



## The Life of: Broiler Chickens

**Chickens reared for meat are called broilers or broiler chickens.** They originate from the jungle fowl of the Indian Subcontinent. The broiler industry has grown due to consumer demand for affordable poultry meat. Breeding for production traits and improved nutrition have been used to increase the weight of the breast muscle. Commercial broiler chickens are bred to be very fast growing in order to gain weight quickly.

In their natural environment, chickens spend much of their time foraging for food. This means that they are highly motivated to perform species specific behaviours that are typical for chickens (natural behaviours), such as foraging, pecking, scratching and feather maintenance behaviours like preening and dust-bathing. Trees are used for perching at night to avoid predators.

The life of chickens destined for meat production consists of two distinct phases. They are born in a hatchery and moved to a grow-out farm at 1 day-old. They remain here until they are heavy enough to be slaughtered. This document gives an overview of a typical broiler chicken's life.

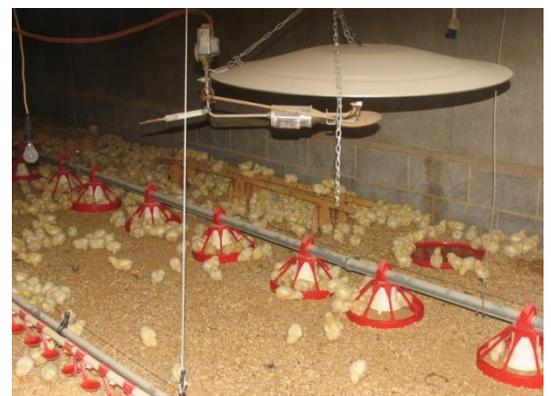
### The Hatchery

The **parent birds** (*breeder birds - see section at the end*) used to produce meat chickens have their eggs removed and placed in an **incubator**. In the incubator, the eggs are kept under optimum atmosphere conditions and highly regulated temperatures. At 21 days, the chicks are ready to hatch, using their egg tooth to break out of their shell (in a natural situation, the mother would help with this). Chicks are **precocial**, meaning that immediately after hatching they are relatively mature and can walk around. A chick classified as a 'day-old chick' is up to 72 hours old (this is when the yolk sac in the egg runs out). At present, chicks destined for organic systems are not treated differently until they get to the grow-out farm.

Chicks need extra heat and high humidity during the first weeks of life. Newly hatched chicks require ambient temperatures of 89.6°F to 95°F and relative humidity of 60% to 70%, which can be difficult to achieve at these high temperatures.<sup>1</sup>

### Vaccination

The modern broiler reaches slaughter weight within several weeks. This leaves little time to develop a mature immune system. Therefore, broiler chicks (including organic chicks) are vaccinated against several different diseases. Some infectious pathogens (such as *Salmonella*) can also be transmitted via the egg (vertical transmission) from the breeder hen to the chick. The breeder hen should therefore also be vaccinated. The most common vaccines used are against Newcastle disease virus, infectious bronchitis virus, coccidiosis, avian pneumovirus, infectious bursal disease, and Marek's disease.<sup>2,3</sup> Vaccines are typically delivered via spraying, drinking water, in-ovo, or injection (subcutaneous most common route). Spray vaccination is the preferred and most effective administration technique for respiratory type vaccines.



Day-old chicks in a littered barn, with a controlled atmosphere for humidity and temperature control.



## Transport of Chicks

When broiler chicks are a day-old, they are transported in transport modules (or chick boxes) from the hatchery to the farm. Chicks travel along a conveyor belt and are dropped into transport boxes or modules. During this process the chicks are immunized with spray and/or subcutaneous vaccinations (e.g., Marek's disease vaccination injected at hatch if not done in-ovo).<sup>2</sup>

There are some scientific guidelines dictating the optimal environmental conditions (i.e., temperature, ventilation) for the transport of day-old chicks.<sup>4,5</sup> Unlike older birds, newly hatched chicks are unable to regulate their body temperatures so are especially susceptible to thermal stress during transport. Maximum journey times for chicks continues to be debated. Newly hatched chicks are initially sustained by energy and water reserves from the yolk sac for a period of time after hatching, but chick survivability is greatly reduced as the time to first feed and water access increases.<sup>4,5</sup> However, new on-farm hatching systems are now available commercially – such as the Vencomatic group's X-Treck system, which allows chicks to access feed and water immediately after hatch and avoids the need for transport.



