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Claw abrasives in layer cages

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by

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Benefits of abrasive strips in layer cages. (SAR-18A).
Should claw abrasives be used in layer cages? (SAR-34A)
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Foreword

One of the criticisms of keeping birds in cages is the excessive length claws reach by the end of the laying period. Most modern strains of hens have been selected for reduced claw length and sharpness of claws. Nevertheless, their claws are still capable of inflicting damage and can still get trapped in the cage structure. This has been recognised in the European Union with the European Communities Council Directive (1999/74/EC) which states that "cages shall be fitted with suitable claw shortening devices" (chapter II, article 5, provision 6).

A low-cost, non-invasive method by which the claws of caged layers can be kept short and blunt can be achieved by fitting strips of abrasive tape on the egg guard. Bird's claws scrape against this tape while they are feeding. This reduces the effectiveness of the claws to cause injury and feather loss and reduces the risk of entrapment. Recently it has been suggested that abrasive paint coated onto the egg guard may also be an effective claw shortener.

To resolve whether egg farmers in Australia should use abrasive strips or apply abrasive paint to layer cages, two trials were conducted. Effectiveness and durability of the abrasives were measured by monitoring body condition and mortality of layers.

Both trials demonstrated abrasive paint was more effective and more durable as a claw shortener than abrasive strips. Hen mortality from prolapse and cannibalism was higher in cages fitted with abrasives in one trial but was not a problem in the other trial. Nevertheless producers need to be wary of the potential for problems with cannibalism if claw abrasives are used in cages.

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Peter Core
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Executive Summary

Caged bird's claws grow to 3-4 cm's while for floor housed birds the claw length is kept shorter (about 1.5 cm) by the birds scratching their claws in the litter. A low-cost, non-invasive method by which the claws of caged layers could be kept short and blunt can be achieved by fitting 8-mm strips of abrasive tape on the egg guard. Bird's claws scrape against this tape while they are feeding. This reduces the effectiveness of the claws in causing injury and feather loss and reduces the risk of birds trapping their claws in the cage. Tauson (1996) suggested that a mixture of paint and sand might also be an effective abrasive when coated onto the egg guard.

If egg producers in Australia are to follow the European directive and install claw abrasives in cages then information on effectiveness of claw abrasives under Australian housing conditions are required. Overseas research suggests abrasives reduce claw length of hens, improves feather cover, lowers mortality and reduces the incidence of scratches and entrapment injuries.

Two trials were conducted at the PPPI to determine the effectiveness and durability of abrasive strips and abrasive paint in layer cages on bird condition and mortality. Applying the pre-prepared paint with a spatula to the egg guard was much easier and took less time than sticking the abrasive strips onto the egg guard. Fitting the strips took longer because they had to be cut from a 25-mm roll into appropriate lengths, the tape backing had to be removed and then the strip stuck onto the egg guard section.

The results from both trials demonstrated that abrasive paint was more effective and more durable as a claw shortener than abrasive strips. The birds using the abrasive paint had the shortest claw length and lowest claw sharpness. One of the reasons claw shorteners are used in cages is to reduce mortality by minimising abrasions caused by the claws. Surprisingly hen mortality from prolapse and cannibalism was significantly higher in cages fitted with abrasives in the first trial but was not observed in the other trial.

It is possible that when birds are frightened or competing for a position at the feed trough they might abrade their vent region on the paint or the strips region encouraging vent pecking. There was however no production, egg quality, behaviour, beak condition or beak length measurements recorded to provide any evidence to help explain the increase in prolapse or cannibalism observed for birds in the first trial.

If producers in Australia intend to install claw shorteners in layer cages they need to be wary that cannibalism and prolapse problems do not occur.

General Introduction

The claws of caged birds can grow to a considerable length and be a source of injury to other birds. The cage floor does not allow the bird to wear down the claw in the same way that it occurs with floor housed birds. A low-cost, non-invasive method by which the claws of caged layers can be kept short and blunt can be achieved by fitting 8-mm strips of abrasive tape on the egg guard (Tauson, 1986). Bird's claws scrape against this tape while they are feeding. This reduces the effectiveness of the claws to cause injury and feather loss and reduces the risk of entrapment. Tauson (1996) suggested that a coat of abrasive paint on the egg guard might be just as effective in reducing claw length as abrasive strips. There are no reports available in the literature to confirm the anecdotal reports from egg producers in Sweden, who found abrasive paint to be more durable and more effective than abrasive strips at reducing claw length.

If Australia is to follow the European Union directive and install abrasives in cages, producers need to know whether the time and cost of installing abrasive strips or applying abrasive paint in cages will be offset by improved feather cover, lower mortality and fewer scratches on the body. The current trials determined the effect of abrasive strips and abrasive paint in layers cages on claw length and sharpness, foot condition, feather cover, body scratches and mortality of hens.

Objectives

Experiment 1

- Determine the effect of abrasive strips and abrasive paint in layer cages on claw length and sharpness, foot condition, feather cover, body scratches and mortality of hens.
- Encourage the use of abrasive strips in the Australian egg industry.
- Provide details of source, product type and protocol for fitting abrasive strips or applying abrasive paint in cages.

Experiment 2

- Establish if claw abrasives are responsible for the increase in prolapse and mortality observed in experiment 1.
- Provide recommendations on use of claw abrasives in cages in Australia.

CHAPTER I INTRODUCTION

Claw length

One of the criticisms of keeping birds in cages is the excessive length that claws can reach by the end of the laying period. This has been recognised in the European Union with the European Communities Council Directive (1999/74/EC) which states that "cages shall be fitted with suitable claw shortening devices" (chapter II, article 5, provision 6). Media vision showing the long claws on caged birds and the difficulty long clawed birds have in walking when placed in floor pens has increased the public's poor perception of keeping birds in cages.

Pullet claws

During the pullet stage the claws can get quite sharp and handlers need to wear protective gloves, long trousers, long sleeved shirts or overalls to avoid lacerations. For example when cage reared birds are being retrimmed or vaccinated at about 10-12 weeks of age, the claws can be a dangerous weapon especially when the birds flap and attempt to escape while being handled. It is not uncommon for handlers to receive lacerations on exposed skin caused by the sharp claws. In recent years the commercial breeding companies have selected against birds with both long claws and sharp claws (B Verrall, Hy-Line Australia Pty. Ltd., personal communication). Nevertheless the claws still grow to about 3 cm's and despite many birds being reared on the floor, claws can still get quite sharp and will inflict injury on other birds and handlers.

Layer claws

When birds are placed in layer cages at 18-20 weeks the middle claw length of current strains of birds reared on the floor are about 18 mm and by end of lay in cages can measure more than 30 mm. During the laying period the claws of birds can cause abrasions on other birds especially during periods of disturbance. For example when birds are being fed it is likely that birds will clamour over each other in an attempt to get to the feed trough causing abrasions to other birds especially if the claws are sharp. Likewise there is potential for injury to birds from claws during other periods of disturbance. For instance birds can get flighty while; i) eggs are being collected, ii) during routine cleaning and maintenance in the shed, iii) when the egg belt and manure belt are being run, iv) when unfamiliar staff enter the shed, and v) when loud noises or unusual events occur in the shed. During some of these disturbances birds attempt to escape from the cage and can cause considerable injuries to other birds and to themselves. It is not uncommon for the claw of a bird to get caught on its own wing. Furthermore, even fairly short claws will still get sharp and may also be a potential source of injury to other birds (Hill, 1975; Ruszler and Quisenberry, 1979; Fickenwirth, *et al*., 1985).

