% as a result of nervousness and fright. "Tail-bobbing" (tail-dipping) should not occur at rest, except in sick birds, but may sometimes be seen in normal, healthy budgies when they alight on a perch fol!owing a burst of activity and excitation. Such airflight "tail-bobbing" will usually subside within a few seconds of rest (Steiner and Davis, 1981; Keymer, 1976).

Hematological values for this species have been studied by numerous investigators, and details on these may be found in the several publications that deal with the diseases of cage birds (Leonard, 1969; Stunkard, Russell and Johnson, 1982; Fowler, 1978). A summary adapted from a recent analysis of hematology and blood chemistry on 251 budgies (Rosskopf *et al.* 1982) shows the following normal blood value ranges:

RBC (x 10^6/mm^3)	2.5-4.5
PCV %	45-57
WBC (10^3/mm^3)	3-8
Granulocytes %	45-76
Agranulocytes %	20-50

The average life expectancy of the budgie under caged conditions is six to eight years, although with optimal care, birds may live for 15 or more years (Keymer, 1976; Axelson, 1981).

2. **Caging and Housing**

a. **General**

Budgies are gregarious birds that like to socialize, so do better when housed in groups rather than singly.

Budgie cages and aviaries should be in special bird rooms or areas within the animal facility. These should be as remote and well-separated as possible from locations in which other avian species are held. Flight cages of 2.5 x 0.9 x 1.5 m (8 x 3 x 5 ft.) high are recommended to hold up to 24 non-breeding adults (Keymer, 1976).

Caging should be constructed of 1-2.5 cm (1/2-1 in.) mesh wire netting, small enough that birds can neither escape nor get their heads through the netting; shock or a broken neck can result from panic from the bird's head becoming stuck in the cage mesh. Cages for individual birds should permit wing stretching, flight, and perching. They should be designed so as to prevent contamination of food and water. A rectangular design of not less than 30 x 30 x 60 cm (1 x 1 x 2 ft.) long, with three solid sides, a central access door, and slide out cleaning tray is recommended.

b. **Breeding Cages**

These will be needed for most laboratory breeding programs, although breeding aviaries may also be used. The breeding cage consists of two compartments separated by a wire or solid, movable partition. This should provide approximately 80 x 30 cm (2.6 x 1 ft.) of floor space with a height of 45 cm (18 in.).

Breeding aviaries of 1.8 x 0.6 x 1.8 m (6 x 2 x 6 ft.) high (provided with wooden nest boxes - 15 x 15 x 23 cm (6 x 6 x 9 in.), are satisfactory for the housing of four pairs of breeders (Keymer, 1976). Perches should always be provided.

3. **Feeding**

a. **Food**

The budgie is primarily a seed eater and will dehusk the seeds prior to swallowing the kernel whole. The resulting accumulation of husks requires that the hoppers be emptied and refilled on a daily basis.

The most common seed mixture fed to this species is a mixture of canary seed (*Phalaris canariensis*) and millet (*Panicum miliaceum*) in approximately 1:1 ratio.

Feeding studies have suggested an increased need for extra vitamin and protein and other elements during the breeding period (Axelson, 1981). Basic seed mixtures are inadequate for youngsters and breeding birds and their use alone may lead to poor hatchability, high chick mortality and poor growth rates. Supplementation of the basic seed mixture with Vitamin E, as well as Vitamins A and D, is recommended. Greens may occasionally be fed to this species. Calcium in the form of cuttle bone should be provided, as should oyster shell and grit.

With very young birds, it may be necessary to provide food in a very shallow dish on the floor of the cage. Young birds should be carefully observed to assure that they are learning to eat properly.

b. **Water**

An ample supply of fresh, clean, water should be provided daily. It has been shown that some birds may drink up to 5% of their body weight

daily. It has also been shown, however, that budgies can go without water for a considerable period of time, if this should become necessary (Tollefson, 1982).

Budgies, unlike canaries and most other cage birds, do not require a water bath. The water for very young birds should be provided in a shallow dish placed on the cage floor.

4. **Breeding**

   a. **Reproductive Biology**

   This species is quite prolific and relatively easy to breed in captivity. Male and female will both mature at three to four months of age; they should not, however, be used for breeding prior to ten or eleven months. The useful breeding period usually extends to about age six in the male and to four years of age in females.

