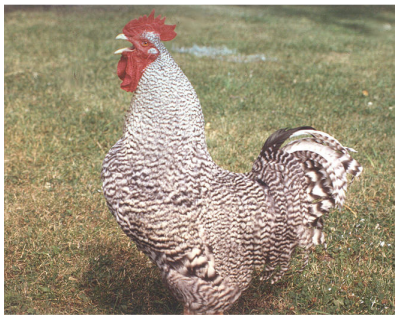
Domestic Poultry

Introduction

The chicken, (*Gallus gallus domesticus*), is the most numerous bird species on the planet.

In the UK, approximately 1 billion chickens are killed every year for food - (19 million chickens a week). Worldwide, this figure is 60 billion/year, and there are currently 5 times more chickens in the world than there were 50 years ago.



Gallus gallus domesticus

32 million turkeys are also reared for food in the UK, as well as smaller numbers of ducks, geese and ostriches. In addition to these, a number of game birds (partridge and pheasant) are reared for release to the wild.

Chickens are heavy, round-bodied, ground-feeding birds belong to the order Galliformes. They are territorial and are hardly capable of flight. They are omnivorous, mostly eating vegetable matter, but also insects and earthworms if kept outdoors.

Turkeys, grouse, quail, partridges and pheasants are also in the order Galliformes, whilst ducks and geese belong to the order Anseriformes (waterfowl), whilst pigeons belong to the order Combiformes and ostriches are Ratites

Use under ASPA

138,287 birds were used under ASPA in 2013 (3.4% of all animals used). Chickens accounted for 94% of these, many of which were to investigate or produce vaccines for the commercially important chicken diseases.

Chickens	137,059
Turkeys	823
Quail	675 (of which none were the European quail (coturnix coturnix)
Other species	7,341 (including zebra finches, ducks and geese, pigeons, emu, guinea fowl wild garden or woodland birds, seabirds, waterfowl and game birds)

In addition to this, a large number of chicken eggs are used for research, and also for the production of vaccines, both for avian and mammalian species. Since January 2013, avian eggs have ben regulated under ASPA from 2/3rds of the way through incubation, but no figures have yet been released by the Home Office on the numbers involved.

Biology of the chicken

The anatomy and physiology of all avian species differs in many respects from that of mammals:

External features
The skin is largely covered in feathers, although the legs are covered in scales. There are 5 main types of feathers, each modified for a different purpose; flight, insulation, camouflage, sexual attraction etc. Most birds moult in the spring, often at the time of egg laying. There are no lips or teeth but the skin is modified to form a keratinised beak (rostrum). The eyes are large and birds can see colour. They possess transparent nictitating membranes.

Chickens possess a fleshy protuberance on the top of the head (the comb), and 2 fleshy protuberances under the chin (the wattles). These can vary in size and shape between breeds, but are usually larger on the male than the female. They act as thermal regulators, whilst the comb is also a sexual display organ of males. There are no sweat glands, but an oil gland (preen gland) is located on the back at the base of the tail. Female chickens also have a brood patch; an area of featherless skin on the underside of abdomen, well supplied with blood vessels to transfer heat to the incubating eggs.

Skeleton
The skeleton of a bird must be light enough to fly and yet strong enough to support the considerable pectoral musculature required for flight. To achieve lightness, the medullary cavities of many of the long bones are filled with extensions of air sacs. However, this leaves the cortices of the bones considerably thinner than those of mammals, which make bird bones quite brittle and susceptible to fracture.

The forelimbs are modified as wings, with fusion of many of the bones to provide additional strength. The sternum has a massive extension, the keel or carina, to allow for the attachment of the muscles of flight.

Cardio-vascular system
The circulatory system is similar to mammals, but the heart is enlarged, and avian red blood cells possess a nucleus (mammals have non-nucleated RBCs). The heart rate is very rapid (200-250/minute, rising to 400+ if frightened). Birds are able to control the blood flow to the lower legs and feet, which are not feathered, to prevent excessive heat loss.

Respiratory system
Birds do not possess a diaphragm, and the lungs are non-lobar and do not expand as in mammals. In chickens, the lungs connect with 9 airsacs, some of which extend into the long bones. Birds breathe by expansion and contraction of the chest wall, acting as bellows. Take great care when handling birds, as without a muscular diaphragm, compression of the chest wall can prevent respiration.

Digestive system
There is an oro-pharynx, with no soft palate. In many birds, including the galliformes, the oesophagus has a muscular dilatation, half way along its length, the crop. This acts to soften food and regulate its flow through the system. The stomach is in 2 parts, the pro-venticulus and the ventriculus or gizzard. The latter is a very muscular organ, which grinds the food. It frequently has grit to assist in this process. There is a short colon with 2 large caecae.