Injuries from claws

When birds are injured by claws there is the potential for cannibalism to develop, especially if there are bloodstains on birds, broken skin, raw wounds and injured vents. In these circumstances, forceful pecking will lead to pecking at the abrasion (Savory, 1995), attracting other birds to join in the pecking. Death of the pecked bird usually results. In addition, if the wound does occur around the lower abdominal region where the skin is very thin (Glatz and Lunam, 1996) death of the bird from pecking occurs rapidly. Picking of the abdominal region several inches below the vent is the severest form of cannibalism. After birds have tasted blood they will continue their cannibalistic habits without provocation. Cannibalistic pecking is responsible for at least 80% of all vent pick-out cases (Smith, 1982) and often results from poor beak-trimming with the offender usually being a cage mate or a bird in an adjacent cage that has been improperly beak-trimmed. When light intensity is kept at 5 lux or lower, which is achievable under European cage layer house conditions, the potential for cannibalism developing is probably quite low because birds cannot see the wound.

Trapped birds

Long claws also cause accidents if the claws of birds get caught in the various parts of the cage. In recent times cage design has improved with cage manufacturers eliminating most of the problem areas especially in the corner of cages and around the feed trough where claws and other parts of the body can be trapped. While most birds can eventually free themselves others may be trapped for some time (Tauson, 1985). During this period other birds will peck and clamour over the bird and can cause injury with the claws leading to cannibalism. Other birds may be trapped for extended periods and die.

Declawing

The claws are one of the most effective defensive structures, causing stress and altering behaviour patterns in other birds of the flock (Ruszler and Quisenberry, 1979). The claws of most bird species are used as weapons to inflict injury on competitors and used to maintain status in the social hierarchy. In some strains of layers declawing has been carried out by removing the distal phalangeal joint of the front toes with a red-hot blade (Compton, *et al*., 1981). In day old chickens the distal phalangeal joint can also be amputated with a sharp pair of scissors angled to retain the ventral aspect of the distal phalanx within the footpad.

Declawing has been reported to reduce hysteria in birds and increase production (Hansen, 1969; Ruszler and Kiker, 1975; Hansen, 1976, Ruszler and Quisenberry, 1979; Compton, *et al*., 1981; Gildersleeve, *et al*., 1981; Martin, *et al*., 1981; Vanskike and Adams, 1983 and Goodling, *et al*., 1984). However, it was reported by Compton, *et al*. (1981) that declawing decreased the support of the foot on the wire, leading to inferior foot condition. In emus, Lunam and Glatz (2000) found that declawed emus were flat-footed and had an altered gait.

In Australia, declawing is practiced in the poultry breeder industry to prevent aggressive roosters causing claw damage on hens. Some strains of layer pullets have also been declawed to alleviate the injuries to the skin of other birds caused by aggressive and panic behaviours. Declawing also reduces the risk to handlers, particularly during procedures such as retrimming, vaccination, pullet transport to the farm and spent hen transport. In the emu industry it is routine practice to declaw emus as it reduces conflict between emus, prevents damage and downgrading of hides and improves worker safety.

Declawing can potentially result in long term pain. Zimmerman (1986) reports that chronic pain in most species can modify specific walking behaviours, including social behaviour. Chronic pain is observed in orthopaedic disease and in some cases following peripheral injury (Gentle, 1997). Tissue and bone damage resulting from declawing could result in persistent pain with birds undertaking protective guarding behaviour and other pain coping behaviours. In heavy breeds of poultry with arthritic complaints loss of locomotor function is common (Thorp, 1994). Animals with this condition are unwilling to stand or walk and there is evidence of one legged standing, limping and sitting as the bird attempts to cope with the pain. In less painful arthritic conditions animals are observed to change their posture more frequently.

Gentle (1997) suggests that chronic pain can result in pain guarding behaviours and declawing might be expected to modify walking behaviour. Studies by Lunam and Glatz (2000), however showed that despite emus becoming flatfooted, there was no behavioural evidence to indicate loss of locomotor ability of declawed emus or to suggest declawed emus were suffering from severe chronic pain because most of the neuromas had resolved by 28 weeks of age. In addition declawed emus engaged in significantly more bouts and time of searching, less stereotype pacing and pecking indicating the declawed birds were under less stress and not as frustrated as control birds which were more aggressive. The behavioural and neurological evidence for emus indicate that declawing does not compromise locomotor ability of emus, despite the altered gait, and has the benefit of improving the social structure in the groups by reducing stereotype behaviour and aggression. For egg layers there have been no comprehensive anatomical or behavioural studies undertaken to assess the effects of declawing. The preliminary studies on declawing with emus and the recent findings on beak trimming and re-trimming of birds by Glatz, *et al.,* (1998) suggests that declawing layers does not result in the degree of chronic pain originally thought. Declawing in poultry might have more welfare benefits than disadvantages.

Abrasives and claw length

Hens in cages are not able to wear down their claws as effectively as free-range birds or birds kept in other non-cage systems. Floor layers spend a great deal of their time foraging for food. This behaviour involves persistent scratching of the litter or soil looking for edible items such as insects, seeds, grain or vegetative material. The scratching behaviour wears down the claws and keeps them blunt. In cages, however, the claw length of the middle toe can reach over 40 mm (Hill, 1975; Tauson, 1977; Fickenwirth, *et al*., 1985) and in some strains the claws can become long, twisted, cracked and with a pronounced curl.

A low-cost, non-invasive method by which the claws of caged layers can be kept short and blunt can be achieved by fitting 8-mm strips of abrasive tape on the egg guard. Bird's claws scrape against this tape while they are feeding. This reduces the effectiveness of the claws to cause injury and feather loss (Tauson, 1986) and reduces the risk of entrapment. Tauson (1986) conducted three experiments with the abrasive tape. Birds using this tape had significantly shorter claws than the control hens throughout the laying period. The length of claws of the middle digits of birds using the tape did not exceed the length of claws in pullets or in birds kept on litter floors. A considerable number of the control hens had broken front claws or claws that were very long and often twisted. In each of the three experiments conducted by Tauson, (1986) claw length of White Leghorn birds provided the abrasive tape was less than 20 mm by 35 weeks of age. Tauson (1986) reported the birds using the tape were easier to handle when taken out of the cages and when being handled at end of lay to transport to the abattoirs for slaughter. The durability and adhesive properties of the tape were found to be acceptable over the 3 experiments. Elson, (2001) tested identical strips both at ADAS Gleadthorpe Poultry Research Centre and on commercial farms in the UK. The abrasive strips were effective, but some of the strips did not last and they became detached from the baffle plate and had to be replaced.

Wienken (personal communication), Technical Department, Big Dutchman International, Germany has indicated that stick on sandpaper strips have a lifetime of about 2 years in their cage systems. The effectiveness of the tape at reducing claw length is dependent on the activity of the birds at the feed trough and the area of the tape fitted to the egg baffle. Tauson (1986) reports that birds which are fed with a chain feeder are normally more active and there will be more wear observed on the tape. The hens used the tape quite intensively by scratching with their feet on the egg guard while feeding.

Rauch (1992) reported that the middle claw length of 42-week-old medium hybrid control layers was 17.4 mm and only 7.2 mm for birds using the tape. In another experiment Rauch (1992) observed that the middle claw length of 61-week-old light hybrid control layers was 29.4 mm and 13.9 mm in birds using the tape.

