

POULTRY WELFARE STANDARDS AND GUIDELINES – LIGHTING

SUPPORTING PAPER PUBLIC CONSULTATION VERSION

Prepared by the Poultry Standards and Guidelines Drafting Group, Oct 2016

ISSUES

Appropriate lighting

- allows adequate flock inspection
- facilitates access to feed and water
- minimises injurious behaviour
- supports optimal production
- provides rest periods for birds
- supports normal eye development in poultry.

RATIONALE

Since most commercial poultry are maintained in indoor housing, the majority of birds are exposed to artificial lighting rather than natural daylight. Factors such as light intensity, photoperiod (light-dark cycles) length and distribution (intermittent), type of light source and wavelength may all have a separate effect.

Day length influences many physiological processes, including laying, growth rate, skeletal development, and behavioural issues. With layer hens, light influences the development and function of a bird's reproductive system, influencing the age at which a hen starts laying and how many eggs she will lay in a given period. Increasing day length accelerates sexual maturity of growing pullets, stimulating egg production, and decreasing day length retards sexual maturity and restrains egg production (Bolla, 2007).

Lighting programs for meat chickens are used to stimulate and control feed intake.

Lighting regimes can also be used to control behaviours such as feather pecking.

RECOMMENDATIONS

The drafting group considered current scientific knowledge and practice and agreed that standards were required to minimise the risk to the welfare of housed poultry.

Standards are proposed to

- ensure lighting intensity allows inspection of poultry and equipment
- ensure lighting intensity maximises the access of young poultry to feed and water
- specify a minimum light intensity during light periods
- ensure that poultry are not exposed to continuous light or darkness (except under certain circumstances).

ANIMAL HEALTH AND WELFARE CONSIDERATIONS

Lighting regimes in poultry housing vary between layer hens and meat chickens and with housing systems.

Light intensity

General

Light intensity must be sufficient to allow inspection of the flock, in order to monitor bird health, feed and water consumption and behaviour. This may require a temporary increase in the light intensity throughout the shed, or focal increase in light intensity through use of a flashlight.

Light intensity should be sufficient to allow young birds to find feed and water in the first days after placement in housing. Recommended light intensity for the first 3-7 days (20-50 lux) is generally higher than for the rearing/growing period for commercial flocks (5-10 lux) (Aviagen, 2014; Hy-line, 2016a; Hy-line, 2016b).

Continuously low light intensities (1 lux or less) can have negative impacts on poultry welfare, and have been associated with increased foot pad lesions and poor eye development in meat chickens (Deep et al., 2010).

Recommendations for light intensity may vary depending on the housing system (caged vs non-caged systems), and light intensity may be greater over feeders than in other parts of the housing.

A gradual change in light intensity during change from light to dark and vice versa allows birds in non-caged systems to safely locate perches (at onset of dark) and move in a more controlled manner to feeders (at light onset).

Layers

Changes to light intensity may be used to control injurious behaviour, such as feather pecking and cannibalism, particularly in laying birds. Kjaer and Vestergaard (1999) compared two levels of light intensity for laying hens during rearing (0-15 weeks) and lay (16-46 weeks) and found that a lower level of light (3 lux) was associated with a greater rate of non-injurious pecking than the higher level (30 lux) which was associated with a greater level of injurious pecking. They proposed that the non-injurious pecking at low levels was due to more exploratory pecking compared with the severe pecking observed at higher levels which had greater potential to progress to cannibalism. These effects were more evident during rearing than lay.

An assessment of lighting needs of laying hens via preference tests showed that older laying hens (23-30 weeks) preferred to spend more of their time in dimmer light (5 lux) than in brighter light (15 or 30 lux) (Ma et al., 2015). However, the authors did observe that the experiment was not necessarily comparable with conventional poultry housing in which birds are housed in consecutive light and dark hours during the day.

