NEUROMA FORMATION IN LAYERS AFTER RE-TRIMMING

C.A. LUNAM¹, P.C. GLATZ² and J.L. BARNETT³

Neuromas are bundles of disarrayed nerves that form as part of the normal regenerative process following injury. Neuromas pose significant welfare implications as they can spontaneously discharge action potentials resulting in chronic pain. In addition, nerve fibres associated with neuromas have a decreased threshold to noxious stimuli and undergo allodynia, a condition in which normally non-noxious stimuli become painful. Previous work has demonstrated that beak trimming at hatch results in the formation of neuromas, regardless of the amount of tissue removed. However, neuromas persist to adulthood only in hens after severe trimming (Lunam et al., 1996). This work is part of a study of the time course of neuromal development and resolution after moderate beak trimming at hatch. The effect of re-trimming on the formation and resolution of neuromas is also being investigated.

At hatch, layers were allocated into three groups: group 1, removal of half the upper beak and one third of the lower beak at hatch, re-trimmed (2mm removed from each of the upper and lower beak) at 14 weeks; group 2, trimmed at hatch only and group 3, non beak-trimmed controls. Four layers were randomly selected from each of the three groups and euthanised by cervical dislocation at 28 weeks of age. The upper and lower beaks were processed for histopathology. Sagittal sections, collected at 200 micrometer intervals through each beak, were stained either with silver for visualisation of the presence or absence of neuromas, or with haematoxylin and eosin for general tissue structure.

Neuromas were observed in all trimmed and re-trimmed beaks. These were marginally more extensive after re-trimming. Neuromas consisted of swirling masses of nerve fibres as well as small foci of micro-neuromas encapsulated in a connective tissue sheath. Neuromas were more extensive in the upper beaks compared to those in the lower beaks. Individual nerve fibres often reached the dermal-epidermal margin and penetrated into the tip of the beak stump. In 3 of the 4 upper beaks that had been trimmed only at hatch (group 2) the neuromal masses were confined to the ventral dermis adjacent to the premaxillary bone. In these beaks, nerve bundles within the dermis between the neuroma and epidermis appeared similar to those in the non-trimmed control beaks. Although fewer than in non-trimmed control beaks, sensory receptors were present in all single trimmed and re-trimmed beaks. Receptors were often present in the distal dermis near the tips of all trimmed and re-trimmed lower beaks.

These results demonstrate that neuromas are present 28 weeks after moderate trimming at hatch. The extent and distribution of neuromas however, compared to that in beaks 10 weeks after moderate trimming at hatch (Lunam et al., 1996), suggest much of the neuromal mass has been resorbed by 28 weeks. The marginal increase in the extent of neuromas 14 weeks after retrimming, as well as the presence of sensory receptors close to the beak tip in re-trimmed beaks, suggests that re-trimming of 2mm causes minimal perturbation of nerves and general tissue structure.


¹ Department of Anatomy & Histology, Flinders University, Bedford Park, SA 5042.
² South Australian Research and Development Institute, Roseworthy, SA 5371.