In Australia there have been two experiments conducted using abrasive tape in layer cages. Murphy (unpublished) indicated that abrasive strips were effective in reducing claw length. Stewart and Dingle (1997) reported an average middle claw length of 23.7 mm for 2 strains (68 weeks of age) using abrasive tape compared to 27.3 mm for the controls. Stewart and Dingle (1997) found that the abrasive tape was more effective at reducing claw length in the Harrison cage than in the Salmet cage or the Edinburgh cage. They indicate that the angle and size of the egg baffle plays an important role in claw length reduction in the various cage types when abrasives are used and recommend the use of abrasive tapes in all cages fitted with baffles.

Abrasives and foot condition

Tauson (1986) found birds using the tape had no deterioration in foot condition except in one batch of birds at 52 weeks of age. Studies by Lunam and Glatz (2000) have shown that declawing in emus alters the weight distribution in the feet when birds are standing. It is likely that this is the case in caged birds with shortened claws. There could be more pressure placed on the pad areas of birds causing a decline in foot condition as was observed in declawed layers by Compton, *et al*., (1981). Rauch (personal communication) and Niekerk (personal communication) did not observe any decline in the foot condition of birds using the abrasive tape.

Abrasives and production

In one experiment Tauson (1986) showed that egg mass per hen housed was significantly higher in birds using cages fitted with abrasive tape and there was a tendency for fewer dirty eggs. Other reports are equivocal on the influence of abrasives on egg production (Ruszler and Kiker, 1975; Ruszler and Quisenberry, 1979; Martin, *et al*., 1981 and Goodling, *et al*., 1984).

Abrasives and egg quality

Abrasives have not been found to affect egg quality (Tauson, 1986; Ruszler and Quisenberry, 1979 and Compton, *et al*., 1981) although Elson (1978) claims sharp toenails may cause shell damage especially in sagging cages where egg roll out is poor. Niekerk and Reuvekamp (2000) indicated there was a tendency for fewer cracked eggs from hens utilising a Patchett abrasive strip.

Abrasives and plumage condition

Tauson (1986) found that abrasive strips did not improve the plumage condition while Compton, *et al*., (1981) and Vanskike and Adams (1983) found there was no difference in the feather cover between normal and declawed hens. In particular, there was no significant differences found in plumage condition of the back of the hens, which would have been expected if the incidence of trampling was high.

Abrasives and cannibalism

There have been no reports linking claw shorteners with an increase in cannibalism. Tauson (1986) found numerically higher (but not significant) mortality in his first experiment but lower mortality in the second and third experiment. Van Niekerk and Reuvekamp (2000) conducted trials with sandpaper fitted in the feed trough. If the feed trough was emptied once a day, it was observed that the sharp points of the beaks were blunted to a small degree, reducing feather pecking damage. Under low light intensities (5 Lux), Van Niekerk and Reuvekamp (2000) did not observe any differences in cannibalism, but under higher light intensities (20 lux) the birds with blunted beaks had a lower mortality due to cannibalism compared to non-trimmed birds with no abrasive device in the feeder.

Fitting abrasive tape

Tauson (1986) reports that abrasive tape (3M-'Safety Walk, General Purpose Black') is easily cut into different sizes and fitted in both new and old cages. If the cage has not got a deflector, it is suggested a similar effect on claw length could be achieved by attaching the strip on the back of the feed trough. However in the Victorsson enriched furnished cage which has an almost vertical baffle plate Tauson recommends not to fit abrasive tape (Elson, personal communication). For heavier breeds (medium brown hybrids) which have shorter claws than lighter White Leghorn hybrids, Tauson (1986) recommends fewer strips of abrasive tape be fitted to avoid bleeding of the claws at the zone of ossification.

Problems can occur with incorrect fitting of abrasive tape

Tauson (personal communication) considers that claw abrasives should be compulsory for caged birds. However, there are sometimes complaints from producers who find that the strips fall off and wear out. The material needs regular checks and has to be renewed after 2-3 years. Tauson (personal communication) indicates that the reasons for the complaints from some farmers but not others may be because the abrasive material used is not correct and may be a cheap replicate with poor self-adhesive glue. Alternatively he suggests the strips were not properly stuck to the egg baffle plate because it was not cleaned to remove fat, feed residues or dried saliva. In new cages an oil film often protects the sheet metal and this protective layer must be cleaned with an appropriate solvent (e.g. acetone) to ensure that the abrasive tape can be effectively secured to the sheet metal. Niekerk and Reuvekamp (2000) suggests the only place to fit the abrasive is on the egg baffle, where the feed trough is located outside the cage. Elson (2001) recommends claw shorteners should be applied well up the baffle plate near the feed trough extending for most of the width of the cage. Elson (2001) suggests that if the area of the abrasive material is too large, then skin irritation can occur which may in turn lead to injurious pecking. In enriched cages, where some feeders are located in the cage, the abrasive could be fitted to the feeder. The effectiveness of this location is questionable as the bird is not able to effectively scrape its toe nail on the abrasives (Niekerk and Reuvekamp, 2000). Another location is on the floor in the form of a grass mat with rubber fingers, but soiling of the strip is likely.

Other abrasives

Abrasive paint

Tauson (1996) mentioned the use of abrasive paint as another method to improve the durability of the abrasive. Very fine sand is mixed in paint and the thick mixture is applied in a band on the egg baffle. Tauson (personal communication) had a discussion with Swedish egg producer who used abrasive paint as a claw shortener on his 15,000 bird-laying farm. The producer used a paint brand in Sweden known as "Technolac-Prime", code 168D46. This primer is normally used for preventing corrosion of equipment like the inside of manure auger tubes.

To produce the abrasive paint, the producer mixed 170 kg of very fine blasting sand (0.4-0.8 mm) with 40 litres of paint. The mixture was sufficient for 3300 cages. A 5-6 cm wide strip of paint was coated onto the deflector plate except for the inner 5-cm. The paint mixture is a very thick paste and was applied to the deflector using a spatula. The producer commented that the abrasive paint was still effective after three batches of birds. The cost of the paint was dependent on the amount bought. In Sweden the current price of this paint is 268 SEK/1 ($51.53/l (AUD). However, three years ago the same paint could be bought in larger barrels for about 50 SEK/l ($9.62/l).

Abrasive baffle made at manufacture

Elson (personal communication) advised that claw shorteners have also been produced during cage manufacture by using the 'coining method' or pressing a 'tread' to make a perforated baffle . Van Niekerk and Reuvekamp (2000) used 2 perforated baffles, one with holes 3 mm in diameter and 2 mm spaces, the other with 5 mm holes. The 3 mm baffle did not provide sufficient abrasion to the nails. The 5 mm baffle gave significant wear of the nails, but only a few nails were abraded. The holes on the baffle soon lost their edge and effectiveness.

Glue and sand

In addition Van Niekerk and Reuvekamp (2000) tested an egg baffle with a strip of sand fixed on it with resin. The abrasive effect on the nails was significant but by the end of the laying period large parts of the strip had been worn down.

Metal plate with filings

Van Niekerk and Reuvekamp (2000) reported that a metal plate with abrasive iron filings produced by Patchett (UK) was an effective abrasive in cages. One Patchett strip (17.5 cm long and 2.5 cm wide) was found to be just as effective as having two strips in the cage and broken nails were significantly lower (0.6% vs 9.4%) than in cages with no strip. Mortality from wounds or leg problems was too low to find an effect. Niekerk and Reuvekamp (2000) reports the plate should last for at least 3 years.

In the UK, Elson (2001) reports that a few egg producers have used the 8 mm wide '3M-safety walk' tape and others the Patchett tungsten carbide faced plate and found both to be effective in shortening claws but the Patchett device was more durable. The degree of shortening was much less with brown hens. One producer in the UK has used the device for 8 years. One observation made by a third year veterinary student who kept the records on a Yorkshire farm using the Patchett device was that inhole shell damage was much reduced. Total cracks were 5 % with the claw shortener and 6.5 % without the claw shortener (Elson, personal communication).

