Lighting

and its Effects on the Welfare of Broiler Chickens

By Ian J.H. Duncan

In most modern poultry production systems, lighting is very carefully controlled to maximise productivity. Both rate of growth and reproductive performance can be manipulated using various lighting programs. However, in some cases, the welfare of the birds has been forgotten. Just because birds are "performing well" (i.e. being productive) does not mean that they are enjoying a good quality of life.

It should be remembered that, compared to the mammalian farm species which depend mainly on a sense of smell, chickens are largely visual animals. The species they are derived from, jungle fowl, although not long-distance fliers, do fly short distances and roost in trees, and so vision is of paramount importance to them.

There are three aspects of lighting to be considered: (1) the level of illumination, (2) the wavelength of the light, and (3) the photoperiod (or daylength). The effects of artificial lighting will, of course, vary depending on the housing system being used. This can vary from completely controlled environments in which the birds only see artificial light, to free range in which they might see very little, with every combination between.

Level of Illumination

Chickens are often kept in extremely dim conditions. This saves electricity, reduces bird activity and so improves feed conversion efficiency, and reduces the incidence of feather pecking and cannibalism. However, the light level is often so low (less than 10 lux) that the birds' welfare is compromised because they are being deprived of sensory input.

It's worth remembering that we need about 20-25 lux to read a newspaper and that outside on an overcast day the light level is about 1,000 lux. It has been shown that hens themselves prefer much brighter conditions especially when feeding.

Another point to consider is that in some housing systems, raised platforms are available for feeders and drinkers. Birds may have difficulty successfully flying up to those facilities when there is too little light to enable them to accurately judge distance. In order to enjoy a good quality of life, all chickens should have light of at least 20-25 lux.

Wavelength of the Light

Birds have a wider spectral sensitivity than human beings, particularly in the ultra-violet (UV) part of the spectrum. They also have better colour vision than human beings. The two usual sources of artificial light via incandescent and fluorescent lamps emit wavelengths that seem to be acceptable to birds even though they are deficient in UV wavelengths. There are other artificial light sources, such as sodium lamps, that emit a very narrow band of wavelengths and these should probably be avoided.

Fluorescent lamps are becoming very popular in poultry barns because they are so much more efficient than

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Further Reading

Lewis, P. and Morris, T., 2006. *Poultry Lighting: the Theory and Practice*. Northcot, Andover, UK.

Malleau, A.E., Duncan, I.J.H., Widowski, T.M. and Atkinson, J.L., 2007. "The importance of rest in young domestic fowl." *Applied Animal Behaviour Science*, 106: 52-69.

Widowski, T.M., 2010. "The physical environment and its effect on welfare." *The Welfare of Domestic Fowl and Other Captive Birds* (Eds I.J.H. Duncan & P. Hawkins), pp. 137-164.

Widowski, T.M., Keeling, L.J. and Duncan, I.J.H., 1992. "The preferences for laying hens for compact fluorescent over incandescent lighting." *Canadian Journal of Animal Science*, 72: 203-211.

incandescent lamps. When first introduced, they could not be dimmed, which was a problem, but this has now been overcome. Also, since fluorescent lamps with magnetic ballasts flicker at twice the supply frequency (imperceptible to human beings), there was concern that birds, which have a much higher flicker fusion frequency than human beings, might see the flickering and find it aversive. However, it has been shown that domestic fowl actually prefer fluorescent lighting presumably because it is richer towards the UV part of the spectrum.

Photoperiod

Consulting any book on poultry husbandry will reveal some variation on the following instructions: "So that chicks may quickly learn to eat and drink, continuous 24-hour light should be used during the first few days after hatching." Thereafter, the traditional advice for broilers is that they should have very long days or even continuous light.

What has been completely forgotten in these recommendations is the need for the birds to rest. This is of paramount importance for young chicks. As with any very young animal, chicks naturally spend much of their time resting and sleeping. The story that chicks need continuous light to learn to feed and drink is a complete myth. Of course, they need to feed and drink, but this can be done in a very short time; what they also need is undisturbed sleep and rest.