Broiler chickens are transported twice in their lives, as day-old chicks (pictured) and as adults to the slaughterhouse.

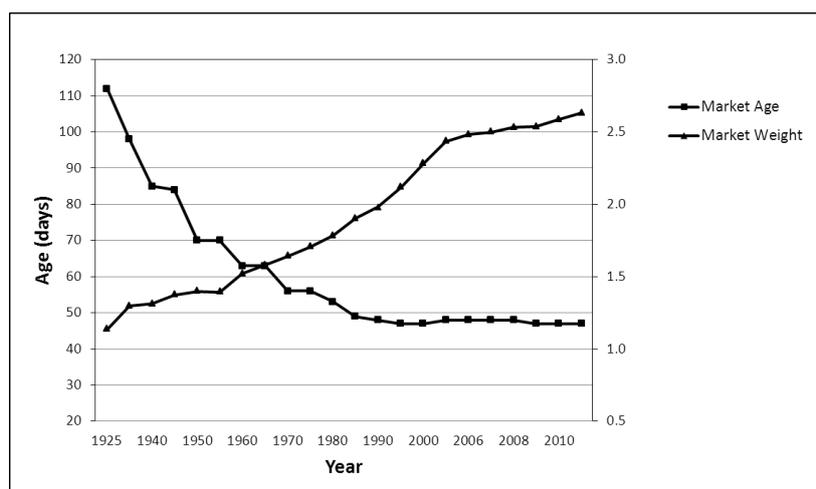
## Housing Systems for Broiler Chickens

### Intensive (Industrial) Farming Systems

Broilers used in intensive systems are from strains that have been bred to be **very fast growing** in order to gain weight quickly (**with typical weight gains of over 50 g**). Unlike laying hens (kept for egg production), which live for about a year, broilers only live for several weeks before they are slaughtered. In the EU, the slaughter age can range from 21 to 170 days but is typically around 5 to 7 weeks.<sup>6</sup>

- **In the US - the average slaughter age is 47 days at a weight of 2.8 kg (6.26 lb)<sup>7</sup>**
- **In the EU – the average slaughter age is 42 days at a weight of 2.5 kg (5.51lb)<sup>6</sup>**

Over the last 80 years or so, the slaughter age of a standard fast-growing broiler has decreased considerably, and the final market weight has also significantly increased (see Figure 1). In comparison, more traditional breeds of meat chickens can take around 12 weeks to reach slaughter weight.<sup>8</sup>



**Figure 1.** Market age and weight changes since 1925<sup>7</sup>

Globally, over 70% of broiler chickens are raised in quite similar indoor intensive (industrial) farming systems<sup>9</sup> and only a small proportion are reared in less intensive, higher welfare systems. Keeping broiler production indoors, without any access to outside areas can help with pest control. In temperate countries, broiler sheds are closed, climate-controlled (e.g., fan-ventilated) and have artificial lighting.<sup>10</sup> In hotter countries, the sheds are more open with curtain sides so that the chickens are exposed to daylight and natural ventilation, but have no outside access.<sup>11</sup>



The standard industry broiler shed in Europe is window-less, but in some countries (e.g., UK, The Netherlands), retailers or assurance schemes require windows to allow natural daylight.<sup>1</sup> In Sweden, windows to let in daylight are mandatory.