Stone

Stone is another abrasive being tested by Van Niekerk (personal communication). Results were not available at the time of writing this report.

Cost of abrasives

Elson (2001) compared the cost of fitting self-adhesive abrasive strips, applying an abrasive compound to the baffle and using Patchett strips. The cheapest option is the self-adhesive abrasive strips, at about 6-7 pence/hen for materials (plus the cost and time involved in cutting and fitting), the compound with an abrasive surface applied directly to the baffle plate was costed at 10 pence/hen, while the Patchett strip was the most expensive option at over 20 pence/hen fitted.

Chapter II Materials and Methods

Beak trimming procedure

Beak trimming was performed by a staff person from the pullet supply company. Use was made of a Lyon beak trimming machine to remove one half of the upper beak and one third of the lower beak from chickens at 7-10 days of age. Only those pullets with excessive regrowth of the beak were retrimmed at 12 weeks of age.

Birds and management

The Hyline Gold and Hyline Brown strains of laying hen were obtained from a commercial pullet grower at 20 weeks of age. Previously birds were vaccinated against Marek's disease at hatching, infectious bronchitis at 4 days and again at 4 weeks, avian encephalomyelitis at 10 weeks and fowl pox at 12 weeks. A coccidiostat was provided to the birds via the water during the rearing phase.

The laying phase for experiment 1 commenced in February 1999 (end of summer) and continued through to December 1999 (start of summer), while for experiment 2 the experiment was conducted from February 2001 to October 2001. For experiment 1, 960 laying hens (Hyline Gold) were housed 5 per cage in 192 Harrison 'Welfare' back-to-back, single tier cages (each 500 mm wide by 545 deep; 545 cm^2/bird) in a fan ventilated insulated laying shed with louvred windows. In experiment 2, 768 Hyline Brown hens were housed at 4 per cage (680 cm^2/bird). The layer shed was equipped with evaporative coolers linked to a thermostat. The cooling operated when shed temperature at bird level reached 25^{o}C. The temperature range in the shed during both experiments was approximately 11-28^{0}C. A high quality layer diet was offered *ad libitum* as mash with birds having free access to water from nipple drinkers. Incandescent lighting was provided in the layer shed and was held constant at 16 h per day. Light intensity in the shed ranged from 10-20 lux and was increased to 90-110 lux during bird inspection and egg collection. Food was provided to a depth of 2-4 cm and total feeding space for each bird at the front of the cage was 12.5 cm. Steel mesh (2.5 x 2.5 cm) was placed over the surface of the feed. This reduced the ability of the hen to flick feed out of the hopper.

Experimental design

For both experiments there were three treatments comprising;

- control cages without abrasives.
- treatment cages with two 8-mm wide abrasive strips fitted to the egg guard.
- treatment cages with an abrasive paint applied in one 5-cm strip to the egg guard.

A randomised design was used for allocation of treatments with 32 replicates per treatment. A single replicate comprised 10 birds in two adjacent cages in experiment 1 and 8 birds in two adjacent cages in experiment 2.

Application of abrasive strips and paint to egg guard of treatment cages

Egg Guard

Abrasives were fixed to the Harrison cage egg guard, which is 490 mm x 70 mm wide and angled into the cage at approximately 60^{0}.

Abrasive strip

A 25 mm wide roll of '3M-Safety Walk, General Purpose Black' abrasive tape was cut into 3 strips of approximately 8 mm. The egg guard was cleaned with acetone and allowed to dry. Two strips of the anti-slip tape were attached to the metal sheet egg guard on the rear of the feed trough. The strip was self-adhesive, 8 mm wide and 490 mm long, reaching along the entire length of the egg guard. One strip was fixed along the top of the egg guard parallel to the feed trough while the second strip was secured on the egg guard 10 mm below the top strip. For the Hyline Gold strain only two strips were stuck to the guard. Tauson (1986) recommended that giving medium weight hybrids access to 3 abrasive strips might cause excessive shortening of the claws and cause bleeding at the zone of ossification. More recently Tauson (personal communication) has recommended one abrasive strip per cage. The cost for the imported brand of abrasive strip for a 500 mm egg guard is approximately 88 cents while for the Australian brand 15c/strip.

Abrasive paint

A sand and paint mixture as recommended by Tauson (personal communication) was prepared by Galaxy Abrasives, Edwardstown, South Australia comprising the Australian equivalent of the Swedish paint product ("Technolac-Prime"; code: 168D46) mixed in a ratio of 1 litre of paint to 4.25 kg of find sand (0.4-0.8 mm). The mixture was stirred thoroughly. The egg guard was cleaned with acetone and allowed to dry. Painter's masking tape was stuck to the egg guard to allow the abrasive paint to be applied liberally to the egg guard in a 5-cm band. The paint was allowed 24 h to dry, the masking tape was removed and the birds then exposed to the abrasive paint. The cost to paint one cage with the abrasive (Galaxy Product Code P1MF) was estimated at 31c/cage for 3 batches of birds. At the end of experiment 1 all abrasives were removed from the baffle and fresh paint and new strips applied for experiment 2.

The prices quoted by Galaxy Abrasives for the abrasive paint and abrasive strip are provided below. GAFA is an Australian made safety tread product and the poultry paint is also an Australian product.

Product Code	Description	Grit Size	Pack Size	Price $ ea
SAFT253	3M Safety Tread 25mm x **18**mt		Ea	96.80
SAFT25G	GAFA Safety Tread 25mm x **50**mt		Ea	92.60
P1MF	G4450 Poultry Paint	24	1lt	41.30
P5MF	G4451 Poultry Paint	24	5lt	190.80
P10MF	G4452 Poultry Paint	24	10lt	337.00

Prices Quoted are inclusive of GST (March, 2002)

Data recording

Data was recorded on each experimental replicate of 10 birds (8 birds in experiment 2) in two adjacent cages. At 20 and 60 weeks of age (50 weeks of age for experiment 2) the following measurements were made. Birds were visually assessed for feather cover, body scratches, footpad and claw fold condition and claw sharpness using a 1-4 point scoring system. The middle claw on both feet was measured with a dressmaker's tape along the curvature of the claw. Claw length was measured on birds that died during the experiment and are reported over 3 age groups, 20-30, 31-42 and 43-60 weeks (43-50 weeks for experiment 2). Mortality was recorded daily and deaths as a result of injury, cannibalism and entrapment were noted as they occurred over the period 20-60 weeks for experiment 1 and over 20-50 weeks for experiment 2. Refer to Glatz (2000) for description of prolapse and cannibalism used to categorise bird mortality. Bird production, behaviour and shell quality were not recorded.

Feather cover

At 20 weeks of age all hens were visually assessed for feather cover and then randomly allocated to the treatments. Feather cover and damage was recorded using a 4-point scale used by Tauson (1984). The scoring system was applied to the neck, breast, back, wings, vent, tail, base of tail and legs as follows; score 4, for a part of the body having very good plumage with none or few worn or otherwise deformed feathers; score 3, for a part of the body where feathers have deteriorated but the skin is still or almost completely covered by feathers; score 2, for a part of the body that shows very clear deterioration of feathers and or with larger naked areas; score 1, for a part of the body with heavily damaged feathers with no or only very small areas being covered with feathers. The average feather score for each individual part of the body and an overall average score were calculated for each replicate of 10 hens in experiment 1 and 8 birds in experiment 2.