Meat Chickens

Deep et al. (2010; 2013) investigated the effects of different light intensities on meat chicken production and welfare. Light intensities between 1 and 40 lux did not influence weight gain, feed intake, feed conversion, mobility or mortality in meat chickens (Deep et al., 2010). However, birds were less active at lower light intensities. In another paper, Deep et al. (2013) concluded that a level of 5 lux should be the minimum level for performance, breast meat yield and bird welfare. Lower levels were associated with higher levels of mortality and poor growth rate.

Turkeys

Low light intensity (1.1 lux) in the first two weeks after hatching had adverse effects on feed intake, bird weight and mortality of poults (Siopes et al., 1984). The effects of light intensities between 1.1 and 11 lux were not investigated in that study. Up to 50 lux is recommended for poults during the first 3 days after placement to stimulate feed and water intake, after which light intensity can be reduced.

Ducks

Ducks kept at light intensities of 5 lux had better feed to gain and greater live weight gain than ducks maintained at 60 lux in an experimental study (Downing, 2014). There was no significant difference in feather damage or other behavioural patterns in ducks kept at 5 lux and 60 lux (Downing, 2014).

Lighting duration

General

During the brooding period, lighting duration is generally maximised to allow chicks to access feeding and watering equipment. Continuous lighting is not recommended, but lights may be left on for up to 23 hours a day in the first 3-7 days. Alternatively, intermittent lighting (four hours on, two hours off) may be used for layer chicks during the first week after placement.

Following the brooding period, light duration is altered to allow birds to rest.

After placement, birds should be 'trained' to become accustomed to periods of darkness to avoid panic in the event of a black-out. Such training may consist of sudden short intervals of darkness (e.g. 15 minutes).

Layers

After the brooding period, light duration is adjusted to maximise pullet growth and optimise the onset of sexual maturity. There is a slow step-down of lighting from 0-8 weeks, until lights are on for 10 hours of the day, after which there are gradual increases in light from 16 to 30 weeks of age. A slower step-down of light hours from 0-12 weeks can be used to prevent early sexual maturity, maximize pullet growth and promote early egg size (Hy-line, 2016a).

Midnight feeding/lighting is an optional lighting technique that promotes greater feed consumption. It is used whenever more feed intake is desired in growing or laying flocks and increases calcium absorption during the night, when most egg shell is formed. This is useful to increase feed intake during peak egg production and helps maintain feed consumption in hot climates. Lights are turned on for 1–2 hours in the middle of the dark period. There must be at least 3 hours of dark before and after the midnight feeding. The light provided during the midnight feeding is in addition to regular day length (i.e. 16 hours + midnight feeding). If midnight feeding is removed, reduce light gradually at a rate of 15 minutes per week (Hy-line, 2016a).

Darkness benefits birds by allowing them to sleep and develop diurnal rhythms. One or two periods of 4 hours (or more) of continuous darkness in each 24 period support positive welfare outcomes in poultry reared under artificial light (Schwean-Lardner et al., 2013).

Meat chickens

Various combinations of light and dark regimes have been trialled including continuous lighting with one hour of darkness or intermittent lighting of two hours on and two hours off. Intermittent programs give broilers discrete feeding times followed by periods of digestion, improving efficiency of feed utilization. Current recommendations by one large broiler company are for a minimum of four hours' darkness from seven days of age (Aviagen, 2014).

Continuous lighting may be used during periods of hot weather, to allow meat chickens to continue to consume water and food during the cooler part of the night, and to prevent huddling. Continuous lighting may also be used in the day/s before pick-up of meat chickens to allow continued access to water after withdrawal of feed and facilitate crop-emptying, which is necessary for processing (Nunes, 2005).

Turkeys

Very little research has been conducted on lighting regimes for turkeys, and the results of such research are conflicting (Schwean-Lardner et al., 2013). Pecking injuries in turkeys were positively correlated with increased light intensities (from 5-70 lux) in one study, but the authors suggested that turkeys could be kept under fluorescent light at an intensity of 10 lux, with appropriate environmental enrichment (Moinard et al., 2001).