   Eggs are normally laid at two day intervals, in clutches of five to six. It is advisable to provide a choice of at least two nesting boxes per pair.

   The incubation period is 18 days. Under laboratory conditions it is usually considered that hatching two clutches per year is optimal.

   b. **Behavior**

   Selected pairs should be caged separately in order to avoid multiple matings, as the cocks are polygamous. Careful selection for compatibility should be made. Suitably matched pairs will show affection by rubbing their beaks together and often the cock will feed his mate with regurgitated seed.

   Nesting material is not necessary, as the eggs will be laid on the bare base of a nesting box. New hens should not be introduced into an established breeding colony, for, as in many other avian species, to do so will enhance the risk of serious fighting.

   The cock usually will feed the hen during the incubation period. When the young chicks hatch, both parents feed the nestlings with regurgitated, partially digested seed. The hen also produces a protein-rich secretion from the proventriculus which is fed to the young. Young birds will leave the nest at from four to six weeks; however, the male will usually continue to feed them until they have learned to take seed on their own.

5. **Health Care**

   a. **General**

   Healthy birds should be alert and bright eyed, with neat, well-groomed feathers, and wings that are usually held tight to the body. The earliest signs of illness may be a change in the normal behavior pattern. As an

illness progresses, the bird generally presents a drowsy appearance, with its feathers becoming dull and its eyes loosing their sparkle. Birds may remain on the cage bottom, with wings drooped, and eyes closed. Some may shiver.

An abnormal eating and drinking pattern is indicative of ill health; some birds exhibit a reduced intake, while in other instances intake may be increased. Matted vent feathers on a bird are an indication of an enteric disorder.

The common signs of sickness in cage birds in general, and budgies in particular, are dealt with in detail in a number of excellent publications which also discuss specific diseases, prevention, and treatment (Petrak and Gilmore, 1982; Stunkard, Russell and Johnson, 1982; Fowler, 1978; Axelson, 1981; Tollefson, 1982; Blackmore, 1982; Taylor, 1969).

It is important that birds exhibiting any of the above symptoms be placed in a warm environment where the ambient temperature can be raised, usually to about 26°C (79°F). This may be accomplished through placement in a smaller cage and the judicious use of a heat lamp. Isolation, by moving the cage to a separate room, is often advisable.

b. **Nutritional Diseases**

Relatively little is known of the actual nutritive requirements of birds, other than poultry, and, therefore, the potential for nutritional deficiencies occurring in groups such as the budgerigars is considerable (Axelson, 1981).

Iodine deficiency resulting in thyroid dysplasia has a high incidence and can be recognized by a characteristic squeak which accompanies each respiration. Tail dipping will also usually occur at each respiration, even at rest. Thyroid dysplasia may be controlled by adding one or two drops of a solution of two parts Lugol's iodine in 28 parts distilled water, to the daily drinking water, or supplementing the diet with cod liver oil (Blackmore, 1982). It has been suggested that various leg deformities sometimes encountered in budgies may be prevented by the addition of manganese to the diet (Taylor, 1969).

French molt, which primarily affects young birds about six weeks of age, is characterized by feather loss, particularly, of the wing and tail feathers. This is a frequent problem in many breeding aviaries, and its cause remains obscure (Taylor, 1982). Affected birds rarely recover and should be culled (Steiner and Davis, 1981).

c. **Infectious Diseases and Zoonoses**

Budgies appear to have allow susceptibility to most infectious diseases, except perhaps psittacosis (*ornithosis*). The zoonotic implications of this disease make it of concern to all laboratory animal facilities housing psittacine birds. Psittacosis is difficult to diagnose as its external

symptoms resemble those of most other febrile diseases in this species. Birds inflected with psittacosis show a general malaise, ruffled feathers, depression, lack of appetite and usually a green, watery diarrhea which may vary in colour and consistency as the disease progresses. There is often ocular and/or nasal discharge, particularly late in the disease.