**Most industry standard sheds are generally barren, except for feeding and drinking lines.** Broilers are reared on a littered floor (often composed of straw, wood shavings, peat, or paper) to absorb the chickens' manure.<sup>11</sup> Feed is available at all times and consists of a pelleted diet high in energy and protein, usually delivered via an automated feeding system. Some farms will feed 'whole grains', not processed cereals, as part of the diet.<sup>1</sup>

Broiler chicks are placed in these rearing/grow-out sheds at one-day old and are typically kept in large, **mixed-sex flocks**. These flocks can consist of 10,000 or 20,000 birds, or more, in a single house.<sup>1,12</sup> Broilers stay at the grow-out farm until they reach slaughter age. When birds get close to final slaughter weights, flocks are often **thinned** (not practiced in the US). This involves the catching and removal of a portion of the flock (usually the female birds that are lighter) for slaughter, to allow the remaining birds more room to grow on to a greater weight. The birds remaining in the house are likely to be stressed as a result of the thinning process, making them more susceptible to **bacterial infections** like *Campylobacter*, a cause of food poisoning which poses a serious public health concern.<sup>13</sup>



A typical chicken shed with tens of thousands birds. The red line provides water; the yellow circular structures are feeders.

The litter in a chicken shed is usually not cleaned out during the broiler's lifetime. In the EU, the litter is completely removed after each flock, and the house is cleaned, disinfected, and replaced with new litter. In contrast, in the US it is more common for the litter to be completely removed and the houses are cleaned and disinfected, only once or twice a year, as opposed to after each flock. Some US producers may reuse the same litter for even more flocks – using techniques, like windrowing, to compost the used litter between flocks to reduce the pathogen load, so going even longer between total litter clean-outs for their broiler houses. The **quality of the litter** will influence **air quality** (i.e., dust levels, air humidity and ammonia levels). **Litter can become wet** depending on the type of litter material, the type of drinkers, water spillage and diet composition (which can influence the composition of the bird's faeces).<sup>1</sup> Wet litter is a **major risk factor** for **contact dermatitis** (i.e., lesions of the breast, hocks and feet).<sup>6</sup>

In the EU, Directive 2007/43/EC specifies rules for the protection of chickens kept for meat production<sup>14</sup> providing the minimal standards required to rear broilers. It outlines stocking densities, and atmospheric conditions, aiming to reduce extreme overcrowding and poor conditions. In countries within the EU, such as the UK, permitted stocking density is further restricted. In other countries, such as the US, there are no federal regulations overseeing the standards for broiler chicken production, such as environmental conditions or stocking density limits.

## **Higher welfare (alternative) systems**

Chickens in alternative farming systems will have **more space** (lower stocking densities) and often use chickens from **slower-growing breeds with higher welfare outcomes**, so the birds are typically slaughtered at an older age than fast-growing breeds. The **environment** can also be **enhanced**, for example with indoor enrichment and/or with an outdoor area.

In the EU, only a small proportion of commercial broilers are reared in alternative systems. In the **US**, less than 1% of chickens are raised as 'free-range' (the term is used if chickens have access to the outdoors for at least some part of the day).<sup>15</sup>





Higher welfare indoor systems can include perches, bails of straw to improve foraging and natural light.

## Higher Welfare Indoor

In these systems, chickens are kept indoors but they have **enrichment, more space, more suitable lighting** (artificial or natural sources) **and are from breeds with higher welfare outcomes** – including intermediate or slower growth rates, as compared to intensive breeds with faster growth rates. Selection for higher welfare outcomes allows these birds to have better physical health (e.g., leg and cardiovascular health) and express more of their natural behaviours.

For instance, in the **UK** the **RSPCA Assured**<sup>16</sup> label outlines welfare standards stipulating a maximum stocking density of 30 kg/m<sup>2</sup> and a growth rate that must not exceed 45 g/day. **Global Animal Partnership**<sup>17</sup> is a third-party certification in the US that outlines a maximum stocking density of 6 lb/ft<sup>2</sup> (compliance by July 2020 for steps 1-3) as well as standards around breed, enrichment, and lighting.

