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## **A meta-analysis on the effects of the housing environment on the behaviour, mortality, and performance of growing rabbits**

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### **Abstract**

Although the number of rabbits (*Oryctolagus cuniculus*) produced in Europe is important, they are under-represented in welfare research. Studies on the effects of housing conditions have focused on performance and mortality. We conducted a meta-analysis to further understand the impact of the housing environment on growing rabbits. Whilst providing a robust quantifiable review, meta-analyses are restricted to existing literature. We included information on behaviour, mortality and performance. Twenty-seven peer-reviewed and conference publications, with a total of 99 experimental treatments, were used. We collected information about rabbit age, bodyweight, sex and breed; allometric space allowance, pen height, group size, environmental temperature, floor type, substrate and enrichment use, lighting, diet and medicated feed. Predictive equations for each response variable were calculated using multiple regression models. Higher space allowance was found to increase locomotor and social activity, and to reduce resting and comfort behaviour. Restricted pen height increased ingestive behaviour; comfort behaviours decreased as space allowance increased, although these might have been confounded with self-directed behaviours in literature. Mortality remained stable at varying space allowances, but increased with larger group sizes and enrichment objects. Growth rate, feed intake and feed conversion were reduced with higher space allowances and larger group sizes, and by provision of substrate and enrichment objects. Findings suggest that higher space allowance and unrestricted pen height are beneficial for rabbit behaviour, but might have undesired consequences if considered independent from other aspects. The challenge of promoting welfare in commercial conditions was highlighted, as a number of parameters which improved behavioural expression reduced performance. In certain cases welfare inputs complemented performance, including providing non-medicated feed and higher space allowance in cooler climates. Although our results should be interpreted with caution given the limitations of the included variables, they are expected to contribute to the improvement of current and new rabbit housing systems to optimise welfare.

**Keywords:** animal welfare, behaviour, growing rabbit, meta-analysis, mortality, performance