Birds (Domestic Poultry)

1

Introduction to poultry

- Domesticated birds kept for the production of meat or eggs
- Mainly chickens
- Poultry flocks >50 birds must be registered

2

Research importance

147,000 birds were used in regulated procedures in the UK in 2018 (8%)

139,882 chickens (95.2%)

6,978 other birds

- turkeys
- quail
- waterfowl
- wild birds

3

Research importance

- Birds are used in broad range of research
  - Production of biological materials (chicken and turkey vaccines)
  - Investigation of avian diseases
  - Fundamental research
  - Developmental studies
  - Ecotoxicology
  - Psychology or zoology research (most of the 'other bird' species)

4

Sources of birds

- **Poultry for use in research may be purchased from any commercial supplier.**
- Fertilised eggs or day-old chicks?
- High health status vs conventional status with unknown pathogen load.
- Parent flock should be healthy and free of egg-transmitted diseases e.g.
  - Mycoplasma
  - Salmonella
  - Chick anaemia virus
- **Always establish the health and vaccinal status of the supply flock.**

5

General avian biology

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Some anatomical features of birds

- Feathers
- Scaly legs
- No diaphragm
- No teeth or lips
- No bladder
- No sweat glands
- Only one ovary
- Lightweight bones
- Air sacs
- 11-25 cervical vertebrae
- Lay eggs

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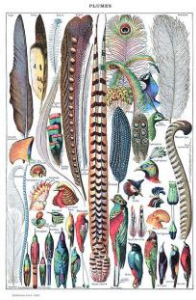
Feathers



Functions

- Flight
- Insulation
- Camouflage
- Courtship
- Seasonal moult - usually spring, often at times of egg laying

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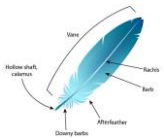
Feathers

- **Contour** – large feathers, on the outside
- **Down** – soft insulating feathers
- **Semiplume** – combination of contour and down
- **Filoplume** – hair-like, thin, short barbs
- **Bristle** – around head and neck – have a tactile function



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Skin

Thin skin

Beak, claws, spurs

No lips, teeth or eye lashes

Comb and wattles

Preen or oil gland

Brood patch

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Skeletal system

- Light, strong skeleton
- Pneumatic bones with thin cortices – brittle
- Forelimbs modified as wings
- Large keeled sternum and pectoral girdle
- Fused thoracic vertebrae and limb bones
- Long neck – many cervical vertebrae

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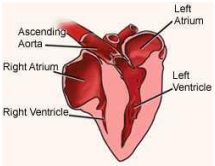
Cardio-vascular system

- Large heart - high metabolic rate
- Heart rate 200-250 beats/minute
- Nucleated red blood cells (cf mammals)
- Control blood flow to lower legs and feet



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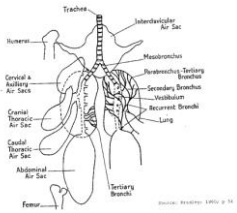
Respiratory system

- No diaphragm
- Two non-lobar lungs
- 9 air sacs – act like bellows
- Oxygen exchange only in lungs
- No diaphragm



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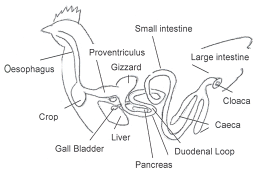
Digestive system

- No soft palate
- Oesophageal dilatation – crop
- Two part stomach:
- 1) proventiculus
- 2) ventriculus (gizzard)
- Short colon, two very large caecae



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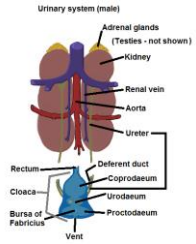
Urinary System

- No bladder :
- ureters open directly into cloaca
- No urine: urate paste, high in uric acid, low in water
- Urate paste deposited as white cap on faeces
- Cloaca – has an urogenital function



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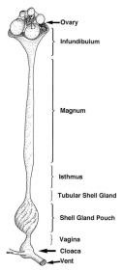
Reproductive system

- Male
  - intra-abdominal testes
  - heat resistant semen
  - males are homogametic (XX)
- Female
  - single ovary and oviduct – left side
  - egg development along oviduct
  - Heterogametic (XY)



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Visual system

- Vision is the dominant sense for many birds
- Large, flattened eyes
- Wide field of vision (330º)
- Can perceive part of the U/V spectrum

