Comments of the Farmed Bird Welfare Science Review (Victoria Agriculture)
- Beak Trimming section by Dr Phil Glatz and Geof Runge

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LH8.3b Beak Trimming

The authors state that
the procedure causes pain and reduces beak function.

The statement that beak trimming causes pain and reduces beak function is a general statement that needs to be justified by the authors. First, they should discuss the anatomy and sensory innervation of the beak and second, they should discuss the extraordinary ability of the beak to regenerate after beak trimming or beak treatment. What is more important concerning the current Industry best practice IRBT and HB beak trimming given the beak regeneration that occurs is the beak length and beak function of the birds well after the operation rather than the emphasis on how much is removed with a hot blade or treated with IRBT and the short-lived pain responses at the time of these processes.

The chicken beak is a highly specialised organ containing salivary glands and taste buds to assist feeding and taste discrimination as well as thermoreceptors, mechanoreceptors and nociceptors that respond to thermal, mechanical and noxious stimuli. In addition, the beak is well innervated by sensory, parasympathetic and sympathetic nerves and contains numerous free nerve endings. The beak of birds has many encapsulated mechanoreceptors, the Herbst and Grandry corpuscles which are sensory structures that enhance fine tactile discrimination.

Many of these receptors remain in the beak after moderate hot blade trimming and the receptors make a connection with the nerves after hot blade trimming. The anatomy and innervation of the chicken beak and the effects of hot blade trimming, and re-trimming has been reviewed by Lunam (2005) and includes facts on regeneration of the beak after trimming and the risk factors associated with the development of chronic pain in birds. A reference on beak anatomy is Lucas and Stettenheim (1972).

It is important for reviewers to discuss the 3 pain phases bird may experience when beak trimmed with a hot blade (Cheng, 2005). Birds initial acute pain reactions to beak trimming are short lived as demonstrated by anatomical, electrophysiological and behavioural evidence. Acute pain (2h to a few days) results from stimulation of nociceptors (pain receptors) in the beak and follows a pain free period (up to 26h) normally associated with action by the birds' endogenous analgesia system (Cheng, 2005). The anatomical, electrophysiological and behavioural evidence strongly suggest that beak-trimming evokes acute pain for only a brief period.

In contrast, birds are subject to continual acute pain from non-trimmed birds pulling their feathers out. In addition, many birds in the flock are subject to the acute pain of cannibalism from non-trimmed birds which often leads to a horrendous death. The bird that is attacked has its flesh is pecked, organs irreparably damaged or torn out and the bird bleeds to death. Therefore, there is a need for birds to have their beaks trimmed or treated to avoid the continual acute pain over the lifetime of the bird from feather removal and the horrific painful death from cannibalism.

The third pain response and the potential of long term or chronic pain in birds trimmed with a hot blade at 6 weeks was described by Breward and Gentle (1985). Some reviewers and policy regulators particularly in the EU believe chronic pain is the reason why beak trimming should be banned without considering later findings on neuromas resolving.

Breward and Gentle (1985) found that after the nerves were cut, micro neuromas (small tangled mass of nerves) developed and sent signals back to brain. The signals were interpreted by Gentle as being like the pain responses from neuromas humans developed after amputation of their limbs. Humans can experience sensations from the stump such as burning, pins and needles and other feelings from the body part that has been removed such as movement, itching and vibration often described as phantom limb pain.

Caution however, needs to be applied in the interpretation of the presence or absence of neuromas in terms of welfare of the bird. Research at the level of the spinal cord in birds has not been undertaken to determine if neuromas in the beak result in chronic pain. In humans the incidence of severe phantom limb pain occurs in only 5 to 10% of the cases (Weinstein 1998). In humans however, the limbs have no ability to regenerate like the beaks in poultry. Beaks have an extraordinary ability to regenerate after moderate beak trimming. The neuromas that develop in poultry resolve as the nerves regrow into the receptors into the beak allowing normal beak function.

Breward and Gentle (1985) noted that neuromas were present three weeks after trimming but they did not examine if the neuromas resolved over time at a later age.

However, Lunam (2005) found that neuromas form in the beak when axons are severed during hot blade beak trimming in day old chickens but went onto find that neuromas did resolve. Lunam (2005) noted that scattered micro neuromas regressed with moderate trimming (one-half of the upper beak; one-third of the lower beak; 2 sec cauterisation) with previously severed nerves establishing a connection with receptors in the beak. However, in the case of severe beak trimming (two-thirds of the upper beak; half of the lower beak; 4 sec cauterisation) neuromas persisted, and it is possible they discharged action potentials that may have been perceived by the bird as chronic pain.