Foot condition (pads and claws)

Foot condition was scored at 20 and 60 weeks of age (50 weeks of age in experiment 2) according to a 4-point scale used by Tauson (1984). The scoring system was; score 4, good condition of foot pads, digits and claw folds without lesions; score 3, lesions which were clearly visible but of minor importance and/or frequency, i.e. without inflammation or deep fissures; score 2, lesions which appeared at several places on the foot and to a certain degree considered severe; score 1, very poor condition with inflamed and/or bleeding lesions spread over several parts of the foot. A similar score condition was adopted for scoring degree of chipping and/or twisting of claws; score 4, short or normal length of claws with no chipping and no twisting of nails; score 3, claws starting to grow above normal with minimal chipping apparent; score 2, clearly over-grown claws with extensive chipping; and score 1, extremely overgrown claws with extensive chipping and/or twisting of nails.

Scratches on skin

A subjective method was adopted for scoring incidence and extent of scratches observed on birds; score 4, no scratches; score 3, minor scratches and abrasions (< 1 cm in length); score 2, extensive scratches and abrasions (1-2 cm in length) and score 1, major scratches and abrasions (> 2 cm in length).

Claw Sharpness

The middle claw was scraped on a persons finger nail and given a score of 4 if a large scratch was observed; score 3 if medium size scratch was observed; score 2 if small scratch was observed and score 1 if no scratch was left on the nail. This process was adapted from a simple field method of determining abrasiveness of rocks.

Abrasive score

A persons fingernail was scraped onto the abrasive in each cage at the end of the trial and given a score of 4 if a large scratch was observed; score 3 if a medium sized scratch was observed; score 2 if a small scratch was observed and score 1 if no scratch was left on the fingernail.

Wear on the abrasive strips and paint

Observations were made to determine if there was any differential wear observed on the abrasives at the end of the experiment i.e. after strips and paint had been utilised by hens for 40 weeks in experiment 1 and 30 weeks in experiment 2.

Statistical analyses

Both experiments were analysed using the General Linear Models procedure (using Base-SAS ® software, 1988). Least significant differences were used to separate means when significant effects ($P<0.05$) were detected by analysis of variance. The large number of replicates (32) used in the trial gave the experiment considerable statistical power to enable small differences to be detected between the treatments.

Animal Ethics

The approval of the animal ethics committees of the Department of Primary Industries and Resources South Australia and University of Adelaide was obtained for both experiments in this study. All the procedures complied with the “Australian Code of Practice for the Care and Use of Animals for Scientific Purposes” (Australian Agricultural Council, 1990) and the "Australian Model Code of Practice for the Welfare of Animals. Domestic Poultry" (Standing Committee on Agriculture and Resource Management, 1995).

Chapter III Results

Scratches on skin

No scratches or abrasions were observed on the skin of birds in both experiments. In experiment 1 some birds with poorly feathered areas around the vent looked red and sore. In a previous anatomical study Glatz and Lunam (1996) showed that the vent region, despite the red colour on the surface, was not inflamed or sore. The red appearance is normal for layers as the blood vessels are very close to the skin surface around the vent region. Furthermore the skin thickness around the vent is less than all other regions on the body. This makes it a prime region for pecking attacks from other birds.

Claw length and sharpness

The middle claw length of hens from the three treatments was significantly different ($P<0.05$) at 60 weeks in experiment 1 and at 50 weeks in experiment 2. The birds using the abrasive paint had the lowest claw length and claw sharpness (Table 1a, 1b). Before the birds were exposed to the abrasives there was no significant difference in claw length or claw sharpness for the birds allocated to each of the experiments as would be expected. It was observed that there was a gradual increase in claw length of birds from 18-21 mm using the abrasive strip in experiment 1 while the claw length of birds exposed to the abrasive paint remained at about 14 mm (Table 2a) in experiment 1 and 12-13 mm in experiment 2 (Table 2b)

Feather score of hens

Overall feather score of hens and score for most body parts of birds from the three treatments were not significantly different at 60 weeks for experiment 1 (Table 3a) or at 50 weeks for experiment 2 (Table 3b). The exception was the better feather score of the tail of birds using the abrasive paint compared to the control and strip treatment in experiment 1 (Table 3a). The feather cover of the vent on all treatments in experiment 1 had the poorest feather cover of any body part, while in experiment 2 the breast had the poorest cover.

Foot and claw condition

The right pad, the right digit and the right claw fold of the birds using the abrasive paint were observed to have significantly ($P<0.05$) better condition than similar body parts on both the control hens and the hens using the abrasive strip in experiment 1 (Table 4a) but no differences were observed between treatments in experiment 2 (Table 4b).

Mortality

Mortality from prolapse and cannibalism was significantly higher ($P<0.05$) for birds using the abrasive strips and abrasive paint (Table 5a) in experiment 1. There was a trend for the overall mortality to be higher (approached significance at $P=0.10$) for the birds in experiment 1 using the abrasive strips and abrasive paint compared to the control group. In experiment 2 no differences in mortality were observed between the treatments. Only 2 birds died from cannibalism in experiment 2 and this occurred late in lay for birds using the abrasive strips.

Abrasive score of claw shorteners

There was a significantly higher abrasive score obtained for the abrasive paint compared to the abrasive strip after 40 weeks of use by the hens in experiment 1 (Table 5a) and after 30 week of use in experiment 2 (Table 5b).

Observations on the wear of the abrasive paint and strips

None of the 128 abrasive strips installed on the egg baffle came loose in either experiment. The left and right ends of the tape on the baffle (nearest to the cage sidewall) were not used as extensively as centre portion of the strips. The galvan from the metal on the baffle formed a 'solder-like' seal with the glue on the upper edge of each strip. Presumably the constant abrasion of the claw on the galvanised iron baffle and the abrasive strip caused this unusual bonding between glue and metal. There were some manure stains noticed on the baffle and strips.

In contrast to the abrasive strips the abrasive paint was chipped off in various sections along the baffle. The ends of the paint strips on the baffle (areas nearest to the cage sidewalls) were not used as extensively as centre portion of the strips. It was estimated that about 80% of the painted surface remained intact after 40 weeks of use in experiment 1 and about 85-90% after 30 weeks use in experiment 2. Most of the chipping of paint occurred about 10 cm's from the end of each baffle. Manure stains on the baffle and paint were noticed in both experiments.

Table 1a. Experiment 1-Claw length and claw sharpness (1, blunt; 4, sharp) at 20 and 60 weeks for control hens (Hyline Gold) versus hens in cages provided with abrasive strip or abrasive paint (values at 20 weeks are prior to exposure to abrasives).

Treatment	Claw length at 20 weeks (mm)		Claw length at 60 weeks (mm)		Claw sharpness at 20 weeks		Claw sharpness at 60 weeks	
	Left claw	Right claw	Left claw	Right claw	Left claw	Right claw	Left claw	Right claw
Control	18.8	18.9	31.8a	31.5a	3.4	3.5	3.5a	3.6a
Strip	18.8	18.8	24.0b	23.7b	3.5	3.5	2.2b	2.2b
Paint	18.5	18.8	14.0c	13.6b	3.5	3.4	1.2c	1.1c
l.s.d. (P=0.05)	ns	ns	0.9	1.0	ns	ns	0.3	0.2

(ns = not significant in analysis of variance; means within columns followed by a different letter are significantly different at P = 0.05, l.s.d.= least significant difference).

Table 1b. Experiment 2-Claw length and claw sharpness (1, blunt; 4, sharp) at 20 and 50 weeks for control hens (Hyline Brown) versus hens in cages provided with abrasive strip or abrasive paint (values at 20 weeks are prior to exposure to abrasives).