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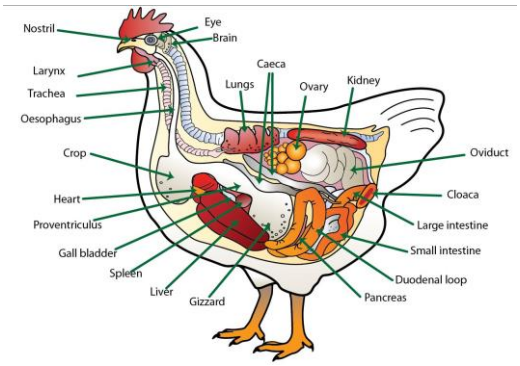

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Physiology

- **High body temperature – 41.5 – 42.50 C**
- High basal metabolic rate – heart rate 200-250/min
- High proportion of red fibres in muscle
- Very susceptible to stress
- Calmed by dimmed lighting

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Domestic chickens

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The domestic chicken

The bird that gives birth every day

Red Jungle Fowl
Gallus gallus

Domestic chicken
Gallus gallus domesticus

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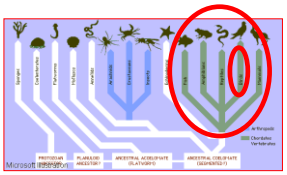
The domestic chicken

Kingdom	Animalia
Phylum	Chordata
Class	Aves
Order	Galliformes
Family	Phasianidae
Genus	*Gallus*
Species	*Gallus gallus (domesticus)*



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Poultry

- Galliformes:
  - Chickens and turkeys
  - Quail, pheasants, partridges
  - Guinea fowl
- Anseriformes:
  - Waterfowl (Ducks, geese)
- Members of these 2 orders also known as FOWL
- Columbiformes: Pigeons
- Struthioniformes: Ostriches

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The Domestic Chicken

- Breeds
- Mostly hybrid lines
- E.g. Light Sussex
- Rhode Island Red
- Various rare breeds
- Inbred lines/KO lines
- Lines vary in responses

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Husbandry

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Adults

- Domestic chickens are social animals.
- Groups of 5-20 birds.
- They form social structures, communicating by calls, contacts and visual demonstrations.
- 'Pecking order' is established.
- Care when regrouping

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Natural behaviour

- In natural conditions, chickens spend up to 90% of their time foraging.
- They also sunbathe, dust-bathe, perch, run about the yard, and socialize in small groups.
- Hens scratch out nests in the straw in which to lay their eggs.
- Outdoor access if possible
- Floor pens vs cages

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Housing

Floor pens vs cages

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Environment

Temperature	**15-25°C**
Humidity	40-80%
Light Levels	>20 Lux
Noise Levels	< 50dB
Ventilation	15-20 air changes per hour
Photoperiod	10 hours dark:14 hours light

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Light

- Chickens often kept in low light to reduce feather pecking
- Dawn and dusk
- Photoperiod, light intensity and dawn/dusk influence egg laying.

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Litter management

- Wood shavings or straw.
- Correctly managed litter should be dry and friable.
- However, if drinker management or ventilation is poor, litter can become wet or consolidated.
  - Bird droppings remain on top of the litter
  - Soiling of the birds, scabby hocks and breast blisters
  - Predispose to respiratory infections

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Chick rearing

- Poor thermoregulation - temperature and humidity important
- After hatching, house in brooder
- Reduce temperature over 5-6 weeks
- 16 hours light daily
- **Solid floors**

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

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Chick rearing

- Birds should distribute in an O around the brooder lamp
- Can use a brooder guard
- Weigh weekly:
  - 7 d = 140-150 g
  - 14 d = 250- 400 g
- 10 days
  - Change feed at
  - Increase ventilation
  - Lower temperature

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Nutrition

- Poultry are omnivorous
  - vegetable matter, insects and earthworms.
- Presentation of food depends on the age and status of the bird, e.g. broiler (for meat), chicks, or layers
- Adult chickens consume typically 125-250g food/day, and drink 200-300ml water/day
- Cereal based, with added protein, oils, vitamins and minerals.eg. layers pellets 4% oil, 10-17% protein, and 5-7% fibre
- Crumbs for young chicks (<3-4 weeks) higher in protein
- Sensitive to abrupt diet changes – make changes gradually

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Feeding young birds

- **First 4-5 days - chicks absorb yolk sac.**
- Must learn to eat as this reduces. If not – 'starve out' = common cause of mortality in the first week of life.
- Feed small readily accessible crumbs with plenty of space to feed (5cm/chick).

- Growing birds – rapid growth can lead to bone malformations. May restrict feed.