## Free Range

In the UK, free range chickens have access to an outdoor range during the daytime for at least half of their lifetime and the birds used are often **slower-growing breeds**. The housing provided is either a fixed shed or a mobile house that can be moved around the pasture. **Popholes allow access to the range**. At night the birds come inside for protection from predators. Chickens use a range more if it is of good quality (e.g., with presence of cover in the form of trees, bushes or hedges or with artificial shelters).<sup>18</sup>

In the US, the USDA defines free range as a system that provides access to the outdoors, however this **term is unregulated by the USDA** in terms of outdoor features and the amount of time broilers are allowed outdoor access.<sup>21</sup> Therefore, free range can be used to define a wide variety of systems in the US. However, there are certifications in the US, such as Global Animal Partnership and Animal Welfare Approved, that set clear and verifiable standards for free-range systems.



Popholes allow free range birds access to the range. Bales of straw in the shed provide enrichment.



**Traditional Free Range:** In these systems, the chickens are usually of slower-growing, more traditional breeds and they will live longer than intensively reared chickens.<sup>18</sup> An example of these is Label Rouge broilers in France. These are slow-growing hardy breeds with golden or black feathers which have been selected for the quality of their meat.

**Capons:** These are male birds that are castrated at an early age to allow them to become fatter than a normal male bird. It is performed without any pain relief and requires cutting into the abdomen to access the testes. This will cause extreme pain to the bird. While it is banned in the EU, traditional farming systems use a derogation for traditional practices to maintain this practice,<sup>18</sup> such as Label Rouge.



## Organic

**EU organic standards** stipulate:

- Chickens should either be reared until they reach the minimum slaughter age of 81 days or shall come from slow-growing chicken breeds (also reared until 81 days of age).<sup>20</sup>
- The maximum stocking density is 21 kg/m<sup>2</sup> inside the chicken shed and at least 4 per square metre per bird is provided outside. Higher stocking densities are permitted (16 birds per m<sup>2</sup> or up to 30 kg/m<sup>2</sup> inside, plus 2.5 m<sup>2</sup> per bird outside) if the chickens are kept in small mobile houses which allow easy access to the outdoors.
- Organic chickens should have access to an open-air area for at least one third of their life. The outdoor range should be mainly covered with vegetation.

**USDA organic standards in the US**<sup>19</sup> stipulate:

- Chickens must have continuous outdoor access (with shade, shelter, sunlight, clean water, exercise areas, and organic land if pasture is used), but there is no minimum requirement for time outdoors.
- Total continuous confinement indoors is prohibited.
- Feed must be certified organic, cannot contain any animal-by products, antibiotics, GMO derived products, or synthetic preservatives.

## Catching and Transport

When broilers reach market weight, they are caught, put into transport crates and transported to a slaughterhouse. Before transport broilers are usually **deprived of food** for several hours.

The most common method of **catching** is **manually** by teams of catchers, who pick up the birds and carry them inverted and **by a single or by two legs** to put them in crates for transport. A gentler method of is where birds are **carried upright in pairs**. Automated **mechanical harvesting methods** also exist. **These are machines with long, rotating rubber fingers** which collect the birds onto a transport belt which then conveys the broilers into the drawers of a transport container system.<sup>21</sup>



When broilers reach slaughter age, they are transported in crates to the slaughterhouse on loaded vehicles.

The transport containers are put onto trucks for transport. Modern poultry **transport trucks** are equipped with sails on the side to protect the animals from **adverse weather conditions** during transport.<sup>21</sup> **Journey duration** is an important risk factor for the broiler mortality resulting from thermal stress during transport. Journeys of over four hours constitute a greater risk to welfare from heat or cold stress than shorter journeys.<sup>5</sup> **Driver behaviour, driving style and road type** also have an effect on transported animals. Strong vibration and fast accelerations are aversive to broiler chickens.

On arrival at the slaughterhouse, the chickens normally wait in their transport crates in a **lairage area** before being removed from their transport units. Depending on the climate, the wait period in lairage can expose birds to hot temperatures, which can cause the birds to overheat given

the high density at which they are transported. Birds are also at risk of cold stress in colder climates. The processes of catching, crating and transport can cause injuries and stress, leading to the **deaths** of many birds upon **arrival at the slaughterhouse**.