Treatment	Claw length at 20 weeks (mm)		Claw length at 50 weeks (mm)		Claw sharpness at 20 weeks		Claw sharpness at 50 weeks	
	Left claw	Right claw	Left claw	Right claw	Left claw	Right claw	Left claw	Right claw
Control	18.0	18.1	25.8a	26.1a	3.4	3.4	3.2a	3.2a
Strip	18.4	18.3	18.9b	19.3b	3.5	3.5	2.8b	2.8b
Paint	18.4	18.2	12.1c	12.2c	3.4	3.5	2.8b	2.8b
l.s.d. (P=0.05)	ns	ns	1.3	1.2	ns	ns	0.3	0.3

(ns = not significant in analysis of variance; means within columns followed by a different letter are significantly different at P = 0.05, l.s.d.= least significant difference).

Table 2a. Experiment 1-Left and right foot claw length of Hyline Gold birds which died over the periods 20-30 weeks, 31-42 weeks and 43-60 weeks.

Treatment	Claw length (20-30 weeks) (mm)		Claw length (31-42 weeks) (mm)		Claw length (43-60 weeks) (mm)	
	Left	Right	Left	Right	Left	Right
Control	24.7a	25.0a	24.5a	27.0a	27.2a	27.8a
Strip	16.9b	18.1b	18.7b	18.9b	21.4b	21.2b
Paint	14.8c	15.3c	13.0c	13.3c	14.8c	14.3c
l.s.d. (P=0.05)	1.7	1.8	1.8	1.9	1.9	2.1

(ns = not significant in analysis of variance; means within columns followed by a different letter are significantly different at P = 0.05, l.s.d.= least significant difference).

Table 2b. Experiment 2-Left and right foot claw length of Hyline Brown birds which died over the periods 20-30 weeks, 31-42 weeks and 43-50 weeks.

Treatment	Claw length (20-30 weeks) (mm)		Claw length (31-42 weeks) (mm)		Claw length (43-50 weeks) (mm)	
	Left	Right	Left	Right	Left	Right
Control	17.0	17.3	21.2a	20.8a	22.5	22.5
Strip	17.0	16.5	17.2b	18.6b	#	#
Paint	18.0	18.0	14.3c	15.0c	12.5	13.0
l.s.d. (P=0.05)	ns	ns	2.1	2.1	na	na

(ns = not significant in analysis of variance; means within columns followed by a different letter are significantly different at P = 0.05, l.s.d.= least significant difference).
Na = there were insufficient data to enable statistical analyses. # no birds died in this period.

Table 3a. Experiment 1 Feather score (1, poor; 4, good) of body parts at 60 weeks for control hens versus hens (Hyline Gold) in cages provided with abrasive strip or abrasive paint (values at 20 weeks for all treatments prior to exposure to abrasives were not significantly different).

Treatment	Neck	Breast	Back	Tail	Base of tail	Vent	Legs		Wings		Overall score
							L	R	L	R	
Control	2.98	2.68	2.92	2.50b	2.67	2.42	3.15	3.09	3.23	3.34	2.88
Strip	3.03	2.65	2.85	2.50b	2.43	2.39	2.94	2.91	3.22	3.20	2.80
Paint	3.04	2.83	3.01	2.71a	2.68	2.30	3.17	3.14	3.34	3.34	2.97
l.s.d. (P=0.05)	ns	ns	ns	0.2	ns	ns	ns	ns	ns	ns	ns

(ns = not significant in analysis of variance; means within columns followed by a different letter are significantly different at P = 0.05, l.s.d.= least significant difference, L = left; R = right).

Table 3b. Experiment 2-Feather score (1, poor; 4, good) of body parts at 50 weeks for control hens (Hyline Brown) versus hens in cages provided with abrasive strip or abrasive paint (values at 20 weeks for all treatments prior to exposure to abrasives were not significantly different).

Treatment	Neck	Breast	Back	Tail	Base of tail	Vent	Legs		Wings		Overal l score
							L	R	L	R	
Control	3.15	2.84	3.28	3.05	3.38	3.52	3.37	3.37a	3.26	3.27	3.25
Strip	3.13	2.76	3.28	2.97	3.32	3.43	3.22	3.21ab	3.23	3.32	3.18
Paint	2.78	2.65	3.04	3.05	3.32	3.23	3.05	3.03b	3.32	3.32	3.08
l.s.d. (P=0.05)	ns	ns	ns	ns	ns	ns	ns	0.22	ns	ns	ns

(ns = not significant in analysis of variance; means within columns followed by a different letter are significantly different at P = 0.05, l.s.d.= least significant difference, L = left; R = right).

Table 4a. Experiment 1-Foot and claw condition (1, poor; 4, good) at 60 weeks for control hens (Hyline Gold) versus hens in cages provided with abrasive strip or abrasive paint (values at 20 weeks for all treatments prior to exposure to abrasives were not significantly different).

Treatment	Left pad	Right Pad	Left digit	Right digit	Left claw fold	Right claw fold	Left claw	Right claw
Control	3.35	3.30ab	2.46	2.35b	2.92	2.97	3.14	3.12b
Strip	3.27	3.23b	2.39	2.37b	2.88	2.88	3.13	3.16b
Paint	3.41	3.40a	2.56	2.61a	2.96	3.00	3.27	3.31a
l.s.d. (P=0.05)	ns	0.11	ns	0.20	ns	ns	ns	0.15

(ns = not significant in analysis of variance; means within columns followed by a different letter are significantly different at P = 0.05, l.s.d.= least significant difference).

Table 4b. Experiment 2-Foot and claw condition (1, poor; 4, good) at 50 weeks for control hens (Hyline Brown) versus hens in cages provided with abrasive strip or abrasive paint (values at 20 weeks for all treatments prior to exposure to abrasives were not significantly different).

Treatment	Left pad	Right pad	Left digit	Right digit	Left claw fold	Right claw fold	Left claw	Right claw
Control	3.81	3.64	3.78	3.81	3.81	3.93	3.81	3.74
Strip	3.77	3.71	3.78	3.73	3.88	3.94	3.77	3.71
Paint	3.86	3.73	3.85	3.82	3.86	3.93	3.78	3.77
l.s.d. (P=0.05)	ns	ns	ns	ns	ns	ns	ns	ns

(ns = not significant in analysis of variance; means within columns followed by a different letter are significantly different at P = 0.05, l.s.d.= least significant difference).

Table 5a. Experiment 1-Abrasive score (1, not abrasive; 4, highly abrasive) for Hyline Gold hens in treatment cages at end of trial (60 weeks), overall mortality and mortality from prolapse and cannibalism (values at 20 weeks for all mortality was zero).

Treatment	Abrasive score	Overall Mortality (%)	Mortality from prolapse and cannibalism (%)
Control	1.00a	4.7	1.6a
Strip	2.03b	10.9	5.9b
Paint	3.09c	9.4	6.3b
l.s.d. (P=0.05)	0.09	ns (P=0.10)	4.2

(ns = not significant in analysis of variance; means within columns followed by a different letter are significantly different at P = 0.05, l.s.d. = least significant difference; note that overall mortality % approached significance at P = 0.10).

Table 5b. Experiment 2-Abrasive score (1, not abrasive; 4, highly abrasive) for Hyline Brown birds in treatment cages at end of trial (50 weeks), overall mortality and mortality from prolapse and cannibalism (values at 20 weeks for all mortality was zero).