Urinary system
The chicken does not have a bladder. The urine is thick and pasty, with low water content, but high in uric

acid. This urate paste is excreted via the ureters, which also open directly into the cloaca. The urate paste shows as a white cap on some faecal stools.

Reproductive system
The hen has only one functioning ovary and oviduct (the left), which opens directly into the cloaca. The male has 2 intra-abdominal testes located by the kidneys. The ductus deferens opens into 2 small papilla on the wall of the cloaca. Fertilisation of the egg occurs in the oviduct. Incubation for chicken eggs is 21 days and for turkey eggs is 28 days.

Husbandry

1) Chicks

Temperature
Chicks have very poor thermo-regulation for the first few weeks of life and so immediately after hatching they are moved to brooders. The room temperature of a brooder should be 24-26C°C, with supplementary heat to provide a warmer area maintained at 30-32°C, under a canopy. A dull emitter heater is often used, and should provide a temperature of 32°C at 15cms from the brooder canopy, at a height of 5cm above the floor. The chicks should be confined by the use of a brooder guard (1.5 metres diameter) for the first few days. Thus chicks will have a choice between temperatures from 24-32°C for the first week of life. Relative humidity should be 60-80% for the first week of life.

The chicks' behaviour should be used as a guide when setting brooder lamp temperature. If thermally comfortable, chicks of all species will be evenly spaced in the enclosure and making a moderate amount of noise; quiet chicks may be too hot and chicks making noisy distress calls may be too cold.

The temperature of the brooder room should gradually be reduced to 24-26°C by 4 weeks of age and 20-21°C by 5-6 weeks of age. The feeder length must be increased to 15cms/bird (4-9 if ad-lib) and the drinker length to 2.5 cms/bird. If nipple or cup drinkers are used, there should be 1 nipple (or cup) per 3-4 birds, with a minimum of 2 in each enclosure.

Age (days)	Under lamp (°C)	Ambient temperature in room (°C)	Relative humidity (%)
Up to 1	35	25 to 30	60 to 80
over 1 to 7	32	22 to 27	60 to 80
over 7 to 14	29	19 to 25	40 to 80
over 14 to 21	26	18 to 25	40 to 80
over 21 to 28	24	18 to 25	40 to 80
over 28 to 35	–	18 to 25	40 to 80
over 35	–	15 to 25	40 to 80

Feeding
For the first 4-5 days of life, the chick will survive by absorbing its yolk sac, but as this becomes smaller, the chick must eat to stay alive. Those chicks that do not learn to eat within this time will starve to death, commonly called "starve out". Starve out is a common cause of mortality in the first week of life and every effort must be made to start the chicks feeding. Feed must be small (crumbs) and easily accessible. Place

the feed on chick paper or on flat trays where they can walk and feed easily. Calcium and phosphorus ratios in starter crumbs must be correct, or rickets can occur at about 21 days of age. Allow 5cm/chick for feeders.

Water: Drinkers must be easily reached (ground level) and allow 1.5cms/chick.

Lighting: Initially, the lighting should be set at 40 lux for 16 hours/day, allowing only 8 hours dark.

Bedding: Chicks of all species should be housed on solid floors with litter. Litter should be absorbent (not dusty), and 3-5cms deep. Use untreated wood if shavings.

2) Adults

Behaviour
Chickens retain much of the biology and behaviour of the Jungle fowl from which they were domesticated. Behaviours that are most important to the species are nesting (in females), perching and using litter for foraging, scratching, pecking and dust-bathing.

Chickens are ground dwelling birds that cannot fly more than a few feet. They are flock animals and will spend a considerable part of the day foraging over their home territory. Nest-building is an important behaviour for laying birds.

They are social animals and should be housed in groups of around five to twenty birds, with fewer males than females in adult groups, for example, a ratio of 1 to 5. Attempts have been made to select strains of fowl for reduced feather pecking or agonistic behaviour. The existence of appropriate strains of this type should be determined, and the feasibility of acquiring them, should be assessed for each project.

Birds should be housed in enclosures which facilitate and encourage a range of desirable natural behaviours, including social behaviour, exercise and foraging. Many birds will benefit from housing that allows them to go outdoors and the feasibility of this should be evaluated with respect to the potential to cause distress or to conflict with experimental aims. Some form of cover such as shrubs should always be provided outdoors to encourage birds to use all the available area.