These results were consistent with other workers and indicate that neuromas do form after hot blade trimming but resolved in birds moderately trimmed with sensory receptors and free nerve endings still present in the upper and lower beak. Neuromas only persisted in birds that had been severely trimmed when two-thirds of the upper beak and one-half of the lower beak was trimmed. HB at 1 d of age results in rapid healing of the tissue – this is slowed when trimmed at 35d (Schwean-Lardner et al., 2016). Hot blade trimming at a younger age results in rapid regeneration of the beak tissue with minimal formation of scar tissue (Lunam, 2005).

An anatomical and behavioural study examined the effects of moderate hot blade beak-trimming of chickens on the day of hatch (one-half of the upper beak and one-third of the lower beak) and re-trimming of 2 mm of the upper and lower beak at 14 weeks-of-age (Lunam, 2005). Sensory receptors and individual nerve fibres were observed near the tips of the retrimmed upper and lower beaks at 28 weeks-of-age. At 66 weeks-of-age, sensory receptors and nerve fibres were observed in the dermis at the beak tip (Lunam, 2005). The hens returned to normal feeding and pecking behaviours (Jongman et al. (2008) and supported the microanatomy that the sensory input to the beak is restored after retrimming. Taken collectively the data suggests that moderate hot blade trimming at hatch or at an early age, as well as conservative re-trimming at 14 weeks-of-age minimises the development of scar tissue and allows reinnervation of free nerve endings into the beak tip. In addition, encapsulated sensory receptors in the beak stump will move towards the beak tip (Lunam, 2005).

Gentle (1998) the EU advocate originally calling for a ban hot blade trimming in 1985 eventually agreed that neuromas do resolve, and he made a compelling case that hot blade should be allowed to be practiced in young birds using moderate trimming (Gentle, 1998).

Research previously by Glatz (1987, 1990) had identified that hot blade beak trimming birds at hatch and removing half of the upper beak and one third of the lower resulted in less stress to birds and better performance than beak trimming birds at older ages.

These findings on hot blade trimming in Australia by Glatz (1987, 1990) were recognised in the 1992 and 1995 Australian Model Code of Practice for the Welfare of Animals. Domestic Poultry; i.e. day-old chickens should have no more than one-half the upper beak and one-third of the lower beak trimmed with a hot blade (i.e. 3mm of upper beak and 2.5mm of the lower beak trimmed in day-old chicks and 10 day-olds should have no more than 4.5mm of the upper beak trimmed and 4.0mm of the lower beak trimmed). This resulted in birds having 12mm of upper beak remaining at 18 weeks (i.e. 2/3 of beak) with a 2mm step to the lower beak.

It is important to note that the guidelines for the amount of beak to remove with a hot blade have no relevance to the amount of beak treated with an infrared light source. Unlike hot blade trimming, with IRBT the beak surface remains intact protecting the treated soft tissue underneath.

In the 2002 Australian Model Code of Practice for the Welfare of Animals, Domestic Poultry specified that beak trimming of birds be conducted using an accredited trainer under an accredited training program in accordance with an agreed accreditation standard. Dr Phil Glatz was requested by RIRDC's Egg Program to develop an accreditation standard published in a training manual for hot blade beak trimmers and worked with TAFE, NSW, VIAS and PIRSA (see Bourke et al. 2002) to develop the standards in the manual.

The Code stated that beak trimming must be performed only by an accredited operator or under the direct supervision of an accredited trainer as part of an accreditation training program and must be performed only in accordance with agreed accreditation standards (in the training manual). The amount of beak to remove at various ages with the hot blade from beak trimmers to follow were illustrated in a graph in the training manual and were the same amounts recommended in the 1992 Code based on the work of Glatz (1987, 1990); i.e. 3mm of upper beak and 2.5mm of the lower beak trimmed at day-old and 10 day-olds should have no more than 4.5mm of the upper beak trimmed and 4.0mm of the lower beak trimmed). **As discussed above it is critical to reinforce that the amount of beak to remove for hot blade beak trimming should not be linked to the IRBT method in the Australian Welfare Standards and Guidelines.**

The recommendation that only 1/3 of the beak be trimmed early in the life of birds with a hot blade must be rejected as it will result in rapid regrowth of the beak, injurious pecking and subsequent mortality in birds.