Treatment	Abrasive score	Overall Mortality (%)	Mortality from prolapse and cannibalism (%)
Control	1.00a	8.2	0
Strip	2.24b	6.6	0.8
Paint	3.94c	5.5	0
l.s.d. (P=0.05)	0.13	ns	ns

(ns = not significant in analysis of variance; means within columns followed by a different letter are significantly different at P = 0.05, l.s.d. = least significant difference; note that overall mortality % approached significance at P = 0.10).

Chapter IV Discussion

Claw length-comparison with Australian and overseas results

The 7.8 mm and 5.9 mm reduction achieved in middle claw length using the abrasive strips in experiment 1 and 2 respectively was greater than the 3.6 mm reduction achieved in the Queensland studies using a 12.5 mm wide abrasive strip (Stewart and Dingle, 1997). There was a greater abrasive area in this current trial for the birds to abrade the claws than provided by Stewart and Dingle (1997).

However, in Europe, Rauch (1992) and Tauson (1986) achieved a two fold reduction in claw length (15 mm) using the same area of abrasive tape than was used in the current study. There are a number of possible reasons why the reduction in claw length achieved was greater in the European work. First, the abrasive tape used in the Australian work might not have had the same abrasive properties of the European product despite both having the same brand name; second; the European birds might be more active at the feed trough and utilise the tape more frequently; third the claws of the Australian birds might be harder. The abrasive paint used in the current studies was far more effective as a claw shortener, reducing claw length by 17.8 mm in experiment 1 and 13.7 mm in experiment 2. This is probably because the area of abrasive paint provided was far greater than provided by the abrasive strips. Applying the paint in similar strips as the tape might enable the bird to chip the paint off more easily. The reduction in claw length achieved with the abrasive paint, however, was the same reduction achieved by the abrasive strips in the European work.

Comparison of the effort required to apply the strips and paint to the egg guard

It was much easier and it took less time to apply the paint to the egg guard compared to sticking the abrasive strips to the egg guard. There was more time involved in cutting the 3 strips from the 25-mm roll, then cutting these strips into appropriate lengths, removing the backing of the tape (which can be a time consuming exercise) and then sticking the tape onto the egg guard. It was simpler and quicker to apply the pre-prepared paint and sand mixture onto the egg guard with a spatula. Later on when the abrasive paint wears off it would also take less time to apply a second coat of paint compared to scraping the used abrasive tapes from the egg guard and sticking on the new tape. The key finding in this trial was that abrasive paint was more effective in achieving a reduction in claw length than strips and is recommended for use where farmers are confident abrasives in the cage are not going to result in an increase in mortality (see below).

Mortality

Overseas results indicate that abrasive strips either reduce mortality (Ruszler and Kiker, 1975; Ruszler and Quisenberry, 1979; Martin, *et al*., 1981; Goodling, *et al*., 1984) or mortality is not improved by use of abrasive strips (Tauson, 1986). However Elson (2001), suggests if the area of the abrasive material is too large, then skin irritation can occur which may in turn lead to injurious pecking. Likewise Niekerk and Reuvekamp (2000) observed mortality from wounds and leg problems for birds utilising a Patchett strip but it was too low to be significant.

One of the original reasons for reducing claw length was to minimise abrasions caused by the claws and reduce mortality. In contrast to the European findings, experiment 1 showed that cannibalism and mortality increased when abrasives were used, but in experiment 2 the same response could not be repeated although two birds utilising the abrasive strip died from cannibalism. The major difference between European and the Australian conditions is the light intensity to which the birds are exposed. Under European conditions light intensity is usually 5 lux or less while in this current experiment light intensity in the shed ranged from 90-110 lux during egg collection, feeding and bird inspections and 10-20 lux for the remainder of the time. The increase in light intensity results in increases in bird pecking activity (Abraham and Glatz, unpublished) and provides a possible explanation for the increase in cannibalism and prolapse found in experiment 1. The difference in results may indicate a strain susceptibility to mortality from cannibalism associated with abrasive strips or be related to density of housing. Stocking density in experiment 1 was 545 cm^2/bird while in experiment 2 stocking density was 680 cm^2/bird.

In an attempt to explain the results of experiment 1 it is hypothesised that when birds are frightened or are competing for a position at the feed trough they abrade their vent region on the strips. Any injury or scratch would attract other birds to peck at the lesion. Once a death occurs in a cage from cannibalism other deaths of birds in the cage normally follow (Glatz, 2000). This situation was apparent in experiment 1, where there were a number of cages where multiple deaths occurred in cages with the abrasive strip and abrasive paint. It would only take one lesion or an abrasion on a bird to occur to initiate cannibalistic attacks by birds in the same cage. The reduced stocking density and better feather cover in the vent region of birds in experiment 2 may have reduced the susceptibility of birds to abrading their vent on the claw abrasives.

In the Ratite Industries maintenance of hide quality is crucial and every effort is made by farmers to minimise any object in the environment that can cause abrasions. Damage to the hide can occur especially when the bird rubs against these objects when it is stressed or frightened. It seems logical that including an abrasive object in a cage for laying hens must greatly increase the risk of the bird suffering from an abrasion especially when faeces were observed on the strips and the paint in both experiments and also reported by Niekerk and Reuvekamp, (2001). It could be argued that the location of abrasives in the cage would have made it difficult for a bird to abrade itself, but faeces were noticed on the strips and the paint indicating the vent was in close proximity. No scratches were observed on live birds in both experiments possibly because those that did receive an abrasion were pecked and died. There may be a need to use less abrasive tapes or paint under Australian conditions. Furthermore, there needs to be an assessment of whether minor abrasions received by birds from other parts of the cage structure are contributing to the problem of cannibalism.

The other concern in the current experiment was the inconsistent beak length and beak condition of the birds delivered as pullets, particular for birds in experiment 1 where up to 10 % of the birds were severely trimmed while a further 10 % of birds needed a further retrim (Brian Verrall, personal communication). It is likely that the birds needing retrimming were the birds responsible for the cannibalism observed in experiment 1. By chance at housing there might have been a disproportionate number of birds with long beaks placed in these cages fitted with abrasives, relative to the control cages, although this seems unlikely.

Another factor worth considering as an explanation for the increase in mortality in experiment 1 is that blunting of the claws removes one of the defensive weapons of birds. Those birds with a longer and sharper beak might be able to exert even greater dominance over other birds in the cage with shorter beaks. The claws are used as weapons to inflict injury on competitors, maintain status in the social hierarchy and can alter the behavioural patterns in other birds of the flock (Ruszler and Quisenberry, 1979). In support of this Lunam and Glatz (2000) reported that declawed emus were under less stress and not as frustrated as non declawed birds which were more aggressive. Declawing in emus improves the social structure in the flock by reducing stereotype behaviour and aggression. By removing the claw as a defensive weapon by use of claw shorteners in poultry may further increase the importance of the beak in dominance interactions, perhaps explaining the increase of cannibalism in birds with access to abrasive strips.

Lack of production and behavioural evidence to explain findings

In both experiments, no production, egg quality, behaviour, beak length and beak condition measurements were undertaken to provide evidence to help explain the differences in cannibalism noted for birds in experiment 1 and 2 provided the abrasives.

Should birds be declawed or should claw shorteners be used?

The potential problem associated with the use of claw shorteners under Australian conditions raises the issue of whether birds should be declawed instead. There is anecdotal evidence that strains of birds vary in their tendency to trample other birds in cages. The need for shortened claws would be different in these strains. Declawing involves partial removal of each toe with a red-hot blade and would initially cause acute pain, with possible long term chronic pain and alteration to gait. Zimmerman (1986) reports that chronic pain in most species can modify specific walking behaviours, including social behaviour. Neuromas have been reported in the toes of domestic fowl after declawing (Gentle and Hunter, 1988). A study by Lunam *et al*., (1996) showed that the histology of the emu toe is similar to the domestic fowl (Lucas and Stettenheim, 1972) and the resorption of neuromas in the toe observed in the emu is also likely to occur in poultry. Thus the neuromas in the toe observed by Gentle and Hunter (1988) soon after declawing in poultry may have been found to have resorbed if examined later, thus reducing any welfare problems associated with declawing.