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Water

- Fonts or automatic drinkers.
- Drinker management is important.
  - Chicks - ground level. Allow 1.5cm/chick.
  - As birds grow, **raise drinkers to head height** and increase drinker length to 2.5 cms/bird.
  - If nipple or cup drinkers 1 nipple (or cup) per 3-4 birds, with a minimum of 2 in each enclosure.
  - Leaking and overflowing drinkers must be avoided.

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Reproduction

- Seasonal breeding – start in spring, stop in autumn
- Females begin egg laying from 18 weeks, males produce semen from 8 weeks
- Females lay daily until clutch size 12-13 then incubate all at once.
- Fertilisation in infundibulum – females can store sperm.
- Egg production in oviduct takes 24 hours.
- Incubation – 21 days (28 in turkeys and ducks)
- Incubate with pointed end down and turn regularly until 1–3 days before hatching, or embryo may stick to the shell.
- Adequate ventilation needed.

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Environmental enrichment

- Motivated to perform 'comfort behaviour' – flapping stretching
- Solid floors, substrate to encourage foraging
- In cages – solid area with substrate, Astro turf
- Pecka blocks, rope, string
- Baby and parrot toys, egg trays filled with food (powdered for young chicks)
- Perches - roosting is an important behaviour. Enough for all birds
- Dust baths to encourage preening
- CDs - draw the birds attention to the light
- Nest boxes for laying hens

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Behaviour

- Chickens retain much of the behaviour of Jungle fowl.
- Important behaviours are nesting (females), perching, foraging, scratching, pecking and dust-bathing.
- Chickens are ground dwelling birds that cannot fly more than a few feet.
- Flock animals that spend a considerable part of the day foraging.
- **Failure to provide for these behavioural needs leads to abnormal behaviour and poor welfare**
- Many problems associated with inappropriate pecking
  - Own feathers or skin, or another chicken's
  - Misdirected foraging behaviour in poor environment, or genetic

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Prevention of feather pecking

- **Improve the environment**
- E.g. Pecking substrate
- Lower light intensity

- De-beaking – laying hens under 10 days

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Recognition of pain and distress in birds

Healthy birds are active and alert with smooth feathers, red comb and wattles

- **Appearance**
  - Comb – bright red and upright.
  - Eyes – 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**
  - Calm and contented, but not silent.
  - undisturbed by human presence or actively approach.
  - Feeding and drinking normally
  - Laying (if appropriate)
  - Putting on weight (<18 weeks)
  - Moving freely and interacting with others
  - Preening and perching
  - Dustbathing or sunbathing
  - Sparring or mock fighting – young birds

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Sick birds

- Signs can be subtle – overtly sick chickens often have advanced disease
- Behaviour — Isolated from group
- — Inactive/unresponsive
- — Catatonic (severe pain)
- Feather condition — Feathers ruffled
- — Feathers groomed
- — Feather loss
- — Feather discolouration
- Body condition — Poor growth, eating and drinking?
- Other — Not laying, clinical signs
- — Mortality – 5% in first week
- Can score birds for faecal soiling or feather loss

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Respiratory system

Coughing (snicking)

Sneezing

Mouth breathing

Oculo-nasal discharge

Swollen sinuses

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Gastro-intestinal system

Diarrhoea – bacterial
viral
parasitic

Bloody diarrhoea

Dehydration

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Locomotor system

Lameness

Posture and gait

Wing droop

Head tilt

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Diseases of poultry

- Infectious diseases 1) Bacterial:
-
- Salmonella
- E. coli
- Campylobacter
- Staphylococcus
- Klebsiella
- Mycoplasma
- Psitacosis

Care – some are zoonotic

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Diseases of poultry

- Infectious diseases: 2) Viral:
- Newcastle disease - NOTIFIABLE
- Avian influenza (AI)
- Infectious bronchitis (IB)
- Avian metapneumovirus (Swollen head syndome)
- Infectious bursal disease (IBD or Gumboro disease
- Infectious laryngo-tracheitis (ILT)
- Mareks disease (MD)
- Chick anaemia virus

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Diseases of poultry

- Infectious diseases
- 3) Fungal Aspergillosis
- 4) Parasitic Coccidia
- Ascarid worms
- Red mites
-

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Vertically transmitted diseases

Agent	Vertical transmission
Avian adenoviruses, group 1	Yes
Avian encephalomyelitis virus	Yes
Avian infectious bronchitis virus	No
Avian infectious laryngotracheitis virus	No
Avian leucosis viruses	Yes
Avian nephritis virus	No
Avian orthoreoviruses	Yes
Avian reticuloendotheliosis virus	Yes
Chicken anaemia virus	Yes
Egg drop syndrome virus	Yes
Infectious bursal disease virus	No
Influenza A virus	No
Marek's disease virus	No
Newcastle disease virus	No
Turkey rhinotracheitis virus	No
Mycoplasma gallisepticum	Yes
Mycoplasma synoviae	Yes
Salmonella pullorum	Yes