Feather pecking
Many of the potential welfare problems specific to birds are associated with inappropriate pecking behaviour. This can be divided into aggressive pecking; feather pecking (where individuals either peck at other birds' feathers or pluck and pull at their own); and pecking at the skin of other birds, which can cause serious suffering and mortality if unchecked. The cause of inappropriate pecking is not always clear, but is believed to be mis-directed foraging behaviour, which can be linked to a number of factors, such as overcrowding, wire mesh floors and bright lighting. It is an inherited trait and there are strain variations. it is often possible to avoid outbreaks by rearing chicks with access to substrate that enables them to forage and peck appropriately.

Prevention is especially important because fowl are attracted to damaged feathers, and the presence of a few feather-pecked birds may therefore lead to the rapid spread of injurious pecking. There are a number of measures that should be employed to avoid outbreaks of injurious pecking wherever possible and to reduce or prevent this behaviour should it occur. These include providing alternative pecking substrates such as foraging substrate, bunches of string, pecking blocks or straw; providing visual barriers; periodically or temporarily lowering the light intensity or using red light; and using light sources that emit UV rays. Anti-pecking sprays are commercially available and can be used to reduce the incidence of

injurious pecking in the short term, but it will still be necessary to address the underlying causes of the behaviour. Some strains of domestic bird have been selectively bred so that inappropriate pecking is reduced and such strains should be researched and used wherever possible.

De-beaking (beak-trimming) to prevent feather pecking and aggression, is sometimes carried out at 1 day of age in layers, but it causes both acute and chronic pain, and should not be performed on chickens used under ASPA.

Accommodation

Birds should be housed in socially harmonious groups within the animal enclosure, unless the scientific procedures or welfare requirements make this impossible. Special care is needed when regrouping birds or introducing an unfamiliar bird to a group. In all cases, groups should be monitored for social compatibility on an ongoing basis. Single-housing of birds for even short periods can be a significant stress factor. Therefore, birds should not be single-housed unless justified on welfare or veterinary grounds. Single-housing on experimental grounds should be determined in consultation with the animal technician and with the competent person charged with advisory duties in relation to the well-being of the animals.

Chickens are social animals, so the formation of appropriate, stable, harmonious groups should be given a high priority.

Poultry can be kept in a variety of types of accommodation. It is a requirement of ASPA that birds should be kept in floor pens, unless there are good scientific reasons to house in cages.

Some hybrid strains of broiler chicken can grow very quickly, so good forward planning is required to ensure that adequate space is available for the duration of the experimental period. The numbers of birds that can be kept in cages are determined by their weight.

Lighting

Chickens are often kept in subdued lighting to reduce the incidence of feather pecking. However, higher levels are to be encouraged and very low lighting levels (<20 lux) for long periods should not be used. The increased activity resulting from the use of higher intensity lighting can be offset by using red filters, which the birds see as dark. Wherever possible there should also be a dawn and dusk period. This, and the total length of photoperiod, will influence the egg laying cycle in poultry.

Feed and water

In broiler breeds, rapid growth can cause leg problems, (such as tibial dystrochondroplasia), or circulatory problems, (leading to ascites). Food intake in these birds may need to be restricted. Food intake (usually 125-250g/day), and water consumption (200-300ml/day) will vary with the type of bird kept and the accommodation.

Poultry are very sensitive to abrupt diet changes, and any changes in feed must be made gradually by mixing the feed in decreasing proportions of “old” feed over a few days.

Not only is it important to feed the correct rations, but with restricted diets you must always ensure that there is adequate space for all the birds to feed at the same time.

Water may be provided in a variety of ways e.g. fonts or automatic drinkers. Drinker management is very important. As the birds gain weight, so the drinkers must be raised such that the water is available at head height. Leaking and overflowing drinkers must be avoided

Temperature

Poultry should be kept in rooms at temperatures between 15-25^{0}C, depending on age. Additional heat lamps may need to be provided for young birds If this is the case, the birds must always have sufficient

space to regulate their own environmental temperature by moving away from the lamp.

Ventilation
Poultry held in controlled environment units must have room air changes at between 15 and 20 per hour. The positioning of inlet and extract ducts is very important to provide efficient ventilation without draughts. Inadequate ventilation will result in a build up of airborne dust and microorganisms, water vapour and ammonia. The presence of significant odour on entering poultry rooms is a good indication that the air handling system is not functioning correctly.

Relative humidity
Birds are far more tolerant than mammals to changes in RH and a range of 40 – 80 % is acceptable. However, extreme variation in humidity can affect the rate of heat loss in birds, which will influence feed intake and activity.