Some authors who have reviewed the literature have not looked at the details of the method of trimming used. Many papers do not provide these details. It is important in any review that details of the method of trimming for each of the references is quoted. The risk factors associated with development of chronic pain or persistent neuromas for hot blade trimming are the age of beak trimming, amount of beak removed and cauterisation time. For IRBT the risk factors are lamp power settings, interface plates and/or mirror types, exposure time and depth of treatment.

Without these details, which is the case in the review by Nicol et al. (2017) it is difficult to make an appropriate appraisal of any of the papers where birds have been trimmed using the HB and IRBT method.

The authors state that

Research on pain associated with infra-red trimming is still limited.

The authors (Nicol et al. 2017) indicate that pain associated with infra-red trimming, more correctly termed Infra-Red Beak Treatment (IRBT), is limited but there is evidence to the contrary. Glatz and Hinch (2008) showed that IRBT using a severe treatment resulted in neuromas which persisted to end of lay. The IRBT settings was subsequently modified by Nova-Tech to eliminate chronic pain or adverse sensory function.

The change in IRBT settings was examined by McKeegan and Philbe, (2012) and showed that IRBT does not result in chronic pain or other adverse consequences for sensory function in the beaks of birds. They looked at that long-term effects of IRBT on birds up to the age of 50 weeks and found that reinnervation was visible, and no neuromas or abnormal proliferations of nerve fibres were observed at any age. More recently Schwean-Lardner (pers. Comm) and Schwean-Lardner (a, b, c) 2017 supported the findings of McKeegan and Philbe, (2012). Various configurations of the infrared beak treatment equipment result in minor behavioural changes with minimal impact on comfort behaviours. Mortality from cannibalism was higher in non-trimmed control group. Schwean-Lardner et al (2017 a) examined various configurations of infrared beak treatment equipment on beak characteristics of various strains of white and brown egg birds.

At 3 weeks of age the reduction in upper beak length (relative to control group not trimmed) ranged from 33.6-42.4% for birds with one configuration (27/23) of IRBT. At 18 weeks the reduction in beak length had declined to a range of 17.7-22.9% for the 27/23 treatment.

For the alternative configuration of 25/23 for IRBT the reduction in upper beak length was 38.9-52.4% at 3 weeks and 20.3-34.1% at 18 weeks.

In Australia IRBT targets a 30% beak length reduction at 18 weeks (Gomer, pers. comm).

Therefore, it is important to note that IRBT at day old with various configurations of IRBT for white and brown and strains of layer chicks' results in upper beak length at 18 weeks of age that are 20-30% the length of control birds not treated. More importantly mortality from cannibalism was reduced using IRBT and did not result in chronic pain or other adverse consequences for sensory function in the beaks of birds. The recommendation that only 1/3 of the beak be treated at day old with IRBT must be rejected as it will result in rapid regrowth of the beak and subsequent mortality in birds. Collectively, these results suggest that IRBT of day-old chicks is not associated with chronic pain and is the preferred method of blunting the beak to prevent cannibalism.

The authors state that

The practice (beak trimming) **can significantly reduce mortality in conventional and furnished cages (Guesdon et al., 2006) and in non-cage flocks (Mertens et al., 2009; Defra, 2015; Weeks et al., 2016). Weeks et al. (2016) conducted a quantitative analysis of mortality data from 801 beak-trimmed and 228 intact-beak flocks housed between 2006 and 2012 and found significantly (but not dramatically) lower mortality in the beak-trimmed flocks at 40 weeks and at 70 weeks (7.2% vs 8.3%), using a model that accounted for many other bird and management variables.**

The authors state that Weeks et al. (2016) found beak trimmed flocks had significantly but not dramatically lower mortality than flocks not trimmed when bird and management factors are considered. In response to this comment it is known that there are over 50 variables that may contribute to birds initiating a feather pecking or cannibalism attack (Glatz and Runge, 2017). Research has yet to identify how these bird and management variables discussed by Weeks et al. (2016) can be fully adopted in a flock to minimise feather pecking and cannibalism.

In some cases, a combination of factors on one shed in a farm may initiate cannibalism yet another set of factors may be responsible in another shed making it hard to control cannibalism. In the commercial Egg Industry there are many anecdotal reports in Australia of 20% mortality because of cannibalism in non-beak trimmed flocks (Glatz, 2000). In a research environment in Australia non-beak trimmed layers housed in cages in a naturally ventilated shed had to be beak trimmed when mortality reached 40% only six weeks after the layer trial had commenced (Glatz and Hinch, 2008).

