



Question to EURCAW-Poultry-SFA

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Background context provided by the solicitor

We are seeing an increasing number of mobile laying hen houses. Because of the variety of building types and specifications (different type of insulation, often no mechanical ventilation), and because hens are submitted to outdoor condition to a great extent, environmental management can be challenging. The legislation (Council Directive 98/58/EC and Council Directive 1999/74/EC) does not specify temperature, relative humidity and gas concentration levels. Pending the EFSA opinion, any advice on best practice around environmental conditions, and in particular regarding temperatures (thermal neutral/ thermal comfort zones) for such mobile units would be very useful and helpful.

Question

Could you provide recommendations on environmental conditions management, in particular regarding temperature regulation, for mobile housing for laying hens in order to avoid welfare impairment?

Answer

Introduction

Mobile houses exist in various forms, from partially mobile polytunnels to fully mobile trailer-like systems. The interior varies from single-tier systems with manual feed hoppers and front roll-away nest boxes to aviaries with automatic chain feeders and egg belts (Giersberg et al., 2017). Depending on the housing system and the local conditions, mobile houses could be moved between once a week to four times a year. Although systems with mechanical ventilation exist, most mobile houses depend on natural ventilation and roofs and walls are insulated with the intention of maintaining an appropriate temperature in the house (EFSA, 2023a). Mobile houses are not well studied in scientific literature yet. However, the factors having positive and negative welfare consequences may be similar to those of outdoor rearing systems (Knierim, 2006). Outdoor access systems have much more stimuli than exclusive indoor rearing systems (fresh air, natural light, diversity of plant species and insects, extra space, etc.), promoting the expression of several natural behaviours such as exploratory and foraging behaviours (i.e., pecking and scratching), sunbathing and locomotion (i.e., walking, running and flying). On the other hand, outdoor ranges could have welfare consequences mainly related to the destruction of the range (muddy area) and to the risk of predation and infection (i.e., infectious agents and endo- and ectoparasites) (Knierim, 2006). In the case of the indoor facility, temperature management inside the house could be particularly challenging in case of extreme climate conditions.

Preventing heat and cold stress

In the literature, the thermo-neutral zone of laying hens and layer breeders is estimated to be 15 to 26°C (Aerts et al., 2004), whereas for pullets, it will change with age (e.g. (EFSA, 2023a)):

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- Week 1 of age: 30-32°C;
- Week 2 of age: 28-30°C;
- Week 3 of age: 26-28°C;
- Week 4 of age : 24-26°C;
- Week 5 of age: 22-24°C;
- From week 6 of age to the end of rearing: 20-24°C.

However, the thermo-neutral zone will depend on many factors such as genetics, physiological status, body weight or feather cover but also on air velocity and relative humidity (EFSA, 2023a). In broilers, high relative humidity leads to more difficulties dissipating heat to the environment and thus an increased risk of heat stress as compared to low relative humidity with the same environmental temperature (EFSA, 2023b). Although less sensitive to heat stress than broilers, the same issues occur in laying hens in case of high relative humidity. It has been suggested that the comfort zone of poultry should be adjusted according to the temperature and relative humidity, such as done in the Apparent Equivalent Temperature (AET) (EFSA, 2022). AET is an index based on dry-bulb temperature and relative humidity developed to measure the high effective temperature inside transport containers (EFSA, 2022). Although AET was developed to set the temperature and humidity limits to avoid heat stress during transport, it could also be used in houses. Nowadays there is no AET for laying hens, but EFSA (2022) concluded that the one from broilers (Figure 1) may be extrapolated to laying hens, during transport.



Figure 1: Thermal Comfort Zones for broiler transport defined by Apparent Equivalent Temperature by Mitchell et al. (2004, 2005, 2006 in EFSA, 2022)

Heat stress in mobile houses could particularly occur as this husbandry system generally has no air conditioning and rarely mechanical ventilation and is particularly exposed to high temperature variations due to low insulation and low internal volume (EFSA, 2023b). Cold stress may also occur but is easier to manage

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with the use of an appropriate heating system. Furthermore, rustic layer hybrids (lower yielding) are generally used in the mobile house systems and these birds may be more resilient in case of adverse climatic conditions, whereas indices, such as the AET, are generally calculated for classic hybrids (high yielding). There is a gap of knowledge on the temperatures leading to cold or heat stress in hybrids used in mobile houses systems.