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Diseases of poultry

- Non-infectious diseases
- Musculo-skeletal - splayed legs, ruptured tendons, fractures
- Nutritional - rickets, crop impactions
- Reproductive - egg impaction
- Behavioural - feather pecking, fighting

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Control of disease

- 1) Vaccinations: Infectious Bronchitis
- Gumboro disease (IBD)
- Swollen head syndome (aMPV)
- Mareks Disease
- Newcastle disease
- Coccidiosis
- Salmonellosis

- 2) Anti-coccidial medication

- 3) Antibiotic medication

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Handling and Restraint

- Approach quietly, and place a hand on the back
- Place second hand under the body and lift
- Enclose the wings and support all the bird's weight
- Hold the bird close to your body to stop struggling
- Then take hold of both legs to support the body.
- Bone breaks, dislocations and bruising are common injuries

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Poultry Handling

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Minor procedures

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Routes of Administration

Intravenous injection

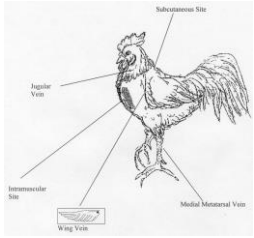
Intramuscular injection

Subcutaneous injection

Intraperitoneal injection

Oral gavage

Cloacal



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Needle selection

- Consider:
  - Route of administration – Intramuscular needs longer needle than subcutaneous
  - Viscosity of liquid – thicker substances need larger needle bore
  - Age and size of bird
  - Examples:
  - IM injection in adult poultry – 5/8th inch + 23G
  - Subcut injection 3/8th inch + 23G

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Intravenous

- Wing vein (brachy-cephalic)
- Jugular vein
- Medial metatarsal vein

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Cardiac puncture

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Intramuscular

- Breast muscle
- Thigh muscle

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Subcutaneous

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Identification

- Wing Tagging
- Leg Banding
- Cage Labelling (Individually Housed Birds)
- Spray Markers (Temporary Marking Only)
- NB Identification of birds is not a regulated procedure.

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Anaesthesia

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LO: 5.2

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Anaesthetic Risks in Birds

- Rapid heat loss
- Hypoglycaemia/starvation – avoid fasting <1kg. Crop should be empty
- Respiratory system – overdose easy
- Handling and positioning – care not to obstruct chest wall. Lateral recumbence best.
- Post-operative care

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LO: 20.6

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Anaesthesia in birds

- Preparation – pre-surgical analgesia mandatory
  - Butorphanol is the analgesic of choice
- Induction: inhalation or injection
  - Isoflurane is the anaesthetic of choice
  - Alphaxalone i/v is a safe injectable agent
  - Ketamine/xylazine i.m.
  - Endotracheal intubation advised for birds >200g
- Keep birds warm and dark in recovery period

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LO: 20.11

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Monitoring anaesthesia

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LO: 20.12

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Post operative recovery

- 100% oxygen initially
- Keep them warm – 40ºC
- Keep them in the dark
- Tape the wings
- Remove cage furniture (perches etc)
- Encourage eating asap

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Euthanasia

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Schedule 1 methods

- HATCHED BIRDS
- 1) Overdose of anaesthetic using a route and agent appropriate for the size and species of animal
- 2) Dislocation of the neck (**up to 1kg**), and using prior sedation in birds over 250 grams
- 3) Exposure to CO_2 gas in a rising concentration (up to 1.5kgs)
- 4) Concussion of the brain by striking the cranium (up to 250g)

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Schedule 1 methods

- EMBRYOS
- 1) Overdose of anaesthetic using a route and agent appropriate for the size and species of animal
- 2) Refrigeration, or disruption of membranes, or maceration in an apparatus approved under appropriate slaughter legislation, or exposure to CO_2 in near 100% concentration until they are dead
- 3) Decapitation (up to 50g)

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Completion of death

1) Permanent cessation of the circulation
2) Destruction of the brain
3) Dislocation of the neck
4) Exsanguination
5) Onset of rigor mortis
6) Instantaneous destruction of the body in a macerator

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Useful Data

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 - life-span to slaughter	5-10 weeks
Broiler weight at 5-10 weeks	2 - 4kgs
Normal body temperature	41.5 – 42.5ºC
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

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