Wavelength/colour

Different colours of light have been trialled in the different species of poultry to influence behaviour. Red light has been found to reduce aggressiveness in laying hens compared to white light and accelerates sexual development (Huber-Eicher et al., 2013). In contrast, Prayitno et al. (1997) found that keeping meat chickens under blue or green light was preferable as the birds are calmer and showed a preference for that coloured light. When similar work was carried out on ducks, it was found that housing Pekin Ducks under white light provided the best conditions for grow-out and blue light caused behavioural changes (Campbell et al., 2015).

REVIEW OF NATIONAL POLICIES AND POSITIONS

Australian jurisdictions have no legislated provisions regarding lighting in poultry houses.

The current Australian **Model Code of Practice for Poultry** 4th edition (2002) states:

- 5.1 *Young birds reared away from the hen require a light intensity of about 20 lux on the food and water for the first three days after hatching in order to learn to find food and water. It may be then reduced to as low as 2 lux during rearing.*
- 5.2 *Sudden increases in light intensity should be avoided as it may cause fight reaction in some strains of birds.*
- 5.3 *During inspection of poultry the light intensity on the birds must be adequate to allow birds to be thoroughly inspected and any problems identified. During inspection of poultry the light intensity may need to be supplemented (e.g. by use of a torch or by turning up the overall lighting in the shed.)*
- 5.4 *Where young poultry are housed in enclosed sheds using continuous light, a 'blackout' training period should be implemented to prevent panic should lighting fail. A suitable method is to commence with 15 minutes blackout and increase over a few days to one hour in each 24 hours.*
- 5.5 *Where poultry do not have access to daylight they should be given lighting over a total period of at least 8 hours per day. Photoperiods in excess of 20 hours per day may be detrimental to the adult laying bird.*
- 5.6 *All enterprises must have access to equipment to measure light intensities and must keep appropriate records.*

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The **RSPCA Australia** approved farming scheme standards for layer hens specify:

3.17 The lighting system must provide a minimum period of 8 hours continuous artificial or natural lighting per day and a minimum period of 8 hours continuous darkness (with all lights off) to be provided at night, in every 24-hour period. The exception to this is during extreme heat where feeding birds during cooler parts of the day may be required to reduce the risk to their welfare.

3.18 The light intensity measured at bird head height across the laying facility, must ensure that, during the light period, no area of the laying facility is lit at less than 10 lux.

3.19 From 1 January 2020, the light intensity between lighting periods must be adjusted in a gradual manner over at least 15 minutes.

The **RSPCA Australia** approved farming scheme standards for pullets specify:

3.17 Chicks up to 1 week of age are permitted to have a maximum light period of 23 hours in every 24-hour period. Continuous lighting is not permitted.

3.18 Between 1 and 3 weeks of age, the dark period must be gradually increased to a minimum 8 hours continuous darkness in every 24-hour period.

3.19 After 3 weeks of age, in every 24-hour period, the lighting system must provide a minimum: a) 8 hours continuous artificial or natural lighting and b) 8 hours continuous darkness (with all lights off) to be provided at night.

3.20 The light intensity measured at bird head height across the rearing facility, must ensure that, during the light period, no area of the rearing facility is lit at less than 10 lux.

3.21 From 1 January 2020, the light intensity between lighting periods must be adjusted in a gradual manner over at least 15 minutes.

The **RSPCA Australia** approved farming scheme standards for meat chickens specify:

3.23 After 7 days of age, the lighting system in the shed must provide a minimum period of 8 hours artificial lighting per day — unless birds have access to natural daylight which provides at least the minimum required intensity — and a minimum period of 4 hours continuous darkness (with all lights off) to be provided at night, in every 24-hour period.

3.24 From 1 January 2015, the light intensity between lighting periods must be adjusted in a gradual manner (using dimmers or switching individual lights on/off) over at least 15 minutes.