Litter Management
Cleaning regimes will vary according to the type of accommodation, but must be such as to ensure that poultry are kept in clean and comfortable conditions.

The litter in a broiler house is usually wood shavings or straw. Correctly managed litter will be dry and friable. However, if drinker management is poor, or the ventilation is inadequate, the litter can become wet or consolidated. Bird droppings will then remain on top of the litter, which will in turn lead to soiling of the birds, scabby hocks and breast blisters, and will also predispose to respiratory infections.

Noise
Birds are susceptible to stress and sudden or prolonged noise can have a detrimental effect on their welfare and production. The general background level of noise in a room should be less than 50dB, below a noise-rating curve of 45 and also free from distinct tonal content.

Environmental enrichment

Fowl are highly motivated to perform 'comfort behaviour' such as wing flapping, feather ruffling and leg stretching, which help to maintain strong leg bones. Birds should therefore be housed in floor enclosures large enough to permit all of these behaviours whenever possible. Ideally, birds should be housed with outdoor access; appropriate cover such as bushes is essential to encourage fowl to go outside.

Flooring for fowl should be solid, as this enables the provision of substrate to encourage foraging and possibly help to reduce the incidence of feather pecking. If fowl need to be caged for scientific purposes, they should be housed in enclosures designed to address behavioural requirements. If there are scientific reasons for not providing a solid floor, a solid area with loose substrate and items such as bunches of string, pecking blocks, rope, turf or straw should be provided for pecking.

Fowl strains that have been developed for rapid growth rates (broilers) are highly susceptible to lameness and their use should be avoided wherever possible. If broilers are used, individuals should be assessed for lameness at least weekly and grown more slowly than those reared commercially unless growth rate is essential for the study.

Fowl should always be provided with the opportunity to perch, peck appropriate substrates, forage and dust-bathe from one day old. Suitable materials for dust-bathing include sand or soft wood shavings. Perches should be 3 to 4 cm in diameter and round with a flattened top. The optimum height above the floor varies for different breeds, ages and housing conditions but perches should initially be fixed at 5 to 10 cm and for older birds at 30 cm above the floor. Perch heights should be adjusted in response to the

birds' behaviour by seeing how easily birds can get on and off perches and move between them. All birds should be able to perch at the same time and every adult bird should be allowed 15 cm of perch at each level.

Especially during the establishment of groups, birds should also be briefly observed during dark periods to confirm that all individuals are roosting. Chickens possess a locking mechanism in their legs that allows them to sleep whilst perching.

Other environmental enrichment to be considered for birds are the provision of scratching areas, dust bowls, water baths, pecking blocks, mirrors and toys.

Laying hens should have access to nest boxes from at least two weeks before coming into lay and no later than 16 weeks of age. Single- or pair-housed birds should each have access to a nest box, with a ratio of at least one nest box per two birds provided in larger groups. Nest boxes should be enclosed and large enough to allow one hen to turn around. A loose substrate such as wood-shavings or straw should be supplied within nest boxes to promote nesting behaviour. Substrate should be regularly replaced and kept clean.

Recommendations for the care of domestic poultry are covered in detail by the DEFRA guide:

Codes of Recommendations for the Welfare of Livestock – Poultry

Handling and restraint

Chicks and young birds up to 7 weeks of age: Approach quietly and place a hand over the bird's back and gently restrain the wings firmly against the body. Once held in this fashion, turn your hand over, so that the chick is restrained on its back.

Adult birds are most easily caught by placing a hand on the back and restraining the wings. Lift the bird by supporting under the body and restrain the bird by pulling it against your chest. Once restrained, your hands can then be transferred to take hold of both of the legs, to support the birds weight

WARNING: Do not catch any bird by the legs, as this will lead to flapping of the wings with possible damage to the bird or the handler.

Personal safety

Trauma: Domestic chickens are normally docile and do not usually present a threat to handlers. However, they can peck, scratch or hit out with their wings, so caution is required. Larger birds, such as geese, and wild birds may be more aggressive.

Allergy: Dust and dander from domestic poultry may present a risk to people with respiratory infections.

Zoonoses: Domestic poultry suffer from a number of diseases that are communicable to man.

- **Campylobacter:** This bacterium does not cause disease in poultry, but is capable of causing food poisoning in humans.

