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# Influence of rearing conditions of pullets on space use and performance of hens placed in aviaries at the beginning of the laying period

Sandra Colson [a], Cécile Arnould [b,1], Virginie Michel [a,*]

[a] *Unité d'Epidémiologie et Bien-Etre en Aviculture et Cuniculture, AFSSA Zoopôle Beaucemaine BP53, 22440 Ploufragan, France*

[b] *Station de Recherches Avicoles, INRA-Centre de Tours, 37380 Nouzilly, France*

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**Abstract**

Many studies have shown how laying aviaries can improve hens' welfare, but little work has been done on the adaptation of hens to this system according to their previous rearing conditions, despite the specific adaptation skills it requires of them. The adaptation to laying aviaries of hens previously reared in different conditions was assessed here through their use of vertical levels, numbers and distances of flights and jumps (in week 20 after transfer and, only in rearing aviaries, in week 15 before transfer), eggs location and laying rate (from weeks 18 to 27 after transfer) and mortality (from weeks 1 to 27). Twelve batches of 282–308 ISA Brown hens were reared from 1 day to 17 weeks of age in floor pens furnished with platforms and perches with manual feed hoppers on litter (FH hens), in rearing aviaries with platforms and manual feed hoppers on litter (AH hens), or in rearing aviaries with automatic chain troughs on platforms (AC hens). Hens in each of these treatments were then transferred to similar laying aviaries with automatic chain troughs on platforms. The FH hens used upper levels less, showed lower accuracy in long flights and jumps and displayed a preference for staying on litter and lower levels, compared with AH and AC hens. They laid fewer eggs inside nest boxes during the first 2 weeks of lay, laid more eggs on litter throughout the observed period, and had a lower onset of laying than AH and AC hens. The FH mortality rate was higher than that of AC hens after transfer, and higher than that of AH and AC pullets before transfer. AH pullets used the lower levels more and made more and longer flights than AC pullets before transfer, but these differences did not persist after transfer. Mortality rates did not differ between AH and AC pullets before transfer, whereas it was higher in AH hens after transfer. AH hens laid slightly more eggs inside nest boxes and had a similar laying

* Corresponding author. Tel.: +33 2 96 01 62 20; fax: +33 2 96 01 62 23.
*E-mail address:* v.michel@ploufragan.afssa.fr (V. Michel).
[1] Present address: Unité Physiologie de la Reproduction et des Comportements, UMR 6175-INRA-CNRS-Université de Tours-Haras Nationaux, INRA-Centre de Tours, 37380 Nouzilly, France.

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rate to AC hens. The present study shows that the design of rearing pens largely influences adaptation: rearing aviaries ensured a better adaptation than furnished floor pens. On the other hand, the feeding system used during the rearing period, particularly troughs location, largely influenced the use of space before transfer, but only slightly influenced the adaptation after transfer in laying aviaries: higher vertical distance between feed and water ensured a better adaptation.


*Keywords:* Adaptation; Early experience; Housing system; Laying hen; Nests use; Spatial distribution

## 1. Introduction

Laying aviaries are one of the housing systems for laying hens authorised by the Council of Europe Directive 1999/74/EC from 2012. Several studies have shown how aviaries can improve hens' welfare compared with conventional cages (for review see Barnett and Newman, 1997). Aviaries diversify the behavioural repertoire of hens (dustbathing, nesting, perching ...) (Blokhuis and Metz, 1992), lower their level of fear and increase their bone strength (Newman and Leeson, 1998) and overall body condition (Michel and Huonnic, 2003). Depending on the type of aviary, hens' disturbance (changes of activity) and abnormal behaviours (feather pecking, stereotypies ...) are lower than or the same as (Hansen, 1994) in conventional cages. The review of Tauson (2005) underlined negative consequences of aviaries compared with conventional cages: higher levels of dust and ammonia, higher risks of health problems, spread of cannibalism, bone deformation or breaking and high rates of floor eggs. This author also reported higher mortality rates and lower production levels in aviaries than in small group of less than 10 hens reared in conventional cages. However, other studies (Taylor and Hurnik, 1996; Häne et al., 2000 and Aerni et al., 2005 for review) reported no significant difference in mortality between these two systems. These discrepancies are probably explained by the fact that welfare improvement depends on design and management of aviaries and on beaktrimming of birds, as underlined by Van Horne (1996) and Barnett and Newman (1997).

Compared with cages and one-level non-cage systems, aviaries are characterized by several vertical levels and thereby require specific adaptation skills of hens. Underuse of facilities (nests, drinker nipples, perches ...), due to poor adaptation may lead to problems of welfare, production or health. For example, if hens do not use platforms where drinkers are, they could not drink and are exposed to dehydration. Early experience influences the development of individuals and how they interact with their environment thereafter (Denenberg, 1969). For example, the enrichment of the environment with manipulable or moving objects, or changes of feed at an early age lowers the emotional reactivity and fearfulness of chicks (Candland et al., 1963; Broom, 1969; Jones, 1986; Gvaryahu et al., 1989), adult hens (Reed et al., 1993) or quails (Jones et al., 1991). Previous experience also influences the preferences for additional space in the litter area (e.g. Faure, 1991) and the use of perches or nest boxes by adult hens (e.g. Huber-Eicher, 2004; for review see Mench et al., 1998). Thus, adaptation of adult hens to laying aviaries is certainly influenced by their previous experience. To maximise their adaptation to laying conditions, pullets should be reared in a housing system similar to the laying system (Fröhlich, 1989; Abrahamsson and Tauson, 1995, 1998; Häne et al., 2000). However, floor pens furnished with perching structures offer a desirable alternative to aviaries for the rearing of pullets, being less expensive and easier to manage. Few studies have focused on the influence of different designs of rearing pens on the subsequent adaptation of hens to