3.25 After 7 days of age, the light levels in the shed (at bird head height) must ensure that, during the light period:

- a. no area of the shed floor is lit at less than 10 lux.*
- b. the average light intensity across the entire shed floor is equal to or greater than 20 lux (except during catching).*

The **Australian Veterinary Association** (AVA) has no specific policy regarding lighting regimes for poultry.

REVIEW OF INTERNATIONAL POLICIES AND POSITIONS

This section is included to provide a brief international context, while acknowledging that Australia's poultry production systems may vary from production systems, poultry breeds and climatic conditions in other countries.

The **American Veterinary Medical Association** has no policy regarding lighting for poultry.

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The **Canadian Agri-food Research Council** *Code of Practice for the Care and Handling of Farm Animals - Poultry – Layers* (2003 – under review) specifies:

5.2.1 *Light intensity should provide adequate illumination for normal feed and water intake and normal activity.*

5.2.2 *Light intensity for the first 3 days of life should not be less than 20 lux (two foot candles) at the eye level of the chicks to encourage them to find and use feed and water. Thereafter, light intensity may be reduced to limit aggressive behaviour, but should also be adequate for birds to eat and drink. Light stimulation begins at the bird's ideal weight, which again varies from strain to strain. Following the guidelines established in the appropriate breeder management guide is important to prevent early sexual maturity and to ensure overall health of the bird through her lifetime.*

5.2.3 *Dimmers may be used to reduce light when the attendant is not present and to increase light to facilitate observation of the birds and the equipment.*

The 2016 DRAFT *Code of Practice for the Care and Handling of Pullets and Laying Hens* has the following lighting REQUIREMENTS for laying hens:

Lighting intensity must be at least an average of 5 lux at feeders during the light phase where birds are kept in cages. Light intensity may only be reduced to correct injurious behaviours (e.g. feather pecking)

Light intensity must be at least an average 10 lux in the hens' environment in non-cage systems during the light phase, so that hens can navigate their surroundings.

Where hens are housed in non-cage systems under artificial light, the light intensity must be raised gradually or staged over a minimum period of 5 minutes and lowered gradually or staged over a minimum period of 15 minutes to give them sufficient time to roost and come off perches without causing injury.

The **Canadian National Farm Animal Care Council** *Code of Practice for the care and handling of hatching eggs, breeders, chickens and turkeys* (2016) specifies:

REQUIREMENTS

Chicks and poults must be provided with a minimum of 1 hour of darkness in each 24 hour period after 24 hours of placement, and the dark period must be gradually increased to a minimum of 4 hours in each 24 hour period by day 5 of placement.

From day 5 of placement through to no sooner than 7 days prior to catching, birds kept in barns must have a dark period of at least 4 consecutive hours in each 24 hour period.

Dark periods must be no more than 20% of the light intensity of the light period.

Light intensity must be adequate during the light period to allow birds to navigate their surroundings and for daily inspections (e.g. 5 to 10 lux). Light intensity may only be reduced temporarily to correct abnormal behaviour.

Light control systems must be inspected regularly and maintained in working order

RECOMMENDED PRACTICES

- a. evaluate the lighting regimen as a potential contributing factor to behavioural problems such as aggression or flightiness
- b. inspect and service light bulbs frequently, as their brightness decreases with age and dust accumulation
- c. begin lighting programs immediately after placement

- d. provide a light intensity of no less than 20 lux for chicks and 50 lux for poults during the light phase for the first 3 days of life to help birds locate feed and water. Thereafter, light intensity during the light phase should provide adequate illumination for normal feed and water intake and normal activity, as well as easy inspection of all birds
- e. after day 3 of placement, start to gradually provide at least 6 continuous hours of darkness that is no more than 10% of the light intensity of the light period in any one 24 hour period
- f. measure light intensities at bird level
- g. minimize large variations in light intensities throughout the barn
- h. refer to Appendix E - Management Practices to Transition to Day-Night (Diurnal) Lighting Programs for guidance.

