

Aversion of chickens to various lethal gas mixtures

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Abstract

In the event of a notifiable disease outbreak, poultry may need to be culled in situ. This should be performed swiftly and humanely to prevent further spread of the pathogen while preserving the welfare of the animals prior to death. Here, we examined the aversion of broiler chicks (*Gallus domesticus*) to three lethal gas mixtures at various concentrations to determine the least aversive mix that could be used in whole-house gassing. For 1 h, individual chicks ($n = 36$) were allowed to place their heads inside three feeding and drinking stations (FDS) in order to access food and water. Each FDS was filled with a different gas mixture, and birds could access each FDS as much as they liked. Twelve chicks each were tested at low (50% carbon dioxide [CO_2] in air, 70% argon [Ar] in CO_2 , 70% nitrogen [N_2] in CO_2), medium (55% CO_2 in air, 80% Ar in CO_2 , 80% N_2 in CO_2) or high (60% CO_2 in air, 90% Ar in CO_2 , 90% N_2 in CO_2) concentrations of gas mixtures. Aversion was assessed based on the time birds spent with head in each FDS (with more time indicating less aversive), and the frequency of head shakes relative to time spent with head in the FDS (with a lower proportion indicating less aversive). Data were analysed by ANOVA. On average, birds spent < 3 min with their head in any FDS. Mixtures containing 90% Ar or N_2 in CO_2 and 80% argon in CO_2 were least aversive and mixtures containing 70% N_2 in CO_2 and 60% CO_2 in air were most aversive, based on time spent with head in. Head shakes s^{-1} were more frequent with low concentration gas mixtures compared to high concentrations, and with all CO_2 in air mixtures, which suggests that the intensity of head shaking is related to the concentrations of CO_2 . From these results, one concentration of each of the three gas mixtures (90% N_2 in CO_2 , 80% Ar in CO_2 , and 50% CO_2 in air) were chosen for assessment on a further 12 birds and the results showed that both inert gas mixtures were less aversive than 50% CO_2 in air based on time spent with head in. Frequency of head shakes s^{-1} did not differ between the three mixtures. Birds found all gases aversive, however it is concluded that inert gas in CO_2 mixtures were least aversive compared to CO_2 in air and these gases also caused less signs of respiratory discomfort.

Keywords: animal welfare, aversion, chickens, disease outbreak, lethal gas mixtures, preference testing