- **Salmonellosis:** The *Salmonella* bacterium does not usually cause disease in poultry, but some species can cause very serious illness in humans. Most cases of salmonellosis aquired from chickens in humans are caused by *S. Enteritidis* or *S. Typhimurium.*

- **Ornithosis (Psittacosis):** This is a serious, potentially fatal, respiratory disease of humans that can be carried by many types of birds, including domestic poultry, pigeons, sparrows and gulls, together with all types of psittacine birds (parrots). It is caused by the bacterium *Chlamydophilia psittaci*

- **Avian influenza:** In 2007, 3 cases of highly pathogenic avian influenza H5N1 were detected in outbreaks in Suffolk and Norfolk, whilst in 2008 there was an outbreak on a poultry farm in Oxfordshire. Although AI is a disease primarily of birds, there have been a number of human cases, mostly in south east Asia, in people that have been closely associated with infected birds.

Signs of health in chickens

It is essential to be able to recognise sick birds, so that appropriate action can be taken to alleviate suffering. Sick birds can usually be identified because they are inactive and adopt a hunched appearance with ruffled feathers. The indicators of good health are as follows:

Appearance

Comb – colour and size; look for changes
Eyes – should be bright and clear
Gait - alert and upright with clean legs
Feathers – smooth and shiny
Tail - carried correctly
Breathing - not laboured and with no oculo-nasal discharges
Droppings - firm and dark with white tip. No faecal staining around cloaca
Bodyweight - correct for age and breed.

Behaviour

Birds should be calm and contented, but not silent. In general, the birds should appear undisturbed by your presence or even actively approach you.
Feeding and drinking normally
Laying (if hen of a suitable age)
Putting on weight(still growing to around 18 weeks of age)
Moving freely and interacting with others
Preening and perching
Dustbathing or sunbathing
Sparring or mock fighting – particularly in young birds

Aggression

High levels of aggressive behaviour and injurious feather pecking can result in extensive feather loss and painful injury, with the added risk of cannibalism. They will also increase the general level of stress and fear among the birds. This may prevent all birds being able to access all facilities, e.g. nest boxes and popholes.

Dirtiness

Under normal circumstances healthy birds keep themselves clean. They will avoid dirty areas and carry out regular preening. Dirt around the vent can indicate diarrhoea. Dirt on the feathers might indicate inadequate litter quality, a wet and muddy outside run and/or poor design of the perching/nesting area. It is a potential source for spreading disease and of relevance for general hygiene and bird wellbeing.

Assess and score 5 birds in each of 10 different areas of the house and/or range. Visually assess one side of the bird, except the feet and legs.

0 = Clean
The bird is clean

1 = Moderate dirtiness
There is soiling on at least one part of the bird but no area ≥ 5cm maximum dimension

2 = Substantial dirtiness
There is soiling on one or more parts of the bird ≥ 5cm maximum dimension

Beak Trimming

Defra proposes that beak trimming should be banned in or before 2016. Commercial producers are now urged to work towards keeping laying hens without beak trimming and the practice should be unacceptable in research birds.

Feather Loss

Feather loss can be a result of a number of factors, but the location of the feather loss on the bird can help to provide an indication of potential cause.

Loss of feathers to the **back and vent** areas usually indicate feather pecking. The causes of feather pecking are multifactorial but can include breed, nutritional imbalance, housing issues, poor range use and rearing conditions. Feather pecking can be very painful and can result in severe injury, sometimes even cannibalism and death - The resulting poor feather cover can lead to thermal discomfort (cold/sunburn) and reduced productivity. It is understood that the birds carrying out feather pecking are in a stressed state leading them to start this behaviour.

Loss or damage to feathers on the **head and neck** may indicate aggressive pecking, often aimed at the head and with the potential to lead to further injury, or mechanical damage, caused by failings of the equipment or housing set-up.

Visually assess and score 5 birds in each of 10 different areas of the house. Score separately for the head and neck area and the back and vent area.

0 = No or minimal feather loss
No bare skin visible, no or slight wear, only single feathers missing

1 = Slight feather loss
Moderate wear, damaged feathers or 2 or more adjacent feathers missing up to bare skin visible < 5cm

2 = Moderate/Severe feather loss
Bare skin visible ≥ 5cm maximum dimension

Sick Birds
Sick birds obviously require additional attention to ensure that any suffering is alleviated as soon as possible. Early recognition, treatment or culling of sick birds is the key to reducing any potential welfare compromise. Birds with fluffed up feathers and an inactive, unresponsive appearance and birds with body wounds that have fresh blood that might attract cannibalistic attention from other birds must be separated or euthanased.

Mortality
Levels of mortality should always be recorded. These will be higher in very young chicks, where mortality of up to 5% may occur in the first week of life.

Diseases of poultry

There are a number of diseases of poultry that you should be aware of.