Condition of claws and footpads.

Tauson (1986) showed that abrasive tape had an immediate impact on claw length. This was also demonstrated in the current study with a significant reduction in claw length being achieved by 31 weeks of age in both experiments. The hens used the tape quite intensively by scratching with their feet on the egg guard as they were feeding.

Tauson (1986) reported inferior foot condition in a group of birds at 52 weeks of age. In contrast, in experiment 1 it was noted that foot condition was significantly improved for the right foot although in experiment 2 no differences were observed between treatments. It was clear that the birds were not abrading their footpad on the abrasives. Instead the lesions were probably caused by hyperkeratosis, a condition on the footpads and digits caused when birds stand on wire. Reasons for the improvement in the foot pad condition in experiment 1 but not experiment 2 could be a strain difference and resolved by undertaking biomechanical studies which involves measuring the pressure exerted on the footpad and toes during walking and standing on wire.

Condition of plumage.

No major significant differences in plumage condition were found between birds using the abrasives and the control hens in both experiments, which agrees with the results of Tauson (1986). Likewise Compton, *et al*., (1981) and Vanskike and Adams (1983) found no differences in feather cover between normal and declawed hens. It was expected that the feather cover of the back of hens might have been improved. The reduced claw length would have minimised the impact of the claws on the feathers during trampling as reported by Hill (1975) and Fickenwirth, *et al*., (1985). It was noticed, however, that the feather cover of the tail of hens using the abrasive paint was superior to the control and the abrasive strip treatment in experiment 1. The tail feathers are often pecked at extensively by other birds in the cage, and could be classified as stereotype pecking behaviour. While the evidence is not convincing, it might be suggested that birds with the shortest claws were less stressed and engaged in reduced stereotype pecking resulting in better feather cover on the tail. In experiment 2 the right leg feather cover was poorer in the abrasive treatments compared to the control. The right foot may be preferred by this strain of hen to retain grip on the egg baffle while eating contributing to some abrasion of feathers. Caution must be exercised in interpreting the results obtained for feather cover in both experiments. Strains and stocking density used were different in both experiments.

Summary

Egg producers in Australia need to know whether reducing the claw length of hens with abrasives will improve hen feather cover, lower mortality and reduce the incidence of scratches on the body. Two trials were conducted to determine the effect of abrasive strips and abrasive paint in layer cages on claw length and claw sharpness, footpad condition, feather cover, body scratches and mortality of hens.

During the preparation of the cages for the experiment it was much easier and it took less time to apply the pre-prepared paint with a spatula to the egg guard compared to sticking the abrasive strips to the egg guard. It was time consuming cutting the strips from a 25-mm roll, cutting them into the appropriate lengths, removing the backing on the tape and then sticking them onto the egg guard.

The results indicate that abrasive paint is more effective as a claw shortener than abrasive strips probably because of the greater area of abrasive made available. The birds using the abrasive paint had the lowest claw length and claw sharpness. One of the original reasons for reducing claw length was to minimise abrasions caused by the claws and reduce mortality. In contrast to previous findings reported in the literature mortality from prolapse and cannibalism was higher in cages fitted with abrasives in the first experiment, but could not be repeated in the second experiment, indicating perhaps a strain difference.

Where cannibalism occurs in birds using abrasives it is speculated that when they are frightened or are competing for a position at the feed trough they might abrade their vent on the paint or the strips. There was no production, egg quality, behaviour, beak length and beak condition measurements recorded to provide any supporting evidence to help explain the significant increase in prolapse and cannibalism observed for birds provided the abrasives.

If producers in Australia intend to install claw shorteners in layer cages they need to be wary that there is potential for cannibalism and prolapse problems to occur.

Chapter V References

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Implications

The trials clearly showed that abrasive paint was more effective as a claw shortener and easier to apply than abrasive strips. If producers in Australia intend to install claw shorteners in layer cages they need to be wary that there is potential for cannibalism and prolapse problems to occur.

Further research is required in the following areas;

- Clarify if the incidence of prolapse and cannibalism for birds utilising claw abrasives is influenced by strain, stocking density, quality of beak trimming and type of housing.

- Establish the durability of different abrasives (including Patchett strips) on commercial egg farms in Australia..

Communications Strategy

Subject to RIRDC approval the findings from this study will be communicated to Industry as follows:

- Report of key findings and recommendations will be forwarded to the editor of in “In an Egg Shell” for consideration as a publication. This newsletter is mailed to all sectors of the commercial Egg Industry in Australia.

- There will be a report of the results to South Australian egg producers in the 2002 SA Pig and Poultry Fair Proceedings.

It is also proposed to present the results of this study to the following conferences if possible:

- 2003 Poultry Science Symposium in Sydney
- 2002 Poultry Information Exchange

Findings will also be communicated via:

- Refereed scientific journals
- Poultry magazines
- Presentations at regional egg producer meetings
- European Poultry Welfare Scientists
- Big Dutchman International

COMPENDIUM SUMMARY

Project Title:	Claw abrasives in layer cages
RIRDC Project No.:	SAR-34A
Researcher:	Dr Phil Glatz
Organisation: **Phone:** **Fax:** **Email:**	South Australian Research and Development Institute 08 83037786 08 83037689 Glatz.phil@saugov.sa.gov.au
Objectives	• Determine the effects of abrasive strips and abrasive paint in layer cages on claw length and sharpness, foot condition, feather cover, body scratches and mortality. • Provide recommendations on use of claw abrasives in cages in Australia.
Background	Caged bird's claws grow to 3-4 cm's while for floor housed birds the claw length is kept shorter (about 1.5 cm) by the birds scratching their claws in the litter. A low-cost, non-invasive method by which the claws of caged layers could be kept short and blunt can be achieved by fitting 8-mm strips of abrasive tape on the egg guard. Bird's claws scrape against this tape while they are feeding. This reduces the effectiveness of the claws in causing injury and feather loss and reduces the risk of birds trapping their claws in the cage. Tauson (1996) suggested that a mixture of paint and sand might also be an effective abrasive when coated onto the egg guard. If egg producers in Australia are to follow the European directive and install claw abrasives in cages then information on effectiveness of claw abrasives under Australian housing conditions are required. Overseas research suggests abrasives reduce claw length of hens, improve feather cover, lower mortality and reduce the incidence of scratches and entrapment injuries.
Research	To resolve whether egg farmers in Australia should use abrasive strips or apply abrasive paint to layer cages, two trials were conducted. Both trials demonstrated abrasive paint was more effective and more durable as a claw shortener than abrasive strips. Hen mortality from prolapse and cannibalism was higher in cages fitted with abrasives in one trial but was not a problem in the other trial. Nevertheless producers need to be wary of the potential for problems with cannibalism if claw abrasives are used in cages.
Outcomes	The trials clearly showed that abrasive paint was more effective as a claw shortener and easier to apply than abrasive strips.
Implications	If producers in Australia intend to install claw shorteners in layer cages they need to be wary that there is potential for cannibalism and prolapse problems to occur.
Publications	Glatz, P.C. (2001). Effect of claw abrasives on mortality in caged layers under Australian housing conditions. *Proceedings of the 6th European Symposium on Poultry Welfare, Zollikofen, pp 263-265.*