## Slaughter

The most common **methods** for stunning and stunning/killing poultry are electrical and gas methods.<sup>22</sup> Stunning is practiced in order to render the birds unconscious and insensible, and to immobilize them before slaughter.

### Electrical Systems

Chickens are **hung upside-down on metal shackles** by their legs and then stunned using an **electrified water-bath stunning** system before they are killed. The animals are then killed by automated knife cut to the throat and subsequent bleeding (exsanguination). Broilers may be ineffectively stunned (due to individual variation in electrical resistance) or only electro-immobilized (i.e., paralyzed but conscious), so are fully aware and experience the pain of having their throats cut.<sup>23</sup> If their throats miss the cutter, they are cut manual by a worker further down the slaughter line. The welfare of broilers processed by electrical water-bathing stunning systems is considered poor due to live birds being subject to dumping from transport containers, handling, inversion and shackling prior to stunning.

### Gas Systems

**Controlled Atmosphere Systems (CAS):** Birds in transport crates are conveyed through a tunnel filled with increasing concentrations of carbon dioxide (CO<sub>2</sub>), inert gases (argon or nitrogen), or a mixture of these gases. Multi-phase CAS systems using CO<sub>2</sub> operate initially stun the birds by successively exposure to gas mixtures containing up to 40% CO<sub>2</sub>, followed by exposure to a higher concentrations of CO<sub>2</sub> (>55%) to cause death. An alternative method uses combinations of CO<sub>2</sub> (up to 30%) and other gases – inert gases and sometimes oxygen – which lessens the aversiveness of the gas to the birds.<sup>24</sup>

**Carbon dioxide** depresses the central nervous systems directly and produces rapid unconsciousness. However, carbon dioxide is aversive to chickens (usually if levels are above 20%). Inhalation of the **inert gases** (e.g., argon and nitrogen) is thought to be painless, but when inhaled in high concentrations, they cause oxygen deprivation in the body, leading to death. Although considered less stressful to birds than CO<sub>2</sub>,<sup>25</sup> inert gas CAS can take longer to kill birds and chickens have been seen to vigorously wing flap following loss of consciousness, which can lead to carcass damage.

### **Low Atmospheric Pressure Stunning (LAPS):**

**LAPS** is a more recent technology that mimics the physiological effects of ascending to high altitudes with **controlled slow decompression**. Oxygen is gradually removed from the air in the chamber containing the birds, so the chickens lose consciousness from a lack of oxygen. Studies to date suggest that in terms of welfare, LAPS may be comparable to other CAS methods. Nevertheless, further research is needed to determine whether birds experience significant pain or distress between the start of the LAPS process and the onset of unconsciousness.<sup>26</sup>

In the **US**, LAPS has obtained a 'no-objection' ruling by the United States Department of Agriculture's office of New Technology. However, the use of LAPS in the US has been limited to a single commercial facility since 2011.<sup>27</sup> In 2018, LAPS was legalized in the EU as an approved slaughter method for broiler chickens up to 4 kg (8.8 lb).<sup>28</sup>

### **Religious Slaughter**

According to Halal/Dhabihah (Muslim) and Kosher/ Shechita (Jewish) slaughter laws, the animal must be alive at the time of death, so the animal is typically not stunned prior to the killing via the cutting of the throat. Although in some Halal slaughter operations, reversible stunning, such as electrical stunning methods, is used prior to throat cutting.

In the EU, the Slaughter Regulation states that stunning is needed to induce a lack of consciousness and sensibility, however the EU also respects the freedom of religion.<sup>29</sup> The regulation therefore allows certain 'religious rites' such as slaughter without stunning, however it requires an accurate cut of the throat with a sharp knife to minimize suffering and the slaughter needs to take place in an officially regulated slaughterhouse. In the US, no legislation currently regulates the handling or humane methods of slaughter of broiler chickens as poultry are not covered under the federal Humane Methods of Livestock Slaughter Act.<sup>30</sup>