The causative virus of psittacosis may be isolated through mouse or chick embryo inoculations. Diagnosis is usually established upon careful postmortem examination. Typical lesions include a significant enlargement of the spleen, a swollen, fragile liver with some discolouration, particularly around the edges, and also areas of focal necrosis. There is exudate and yellowish clots in the air sacs, purulent serous or fibrinous pericarditis, and some congestion in the intestinal tract, particularly on the serosal surface. Smears of the exudate from the air sacs or pericardium should permit positive identification of the causative agent. This latter step will need to be carried out in a specialized microbiological laboratory.

d. **Miscellaneous**

The incidence of neoplasia, as noted earlier, is particularly high in parakeets in general, and is a frequent cause of death in budgies (Steiner and Davis, 1981; Petrak and Gilmore, 1982).

The importation of budgies is subject to the regulations of the Animal Disease and Protection Act of Canada (ADPA, 1978). The importation of birds, particularly psittacines for resale or as personally owned pets into the USA, is subject to stringent regulation and quarantine by the U.S. Departments of Agriculture and Health and Human Services.

C. **JAPANESE QUAIL**

1. **Introduction**

a. **Use in Research**

There are two excellent general references on the care and use of Japanese quail (*Coturnix coturnix*) from which much of the information that follows has been derived (Cooper, 1976; ILAR, 1969). Although coturnix have been domesticated by the Japanese for almost nine centuries, their use in research does not appear to go back more than about 25 years (Wilson, Abbott, and Abplanalp, 1959). Since their early use as a model in poultry research (Wilson, Abbott and Abplanalp, 1961) and embryology studies (Padgett and Ivey, 1969), Japanese quail have been widely used in many areas of biomedical and behavioral research. Recently, they have been employed extensively in toxicological studies on pesticides and insecticide residues.

This species has a number of advantageous characteristics for laboratory use in that they adapt readily to laboratory conditions, have a short generation time and lifespan, with a rapid incubation and maturation that allows for the production of up to four generations per year. They are also naturally hardy, reasonably resistant to disease, and very prolific (high

egg yield). On the other hand, although they consume comparatively little food, they are very wasteful and are seemingly very sensitive to the deleterious effects of inbreeding, with serious loss of reproductive fitness (Cooper, 1976; Sittman and Abplanalp, 1965).

Since 1982, the Natural Sciences and Engineering Research Council of Canada (NSERC) has supported a formal Quail Genetic Stock Centre at the University of British Columbia. This centre has the largest quail collection in North America of approximately 4,000 birds of several outbred stocks and 14 lines carrying various mutations for colour and other characteristics. These holdings are currently available and being utilized for both research and teaching purposes. For further information contact: Dr. K.M. Cheng, Dept. of Poultry Science, University of British Columbia, Vancouver BC V6T 2A2.

b. **Biology**

The physiological values for coturnix have been summarized with references in an appendix to the National Academy of Sciences monograph on coturnix (ILAR, 1969) and the more recent biological data is reviewed by Cooper (1976) from which the following points should be noted:

o Females will reach maturity and commence to lay by 42 days, laying up to 300 eggs per year. Incubation period is 16 to 17 days and may reach 18 days in inbred strains.

o Growth is very rapid, with birds weighing 6-7 g (0.21-0.25 oz.) at hatching showing a sixfold increase by the end of the first week. At sexual maturity, the female will exhibit a greater body weight and overall size than the male.

2. **Housing**

a. **Incubation and Brooding**

Incubation equipment should be housed separately from hatched and mature birds. Commercial incubators for poultry may be used if special trays are obtained or existing ones modified to hold the small quail eggs.

Brooding may be either in battery units or in floor units. Battery brooding is generally preferred for small laboratory breeding programs and battery brooders may be obtained commercially. Standard chick battery brooders may also be used if properly modified (ILAR, 1969). A simple method of room-floor brooding is to use deep litter (wood shavings) in a circular enclosure, walled with plastic, metal, or cardboard around a 250-watt infrared lamp. A circle of 105 cm (42 in.) diameter will hold 150 chicks and mortality is reported as low. However, drowning may be a problem unless water fountains are provided with marbles or stones to prevent the tiny quail chicks from falling in (Cooper, 1976). Advantages of the floor-room system for young quail are that the birds are said to be more docile

and the rather common injury from flying upwards and hitting their heads on the cage roof cannot occur.