Bacterial:
Campylobacter
E. coli
Haemophilus paragallinarum
Mycobacterium avium
Mycoplasma gallisepticum, synoviae
Salmonella pullorum, gallinarum, enteritidis, typhimurium

Viral:
Avian influenza *
Newcastle disease *
Avian leucosis
Infectious bursal disease
Infectious laryngotracheitis
Mareks disease

Fungal:
Aspergillosis
Mycotoxicosis

Parasitic:
Coccidiosis
Nematode worms
Histomoniasis
Ectoparasites

Nutritional: Rickets

* Newcastle disease and Avian Influenza are Notifiable diseases under the Animal Health Act, and suspicion of either disease must be notified immediately to DEFRA.

Vaccines
There are a number of vaccines available for use in chickens to protect against viral and bacterial diseases. In addition, there is one vaccine which will protect against coccidiosis. However, these vaccines are produced for commercial chickens and can often only be purchased in minimum quantities of 100,000 doses, making them uneconomic for small flocks..

Minor procedures

A) IDENTIFICATION

Non-invasive or minimally invasive methods such as noting physical differences, ringing with either closed or split rings and staining or dyeing the feathers are preferable to more invasive techniques such as electronic tagging or wing tagging.

- ***Wing tags.*** These may be metal or plastic, and may be numbered and or coloured. They can have the disadvantage of catching on projections in the accommodation and being pulled out.
- ***Leg bands.*** These are usually of expandable plastic, which will allow for leg growth and can easily be removed. They may be closed or split.
- ***Non-toxic dye*** or marker pen can be used as a temporary system of identification**.**

Combinations of coloured leg rings minimise handling for identification, although due regard should be paid to any potential impact of colours on behaviour in some species. When using rings as temporary marking for rapidly growing chicks, regular checking is essential to ensure that the ring is not impeding the growth of the leg.

Highly invasive marking methods such as toe-clipping or web-punching cause suffering and should not be used.

B) ADMINISTRATION OF SUBSTANCES

The commonly used routes for the administration of substances are given below. Needle sizes are a guide only and the smallest needle possible should be used taking into account the procedure, the size of the bird and the viscosity of fluid to be administered.

ROUTE	APPROPRIATE NEEDLE SIZE
Intra-venous	25 gauge x ½ inch
Intra-muscular	23 gauge x 5/8 inch
Sub-cutaneous	23 gauge x 5/8 inch
Oral	16 or 18 gauge with “pear-drop” end
Chick embryo	27 gauge x ½ inch

1) Intravenous

a) Wing vein: The wing vein (brachial vein) is found on the underside of the wing, running across the surface of the humeral–radio–ulnar joint, directly beneath the skin. Blood removal must be carried out carefully to minimise haematoma formation. The blood may be collected directly into a micro-hematocrit tube.

b) Jugular vein: The jugular veins run either side of the neck. Featherless track of skin overlie the vein and can help identification of their position, although they can be quite moveable in position.

c) Medial metatarsal vein: This is situated on the medial side of the leg.

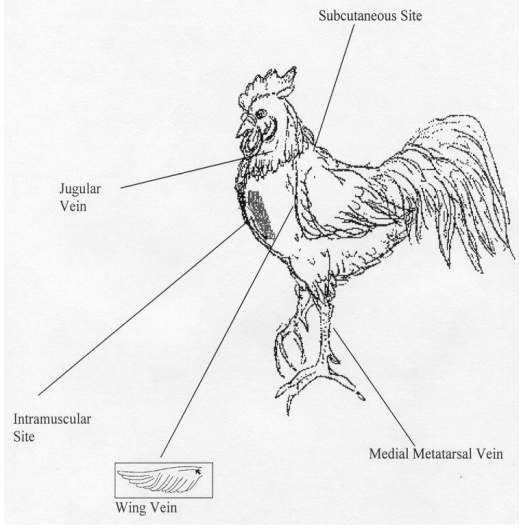
d) Cardiac puncture: This can only be used as a terminal procedure under general anaesthesia. The heart is approached from the neck by inserting a needle along the ventral floor of the thoracic inlet, avoiding the crop.

2) Intramuscular: This is usually performed in the breast muscle, which is situated on either side of the sternum. The thigh muscle may also be used.

3) Subcutaneous: This is usually performed under the skin of the thorax, between the wings

4) Oral: Oral dosing is performed using a needle with a pear-drop end.

5) Intranasal: Substances may be dropped into the nares or inhaled via an insufflator.



Management of pain

Responses to pain in birds are more subtle than with most other species, which can make their recognition more difficult. There are few behavioural signs of pain and chickens may sometimes appear normal, and yet be found to have quite advanced pathological changes at a subsequent post-mortem.