A hen with a brood of chicks in temperate latitudes will spend about 8 hours during the night sitting brooding with her chicks sleeping and resting under her feathers. Then, during the day, there are periods of activity, with the chicks feeding and drinking, alternated with periods of brooding, with the chicks once again sleeping and resting. One of the functions of these brooding periods is thermoregulation, but what has been forgotten is that these brooding periods also allow the chicks to sleep and rest. Even when broody hens and chicks are given very high temperatures, bouts of brooding still alternate with bouts of activity.

When chicks are kept in continuous light (as recommended in most production manuals) they spend much of this time trying to sleep (watch them for 10 minutes to convince yourself that this is true) but are constantly being disturbed by other chicks moving to the feeder.

There is even some evidence suggesting that this might contribute to "starve-out" in turkey poults – they may run out of energy before the behavioural "feeding system" in their brain gets switched on. In experiments carried out in the lab, all turkey poults started to feed eventually if they were allowed to conserve energy in the first few days after hatch. This suggests that all young chicks should be allowed to sleep and rest. If domestic fowl chicks are allowed to have synchronized periods of sleep and rest, they show much healthier active behaviour through the day.

Right from placement, chicks should have a distinct day and night with at

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least 6-8 hours of darkness. Of course this means that brooders are required that do not emit light – but these are easily available. Broilers should continue to be grown with a distinct day and night.

In the past 20 years, intermittent lighting programs have been developed for broilers, which involve a repeating schedule of 1-2 hours of light and 1-2 hours of darkness. These claim welfare benefits through restricted access to feed, slower early growth, and a reduced incidence of lameness. However, it seems to me that these programs actually mimic a brooding cycle and some of the benefits may be due to the birds being allowed to sleep and rest synchronously and being more active when the lights are on.

Conclusions

1. Chickens are visual animals that should be given sufficient light (at least 20-25 lux) to enable them to engage in an active lifestyle.
2. Daylight is probably the ideal light for birds, but both incandescent and fluorescent light seem to be adequate.
3. Sleep and rest are very important for birds, particularly young chicks. Periods of darkness allow birds to sleep and rest synchronously and are essential for good welfare. In addition to a "night" of at least 6-8 hours, both young chicks and older broilers can benefit from intermittent lighting programs that simulate brooding cycles.

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Chick Tips...On Lighting

At a recent SPCA workshop, Dr. Ian Duncan presented some interesting information on intermittent lighting for newly placed chicks and poults. Challenging the conventional wisdom of providing 24-hour light for up to the first week of life, ostensibly to ensure the young are able to find feed and water, he showed data that demonstrated broiler chicks given alternating 40 minute periods of light and dark performed at least as well as those given 24-hour lighting (see "Lighting" article above). The benefits of such a program could be substantial not only for health and welfare of the bird, but also in energy savings. Certainly much research over the years has demonstrated the benefit of providing periods of darkness for growing poultry.

This information, however, brings to mind many other attributes of lighting to which we must pay attention. The timing of light is critical for egg producing birds, of course, and getting the right daytime/night time combination is essential. But the quality of light is also important.

Relatively high intensity lighting (20 to 30 lux) during brooding is very important for attracting the young to the reflections off of water, which is instinctive for chickens and turkeys. But later on, high intensity is not as important and can be reduced to about 10 lux.

In some lines of birds, high intensity lighting can lead to cannibalism and feather picking. Evenly distributed light is also valuable, especially for egg laying birds. If light is unevenly dispersed, it can create areas where birds preferentially lay eggs on the floor instead of in nest boxes. For example, I have seen situations where hens have chosen to lay eggs in the shadow of a feed line, leaving a long line of eggs down the centre of the barn.

To keep lighting optimal:

- Bulbs should be evenly placed
- Make sure all bulbs are working and clean
- All bulbs should be of the same wattage
- Shadows should be cast only where they are needed (e.g. nest boxes)
- Intensity for most periods except brooding should be such that you can easily read a newspaper by the light cast

If measuring light intensity, do it at the level of the bird, not yourself as light intensity decreases the further away from a source you go.

Lighting is one area that we tend to take for granted. Good lighting properly timed will be a net benefit to the welfare and production of the flock.

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