Coturnix require a relatively high brooder temperature at first, approximately 38°C (100°F), reducing to about 24°C (75°F) by the fourth week of age. By this time, they are usually well-feathered and by six weeks are sexually mature. These birds can adapt to a wide range of relative humidity (30-80%). However, it is important that the chicks be protected from draughts and cold, particularly at night time.

b. **Caging and Equipment**

Mature birds may be housed in chick batteries or in special laying cages with sloping floors that allow the eggs to roll out. A continuous supply of fresh, clean water must be provided; troughs or open vessels are satisfactory for this, provided they are protected from contamination with droppings.

For breeding pairs, a cage of 15.2 x 25.4 x 15.2 cm (6 x 10 x 6 in.) high is adequate.

The problem of mortality from drowning amongst young chicks is difficult to overcome. Placing marbles or stones in the water fountain or trough is helpful. Small V-shaped troughs or cage bird plastic water drinkers may be used in smaller cages.

Quail are extremely wasteful feeders, a vice that can be to some extent limited by feeding crumbles rather than mash. A further objection to the feeding of mashes is that those with a high wheat content become glutinous when moistened and will often stick to the feet of quail chicks. Shallow trays and trough feeders should be wire mesh covered so as to reduce food spillage. For the first week of life, quail should be fed from shallow, open containers. It is essential that adequate trough space be provided for these fast growing animals to prevent mortality from starvation (Cooper, 1976).

3. **Foods and Feeding**

Adult birds will eat only about 14 g (0.5 oz.) of food per day; however, they have a very great tendency to waste feed, which should be discouraged (see above).

The requirements for specific nutrients have not been well-identified for this species. Game bird or turkey starter as crumbles, containing 20-25% protein, is recommended, particularly during the first five weeks. It should be fed *ad libitum* and, when a well-balanced turkey starter is used, supplementation will not be necessary until just prior to maturity, at which point dicalcium phosphate or crushed oyster shell should be made available. It is important to avoid feeding turkey starter that is dated more than eight weeks from the time of milling. The shelf-life of this particular feed will be even less in the summer months and should not be used over four weeks after milling.

4. **Breeding**

A ratio of one male to two females results in a high fertility, although one to three is commonly practised and ratios of one to six will be successful with good males. The females will continue to lay fertile eggs for about nine days after the male has been removed.

Artificial insemination techniques will give as high as 83% fertilization lasting four to six days and will not affect productivity (Marks and Lepore, 1965).

Fertility is highest if males and females are kept together at all times. However, fertility falls off rather rapidly in both males and females after six months of age. Maximum hatchability occurs when both parents are between eight and 20 weeks old.

5. **Health Care**

As with other laboratory species, disease prevention is of paramount importance, particularly with birds in systems with high population densities. Newly arrived birds should be placed in a quarantine area for not less than two weeks. The coturnix appears to be susceptible to most of the diseases that affect domestic poultry and, therefore, should be housed separate from either chickens or turkeys.

Prevention, management, and hygienic procedures used to control disease in domestic fowl would seem, in most cases, to be applicable against the equivalent diseases in quail (CCAC, 1980; Harry and Cooper, 1976).

Cannibalism and feather picking, which are indicated by bare backs and heads, are fairly common habits amongst quail, particularly those kept on wire. These vices can, in varying instances, be controlled by means of one or more of the following procedures: debeaking, reducing the light intensity, reducing the stocking density, increasing dietary arginine, fibre and grit.

6. **Special Considerations**

Restraint of individual coturnix is generally accomplished by hand holding. Removal of the bird from batteries or individual cages should be done in a calm, deliberate manner, so as to avoid excitement. One should grasp the whole bird and hold it firmly, with wings pressed against its body to prevent struggling. Quail should not be grasped by a limb, as this allows for struggling and will often result in a broken leg, wing or other injury (ILAR, 1969).

Blood collection for small amounts can be accomplished through wing vein puncture when the bird is placed on its back with the wing extended. When larger quantities of blood are required, these may be obtained from the jugular vein or anterior vena cava. A volume of 3 ml may be withdrawn from the adult without ill effects, while 5-7 ml may be obtained prior to their being killed (Cooper, 1976).

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