Birds in pain or diseased often adopt a hunched posture, and can display “wing droop”. The feathers become “ruffled”, which may be exacerbated by lack of grooming and the bird will separate itself from the cage mates. If groups of birds are affected, then “huddling” will occur.

Unfortunately, the body temperature of birds is not easily measured and can also difficult to interpret. Similarly the heart rate is stimulated by handling and therefore unreliable.

The respiratory rate can give a good indication of distress in birds. Changes in depth and rate can be observed and birds can “mouth breathe” if they are too hot, or have respiratory disease. This may be accompanied by an ocular or nasal discharge, and in some cases by swelling of the nasal sinuses.

With severe pain, birds may develop a catatonic response, becoming immobile and totally unresponsive.

With chronic pain, there is usually a loss of appetite and weight, which can best be measured by weighing the bird regularly.

Unfortunately, there is little known about analgesia in birds as no clinical trials have been undertaken. Current recommendations suggest the use of buprenorphine (vetergesic), butorphenol (torbutol) or flunixin (Finadyne). Flecknell – Laboratory Animal Anaesthesia 2000).

Avian anaesthesia

Anaesthesia in chickens, or any other avians, presents a number of difficulties and carries greater risks than with most of the mammalian species.

Heat loss
Birds have higher metabolic rates and higher temperatures than mammals of equivalent size. The higher temperatures mean that there is a greater difference between the core temperature of the bird and the environment, which leads to greater heat loss during anaesthesia. With small birds, the high ratio of surface area to body weight will also increase the heat loss, so with these it is particularly important to minimise loss of heat during anaesthesia by maintaining a high environmental temperature and providing insulation. Avoid removing large numbers of feathers.

Starvation
For birds under 1 kg, starvation should be avoided, as the high metabolic rate may induce hypoglycaemia. Larger birds may be fasted pre-anaesthesia. In birds with a crop, this must be empty before anaesthesia is induced.

Respiratory system
The respiratory system of the bird differs from that of mammal, by having a series of air sacs which connect with the lungs. The presence of these air sacs may allow a build-up of anaesthetic gases in the dependant areas of the respiratory system, with consequent over dosage. This is not usually a problem, provided it is remembered that the induction of anaesthesia in birds is rapid and so the concentration of anaesthetic agent must be reduced early.

Handling and positioning
Always handle birds gently, taking care not to obstruct respiration, as even short periods of apnoea can result in hypoxia. Positioning under general anaesthesia has a major bearing on respiratory efficiency. In dorsal recumbence, the viscera are pushed anteriorly, compressing the abdominal and thoracic air sacs, and so compromising respiration. Lateral recumbence is the best position for respiration in the anesthetised bird. Avoid taping the wings and legs in full extension, as this can inhibit both respiratory movements and venous return.

Preparation

Analgesia should be given before recovery surgery. The following agents may be used:

- Butorphanol (Torbugesic) 1-2mg.kg i/m — Opioid analgesic – good for surgical pain
- Meloxicam (Metacam) 0.5-1mg/kg i/m — NSAID – good for chronic pain
- Ketoprofen (Ketofen) 2mg/kg im — NSAID – good for chronic pain
- Midazolam (Hypnovel) 0.2-0.5mg/kg — Hypnotic agent – anti-anxiety drug

Induction of anaesthesia

Induction may be by injection or inhalation.

a) Injectable agents

These are best given intra-venously, via the brachio-cephalic or jugular veins. The following are the agents of choice in birds:

1) **Propofol** is a short-acting anaesthetic giving 5-10 minutes anaesthesia, with very rapid recovery. It is most useful as an induction agent, where it gives long enough anaesthesia to allow endotracheal intubation, with the bird subsequently being maintained with an inhalation agent.

2) **Alphaxalone:** Alphaxalone (Alfaxan) is another safe anaesthetic agent in birds. It is usually given by i/v injection, but can also work if given i/m, although the effects are much more variable. It is rapidly metabolised and excreted via the liver, to give a relatively quick recovery with few side effects. It gives approximately 20 minutes of surgical anaesthesia, which can be extended by incremental dosing without increasing the recovery time.

3) **Ketamine and xylazine:** This combination can be used in birds, given by i/m or s/c injection.

b) Inhalation agents

The anaesthetic of choice for birds is **Isoflurane** (various trade names). Other more recent volatile anaesthetic agents (Sevoflurane, Desflurane), may have indications in specific procedures.