The **New Zealand** National Animal Welfare Advisory Committee's *Animal Welfare (Layer Hens) Code of Welfare 2012* states:

(a) Chicks must be provided with light of at least 50 lux at chick level for at least the first seven days so they can easily locate food and water.

(b) Chicks and pullets housed under artificial light must be exposed to short periods of darkness after placement, in order to train them to blackout conditions should lighting fail.

(c) After the training period, where hens are housed under artificial light, lighting schedules must provide a minimum of eight hours of continuous darkness in each 24-hour period.

(d) Lighting levels during the light phase must not be lower than 20 lux at hen level so that hens can see each other and their surroundings.

(e) Light levels during daily inspections must be sufficient to stimulate activity of the hens and allow hens and equipment to be clearly visible.

(f) Where hens are housed under artificial light, the light intensity must be raised and lowered gradually over a 15-minute period to give them sufficient time to roost and come off perches without causing injury.

The **New Zealand** *Animal Welfare (Meat Chickens) Code of Welfare 2012* states:

(a) Lighting intensity for the first four days after placement of the chicks in the brooding area must be sufficient to enable the chicks to learn the locations of food and water. This four day training period must include at least one hour of continuous darkness each day, to accustom the meat chickens to blackout conditions and to prevent panic should lighting fail.

(b) After the training period described in (a) above, lighting patterns must encourage activity and provide a minimum period of darkness each day to ensure adequate rest in chickens, such that:

(i) if only four hours of darkness is provided it must be continuous;

(ii) if more than four hours of darkness is provided, each dark period must be a minimum of three continuous hours.

(c) Lighting levels during the lights-on period must allow the chickens to see one another and to visually inspect their surroundings.

(d) Lighting levels during inspections must be sufficient to stimulate activity of the chickens and allow chickens and equipment to be inspected.

The **European Union** Council Directive 1999/74/EC on layer hen's states:

All buildings shall have light levels sufficient to allow all hens to see one another and be seen clearly, to investigate their surroundings visually and to show normal levels of activity. Where there is natural light, light apertures must be arranged in such a way that light is distributed evenly within the accommodation.

After the first days of conditioning, the lighting regime shall be such as to prevent health and behavioural problems. Accordingly it must follow a 24-hour rhythm and include an adequate uninterrupted period of darkness lasting, by way of indication, about one third of the day, so that the hens may rest and to avoid problems such as immunodepression and ocular anomalies. A period of twilight of sufficient duration ought to be provided when the light is dimmed so that the hens may settle down without disturbance or injury.

The **European Union** Council Directive 2007/43/EC on broiler chickens states:

6. All buildings shall have lighting with an intensity of at least 20 lux during the lighting periods, measured at bird eye level and illuminating at least 80% of the useable area. A temporary reduction in the lighting level may be allowed when necessary following veterinary advice.

7. Within seven days from the time when the chickens are placed in the building and until three days before the foreseen time of slaughter, the lighting must follow a 24-hour rhythm and include periods of darkness lasting at least six hours in total, with at least one uninterrupted period of darkness of at least four hours, excluding dimming periods.

The **OIE Terrestrial Animal Health Code** for broiler chickens states:

There should be an adequate period of continuous light.

The light intensity during the light period should be sufficient and homogeneously distributed to allow the broilers to find feed and water after they are placed in the poultry house, to stimulate activity, and allow adequate inspection.

There should also be an adequate period of continuous darkness during each 24-hour period to allow the broilers to rest, to reduce stress and to promote normal behaviour, gait and good leg health.

There should also be a period for gradual adjustment to lighting changes.

Outcome-based measurables: gait, metabolic disorders, performance, behaviour, eye condition, injury rate.

The OIE Code does not have a chapter for layer hens.

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APPENDIX 1 – DEFINITIONS

Lighting (artificial): The use of controlled artificial light to regulate the day length under which the stock are kept.

Lux: A unit of illumination equal to one lumen per square metre. Used to measure the brightness or intensity of light.