## Broiler Parent Birds ('Broiler Breeders')

The birds that are used to breed the chicks that become broiler meat chickens are called **parent birds/stock or broiler breeders**. There are an estimated 75 million breeder birds in Europe<sup>31</sup> and over 58 million in the US.<sup>32</sup>

### Housing System<sup>3,12</sup>

Young broiler breeder birds are first kept in single-sex flocks in rearing barns, which are set-up like the broiler grow-out facilities as enclosed, mechanically ventilated barns with litter floors. Then at 16-21 weeks of age, the birds are moved into mixed-sex groups in the laying houses (also called production farms). Egg production usually starts between 18-22 weeks of age and lasts until 60-65 weeks of age. Group size during the production period ranges from 3,000-8,000 birds in the EU (>10,000 in the US) and the percentage of males in the group can range between 7 and 11% when egg production starts.



The feeding of broiler breeders is controlled and restricted, to manage body weight and sexual activity.

The majority of breeder laying houses have raised slatted areas (covering approx. 50-66% floor surface) which allows the chicken manure to accumulate in collection pits underneath. The remaining floor surface is littered. Most barns are window-less, but in some EU countries it is a legal requirement that houses have windows (e.g., Sweden). Nests are positioned on the slats and can either be collective nests with an automated egg collection belt or individual nests. Maintaining a good and dry litter (often wood shavings or straw) in the laying house is essential for keeping the nests and eggs clean. Enrichment is not commonly used in breeder housing, although sometimes perches and elevated platforms (required by legislation in Sweden and Norway) are present.

**Cage housing** of broiler breeders is less common with approximately 1-2% of the parent stock in Europe being kept in cages. Some farms (mainly in The Netherlands and Germany), use multi-tier cage systems with groups of 60-100 birds per cage and with natural mating. A small number of farms (mainly in Southern Europe), have breeder hens housed in non-enriched conventional cages, single or group cages, with artificial insemination.

### Mutilations<sup>3,33</sup>

**Chicks for breeding stock may also undergo one or more mutilations, such as spur removal (de-spurring), toe trimming, beak trimming, and comb dubbing** (i.e., removal of a portion of the comb) either at the hatchery or within the first couple weeks of life. These procedures have been introduced to reduce injury (such as feather and skin damage) to other birds in the flock due to (forced) matings, fighting between males, or other forms of injurious pecking. Beak trimming (using hot-blade or infrared methods) is carried out without any pain relief. Toe trimming, spur removal, and comb dubbing are typically carried out using a hot blade or hot wire and most often without any pain relief.

### Food Restriction<sup>3,12</sup>

Weight control is important during the laying period and separate feeding is applied for males and females, so that body weights are carefully controlled. Egg production and body condition determine the amount of feed provided. Food restriction is used to limit body weight gain and achieve desired levels of fertility. **Feed restriction is practised because if broiler breeders were fed standard broiler diets, they would grow too rapidly and become too heavy to maintain good health before reaching the age of sexual maturity.** This would have detrimental effects on their health, their fertility and their welfare. However, feed restriction causes welfare problems associated with hunger (e.g., redirected pecking) and increased aggression around feeding time.

### Mating behaviour<sup>3</sup>

In Europe and the US, natural mating is mostly used. It is important that males and females are equally mature to prevent problems with sexually inactive males or forced copulations/over-mating and aggression towards females. This can lead to distress and injury in the females. **Mating can be improved by using lower stocking densities, leading to more appropriate mating behaviour, such as a greater display of courtship behaviour, as well**



**as fewer forced matings and less struggling of the hens.**<sup>34</sup> The use of environmental enrichment can also be used to improve mating behaviour, which reduces the need and frequency of forced matings.

### Slaughter<sup>3</sup>

Broiler breeders are usually reasonably well muscled at the end of their production period and weigh between 4-5 kg. As there is potential value in the meat from these birds, end-of-lay broiler breeders are sent for commercial slaughter, like standard broiler chickens. There are rarely specific slaughterhouses for broiler breeders so breeders may have to be transported for long distances to reach suitable slaughter facilities.

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