Small birds may be induced using isoflurane by placing them in a chamber, similar to that used for mice and rats. Larger birds can be induced using a mask, with the bird restrained in towel, providing capture and restraint are carried out smoothly to avoid undue stress. An anti-anxiety drug given beforehand, such as Midazolam, will make this safer. Use Isoflurane at 4-5% to induce, but reduce to 2-3% once the bird is unconscious. Anaesthesia is usually achieved in about 60 seconds.

Note that waterfowl can have long periods (5 minutes) of breath-holding, known as the dive response. This is potentially dangerous, but can be reduced by the prior use of anxiolytic drugs.

Endotracheal intubation

Birds weighing more than 200 grams should always be intubated. The glottis is readily visible in the unconscious bird, and it is straightforward to introduce an endotracheal tube. Don't use "cuffed" tubes, as these may cause damage and take care not to push the tube too far down, as the trachea narrows distally. Keep the neck straight while intubating.

Monitor anaesthesia as for other species. The heart rate for a 1kg chicken should be 156 beats/minute.

Post-operative care

When the procedure is complete, the bird should be given 100% oxygen for a period. The rate and depth of respiration should gradually increase. If recovery is slow, moving the wings in and out can assist respiration.

Birds should recover in a temperature of 40ºC (35ºC for those over 250 grams). The recovery area should be quiet with subdued lighting. Many birds experience delirium during recovery and can flap their wings vigorously, leading to injury. A towel or temporary bandage around the wings will help to stop injuries due to wing flapping.

Most birds will eat within a short time of recovery, if they are in a warm, quiet, stress-free and dark environment. If they are not eating, then tube feeding may be necessary.

Humane methods of killing poultry

Schedule 1 methods

Those methods of humane killing listed in Tables A and B below are appropriate for the animals listed in the corresponding entries in those tables only if the process of killing is completed by one of the methods listed in subparagraphs (a) to (f) below:

(a) confirmation of permanent cessation of the circulation
(b) destruction of the brain
(c) dislocation of the neck
(d) exsanguination
(e) confirming the onset of rigor mortis
(f) instantaneous destruction of the body in a macerator.

A requirement in Table A for prior use of a sedative or anaesthetic:

(a) is subject to sub-paragraph (2); and
(b) is not to be read as prohibiting the prior use of sedative or anaesthetic in any cases where it is not required by that Table.
(2) Nothing in this Schedule requires or permits the prior use of sedative or anaesthetic where the distress likely to be caused by administering it is greater than the distress likely to be caused by using the appropriate method of killing without sedative or anaesthetic.

TABLE A - Mature forms

1) Overdose of anaesthetic, using a route and anaesthetic agent appropriate for the size of the bird. (All birds)
2) Exposure to carbon dioxide in a rising concentration (Birds up to 1.5kg)
3) Dislocation of the neck - with the prior use of a sedative or anaesthetic in the case of birds over 250 grams (Birds up to 1kg)
4) Concussion of the brain by striking the cranium (Birds up to 250 grams)

TABLE B - Embryonic forms

1) Overdose of anaesthetic, using a route and anaesthetic agent appropriate for the size and stage of development of the bird.
2) Refrigeration, or disruption of membranes, or maceration in apparatus approved under appropriate slaughter legislation, or exposure to carbon dioxide in near 100% concentration until they are dead.
3) Decapitation (birds up to 50 grams)

Some normal biological values for chickens

Natural life span	5-10 years
Commercial life span	Layers 1-2 years : broilers 32-70 days
Adult weight (laying female)	1.3 – 3.6kg
Broiler weight at 5-10 weeks	2 - 4kgs
Normal body temperature	41.5^{o}C (41-43 ^{o}C)
Heart rate	200 - 250 per minute
Respiratory rate	15 - 25 per minute
Incubation period	20 - 22 days
Hatching weight	50 -70g
Point of lay	18 - 24 weeks

FURTHER READING

1) Council of Europe ETS123 Appendix A – Guidelines for Accommodation and Care of Animals

2) Poultry Health and Management: David Sainsbury ISBN: 0-632-05172-8

3) Poultry Diseases: Pattison, McMullin, Bradbury, Alexander ISBN: 978-0-7020-2862-5

4) The Management and Welfare of Farm Animals: J Webster ISBN 978-1-4051-8174-7

5) Animal Health – Health, Disease and Welfare of Farm Livestock: D. Sainsbury

Blackwell ISBN0-632-03888-8

Useful web sites

- www.thepoultrysite.com General information on poultry diseases and management
- www.defra.gov.uk/ - Information on import/export, and notifiable diseases