While Weeks et al. (2016) state that beak trimmed flocks had significantly but not dramatically lower mortality than flocks not trimmed when bird and management factors are considered the reality in the field particularly in Australia, USA, Canada and in many other countries is that it is difficult to reduce mortality from cannibalism without beak trimming. In the EU some farmers can get away without beak trimming due to birds being housed at low light intensity. Subsidy of the Industry in other countries allows some EU farmers to cope financially with 10% mortality from cannibalism they have on their farms. However, the sustainability of the Egg Industry in Australia and the welfare benefits of birds not being pecked or cannibalised relies on using best practice IRBT in day old chicks and best practice hot blade beak trimming where IRBT is not available. Good flock management practices must also be applied to reduce the risk of stressors occurring which may trigger feather pecking and cannibalism.

The authors state that

Re-trimming the beaks of older birds is sometimes applied as an emergency measure if outbreaks of injurious pecking have become severe. It can be effective (Shinmura et al. 2006b) but trimming at an older age is thought to cause more stress and pain than early beak trimming (Janczak and Riber, 2015).

It would have been helpful if Nicol et al (2017) described the age and the amount of beak removed with the hot blade retrimming and cauterisation time in the paper by Janczak and Riber, (2015). The amount of beak removed with hot blade trimming has a significant effect on whether birds do suffer more stress and pain. An anatomical and behavioural study by Lunam (2005) examined re-trimming of 2mm of the upper and lower beak at 14 weeks-of-age (Lunam, 2005) using a cauterisation time of 1 second. Sensory receptors and individual nerve fibres were observed near the tips of the retrimmed upper and lower beaks at 28 weeks-of-age. Sensory receptors and nerve fibres were observed in the dermis at the beak tip (Lunam, 2005). The hens returned to normal feeding and pecking behaviours (Jongman et al. (2008) and supported the microanatomy that the sensory input to the beak is restored after retrimming. Therefore, the comment from Nicol et al. (2017) that trimming at an older age is thought to cause more stress and pain needs to be qualified with the details of the method of hot blade trimming used.

The authors state that

Beak trimming is a welfare concern because it can cause pain and changes in function (Freire et al., 2008; Freire et al., 2011). HB trimming is accompanied by reduced growth rate, feed intake (Prescott and Bonser, 2004), pecking force and activity (Janczak and Riber, 2015). It also increases adrenocorticotropic hormone levels in the blood and altered immune function (Xie et al., 2013).

Nicol et al. (2017) states that beak trimming is a welfare concern because it can cause pain and changes in function. The reference quoted is Freire et al., (2008) which is a paper associated with the work by Glatz and Hinch (2008) where a severe form of IRBT and HB trimming was used. More recently (Struthers et al. 2017) showed that IRBT does not negatively impact on pecking force and is effective at shortening beak length. Best practice IRBT has subsequently been found not to cause chronic pain and changes in beak function. Likewise, no details have been provided by the authors on details of the beak trimming methodology used in other papers quoted related to the statement beak trimming causing pain and beak function; i.e. Prescott and Bonser, (2004); Janczak and Riber, (2015) and Xie et al., (2013).

Therefore, it is critical when making a balanced assessment that beak trimming can cause pain and changes in function be assessed relative to the details of the method used in each of the papers. If these details are not provided in the paper it is the responsibility of the reviewer to contact the authors to find out these details.

The authors state that

No signs of chronic pain are observed if HB trimming is conducted on very young birds and where only a small portion of beak tissue is removed.

If a large portion of the beak is removed nerve swellings (neuromas) can form and these may continue to send pain signals to the brain even in adult birds (Janczak and Riber, 2015). Recent work shows that healing is faster if HB trimming is conducted at 0 or 10 days than at 35 days of age (Schwean-Lardner et al., 2016).

The details provided above by Nicol et al (2017) on HB trimming that no signs of chronic pain are observed if HB trimming is conducted on young birds if a small portion of the beak is removed is the first time in the paper where some balance on appraising effects on HB trimming are provided. However, no details are given on the actual amount of beak removed and cauterisation time.