Animal-Based Indicators can be assessed to evaluate the thermic comfort of birds. In case of cold stress, huddling and shivering behaviours will be observed. During, heat stress, more sitting and lying behaviours are observed (less locomotor activity), panting and spreading wings away from the body (EFSA, 2023b). Observation of the birds is essential, notably during days with extreme climate.

Recommendations to control temperature, humidity and ventilation inside the mobile houses

According to the European Rural Poultry Association, the management of the environmental conditions in mobile housing should be identical to that recommended for fixed housing with free-range access. Specifically, the recommendations from European Rural Poultry Association and EFSA (2023b) are as follows:

- *Location regarding season and characteristics of the house:*
 - Use insulating materials for the house (roof and walls).
 - Provide heating systems and thermometers to control and monitor temperature.
 - Use active ventilation or passive ventilation on the four sides of the house and especially the ridge or other high positions to ensure good ventilation (EFSA, 2023b).
 - Orientate the mobile houses so that popholes are located perpendicular to the dominant winds.
 - Place mobile houses in the shade during hot seasons and in sunny areas during cold seasons for better temperature regulation.
 - Spray water on the roof if no other alternative are available to decrease inside temperature.

- *Characteristics of the outdoor range:*
 - Provide shelters in the outdoor range, preferably natural shelters (vegetation), for protecting against poor weather conditions. For example, well-shaded areas offer a favourable climate on hot days, and trees and bushes could protect birds from wind and rain.
 - Provide natural vegetation in the outdoor range to make it more attractive for birds (for recommendations on this topic, see EURCAW Poultry-SFA, 2022a and b). This is essential to avoid a high number of birds inside the house during hot days increasing the stocking density and, associated with insufficient ventilation, the inside temperature.

- *Gas / Air quality :*
 - To limit the formation of dust, the choice of litter material and how it is provided and managed is crucial. In general, using de-dusted litter is a major advantage which is not generally applied in practice, but ventilation can also be increased to capture the dust through filtering.
 - Maximal concentration of total dust should never be higher than 30 mg/m³ and more research is needed to determine the maximal dust and CO₂ concentration not leading to negative welfare consequences, which is unknown.

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- o When ammonia concentration is higher than 10 ppm, laying hens show increasing signs of aversion. The maximal concentration of NH₃ should not be higher than 10 ppm.

Conclusion

There are gaps of knowledge on adequate mobile house rearing conditions in scientific literature and professional recommendations, in particular on environmental conditions. Birds should be closely observed in case of extreme climatic conditions. Under “normal” conditions, the management of the environmental conditions in mobile houses is identical to that for fixed housing with free-range access. The outdoor range should be well designed to stimulate use and provide natural or artificial shelters to protect the birds from poor weather conditions.

References

- AERTS, J. M., WATHES, C. M. & BERCKMANS, D. 2004. Environmental management for laying hens. *Cabi Publishing, Cambridge*.
- EFSA 2022. Scientific opinion on the welfare of domestic birds and rabbits transported in containers. *EFSA Journal*, 20, 188.
- EFSA 2023a. Scientific Opinion on the welfare of laying hens on farm. *EFSA Journal*, 21, 188.
- EFSA 2023b. Scientific Opinion on the welfare of broilers on farm. *EFSA Journal*, 21, 236.
- EURCAW Poultry-SFA, 2022a. Design and management of outdoor ranges for optimal use by layers. <https://sitesv2.anses.fr/en/system/files/FS%20BP%20optimal%20outdoor%20orange.pdf>
- EURCAW Poultry-SFA, 2022b. Mobile housing in broiler chicken. https://sitesv2.anses.fr/en/system/files/EURCAW-Poultry-SFA_BP%20mobile%20housing%20EN.pdf
- GIERSBERG, M. F., SPINDLER, B. & KEMPER, N. 2017. Mobile houses for laying hens - both chance and challenge.
- KNIERIM, U. 2006. Animal welfare aspects of outdoor runs for laying hens: a review. *NJAS: Wageningen Journal of Life Sciences*, 54, 133-145.