Nicole et al. (2017) also indicates if a large portion of the beak is removed neuromas may form. Once again, more details need to be provided on the actual amount of beak removed and cauterisation time. The work Nicol et al. (2017) quotes on healing being faster if HB trimming is conducting early in life in birds by Schwean-Lardner et al. (2016) confirms the findings of research conducted in Australia, USA and the UK and published in a beak trimming text book (Glatz, 2005). The text book does provide detailed information on HB trimming, amount of beak removed, cauterisation time, age of trimming and the risk factors associated with pain and reduced beak function in beak trimmed birds. It would appear the Nicole et al. (2017) have overlooked the comprehensive reviews conducted on HB trimming in the text book which would have aided them in providing a balanced assessment of HB trimming in layers

The authors state that

Chronic effects on bird welfare are more likely in birds that are HB trimmed at the age of one week or older.

It would have been helpful if Nicol et al (2017) gave details of the chronic effects on bird welfare when birds are trimmed at the age of one week or older. This aspect has been described in detail in the beak trimming text book (Glatz, 2005) where HB trimming of one-half of the upper beak and one-third of the lower beak at day old using a 2 second cauterisation time was followed by re-trimming of 2 mm of the upper and lower beak at 14 weeks-of-age using a cauterisation time of 1 second. Sensory receptors and individual nerve fibres were observed near the tips of the retrimmed upper and lower beaks at 28 weeks-of-age. At 66 weeks-of-age, sensory receptors and nerve fibres were observed in the dermis at the beak tip (Lunam, 2005). The hens returned to normal feeding and pecking behaviours (Jongman et al. (2008) and supported the microanatomy that the sensory input to the beak is restored after trimming and retrimming.

More recently Schwean-Lardner et al., 2016) showed that HB trimming at one week of age had a faster healing time and no chronic effects were noted. Therefore, the comment from Nicol et al. (2017) that chronic effects on bird welfare are more likely in birds that are HB trimmed at the age of one week or older needs to be qualified with the details of the method of hot blade trimming used and any subsequent ages of trimming. These details are provided by Lunam, (2005) and Schwean-Lardner et al., (2016) on the effect of age of HB trimming on pain and beak function in layers.

The authors state that

McKeegan and Philbey (2012) found no evidence of nerve sensitisation (using single sensory nerve recording), no radiographic evidence of adverse pathology, and, in older birds, no signs of neuroma formation. Birds that have been IR trimmed are also more able than HB trimmed birds to control mite infestations through preening behaviour (Murillo and Mullens, 2016). However, IR trimming does have some adverse effects on birds' behaviour and development. Normal ground pecking was suppressed alongside feather pecking in birds subjected to an early IR treatment followed by a later HB treatment (Hartcher et al., 2015a). Dennis and Cheng (2012) found walking, drinking and pecking behaviour less disturbed in young birds subjected to IR than birds trimmed using the HB method. But birds trimmed using either method show drops in normal feeding behaviour in the first weeks of life (Marchant-Forde et al., 2008) and reduced weight gain (Angevaare et al., 2012).

Nicol et al (2017) refers to the work of McKeegan and Philbey (2012) where there are no adverse effects noted for IRBT but then states that early IR treatment followed by a later HB treatment suppresses ground pecking. When referring to IRBT and then HB trimming in this section (Hartcher et al., 2015a) the authors need to provide some details on the IRBT treatment used as well as the HB method used to make any valid comparisons. Likewise, it is difficult to rationalise the findings on drinking, feeding and pecking behaviours for comparisons between IRBT and HB when there is no information of the actual levels of HB used and the IRBT settings used.

The authors state that

An alternative approach is to provide birds with hard materials that are attractive pecking substrates. Pecking blocks of a variety of designs and materials are now available (e.g. Vencomatic pecking pans). As the birds engage in normal exploratory pecking, the tips of their beaks are blunted, thereby reducing the damage that birds may inflict if they feather peck. There have been a few small-scale studies of the effectiveness of beak blunting but evidence from peer-reviewed replicated studies is currently lacking.

Nicole et al. (2017) have discussed the role of pecking substrates as a method of blunting the tips of beaks to reduce the damage that birds may inflict if they peck other birds. Under Australian conditions these devices at best will provide birds an alternative pecking activity. Based on EU experience (van Niekerk; pers. comm.) the beak sharpness is reduced but there is only a small reduction in beak length. To ensure birds don't causing pecking damage to other birds Industry experience in Australia requires that best practice IRBT and HB trimming are used to prevent feather pecking and up to 20% mortality from cannibalism.

References

Available on request