

Battery Cages and the Welfare of Hens in Canada

A Summary of the Scientific Literature



 Canadian
Coalition for
Farm Animals

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The mid-twentieth century industrialization of farming revolutionized egg production by introducing the battery cage system for laying hens. The system, now virtually universal in industrialized nations, is designed to produce the maximum number of eggs for the lowest possible price. This is achieved through space reduction and tight control of the provision of water, food and light. But these measures, along with genetic selection aimed at producing highly productive layers, have severely compromised the welfare of the caged hens.

Space restrictions and overcrowding have an acute effect on natural poultry behaviours and, consequently, their welfare. The small wire cages (approximately 450 cm² per bird) deny hens the opportunity to flap their wings, nest, dust bathe, perch or forage – all normal behaviours exhibited by hens in a less restrictive, more natural environment.

Curtailing these natural activities leads to a range of problems. Crowding prevents hens from avoiding aggression from other birds. Frustration leads to feather pecking, which can result in open wounds and trigger cannibalism in other birds – a major cause of death in battery systems. The hens' inability to dust bathe or forage (perhaps the most familiar activities associated with chickens) contributes to their frustration and suffering. The absence of perches removes an important means by which hens maintain foot health and good feather condition, and deprives them of an escape from aggression.

In purely physical terms, battery cages can damage hens' health. Movement in the small cages can trap body parts, leading to physical trauma or even death. The slanted wire floors of cages can cause foot ailments. Confinement in battery cages can cause increased feather loss, reduction in bone strength (osteoporosis) and paralysis from spinal cord compression.

These inherent, incidental welfare failings of battery operations are compounded by more deliberate practices common in these systems. Debeaking, used to control feather pecking and cannibalism, can cause chronic pain and deprives hens of key natural abilities, such as preening. Forced moulting, the artificial stimulation of hens' laying cycle to produce more eggs, involves depriving them of food and light for up to 12 days and water for three days – causing severe stress and suffering, and high mortality. Finally, the genetic selection of hens for higher egg production has resulted in hens predisposed to nervousness, which leads to aggression and cannibalism.

Despite ample evidence that hens suffer as a direct consequence of battery systems, no legislative or regulatory remedy exists in Canada to address the compromise of their welfare. Industry's drive to meet the demand for cheap food has superseded any concerns over hen welfare, and Canada continues to promote this system over alternative production methods.



During the Second World War, egg production intensified and farm size, productivity of laying hens and the number of laying hens per unit of labour increased dramatically (de Boer and Cornelissen, 2002). To meet these demands, intensive mechanization of the industry occurred, and the “battery cage” was introduced.

Battery cages measure approximately 16” by 18” with sloping wire floors. They provide a barren space of approximately 450 cm² per bird (BC Egg Marketing Board Standing Order, 2002), with five to seven birds confined in each cage. They have been criticized by animal welfare organizations and scientists throughout the world (Taylor and Hurnik, 1996). According to Stevenson (2004), battery cages represent one of the worst manifestations of industrial farming. Yet in 2003, according to Agriculture and Agri-food Canada, 26 million egg-laying hens were kept in battery cages in Canada (http://www.agr.gc.ca/misb/aisd/poultry/gleg_e.htm). As a result of the intensive confinement, the birds usually have their beaks cut to control aggressive pecking among cagemates. Conditions such as osteoporosis, foot ailments, frustration, and premature death are common among battery hens. These birds spend about a year in battery cages (for a total of 16 to 18 months if they have also been reared in cages) or until their productivity declines. They are then slaughtered and used for chicken by-products or compost.

Industry representatives often point to high egg production as an indicator of good (humane) welfare. But according to Duncan (1981), productivity is a poor measure of welfare. The narrow focus of genetic selection on high production means the current breeds of layers “would produce the same number of eggs even if they were kept in a tin can,” (Church, pers. comm.). The British Farm Animal Welfare Council in 1979 laid down a set of basic, general principles known as the Five Freedoms. In 1993 they were revised to read:

1. Freedom from Hunger and Thirst
2. Freedom from Discomfort

3. Freedom from Pain
4. Freedom to Express Normal Behaviour
5. Freedom from Fear and Distress

These freedoms have been adopted by many groups in Canada, including industry groups such as the Alberta Farm Animal Care Association, as the underlying principles for farm animal care (<http://www.afac.ab.ca/fivefreedoms.htm>). However, battery cages are the least likely of any hen-housing system to provide these freedoms and seem to fail at four out of the five freedoms (Appleby and Hughes, 1991).

After reviewing the scientific literature, Baxter (1994) concluded that battery cages cause suffering to hens in at least seven different ways:

- Chronic frustration of normal behaviours including dustbathing and wing flapping
- Chronic inhibition of comfort behaviours and increased incidence of frustration leading to feather pecking
- Chronic stress and disruption of social behaviours
- Acute suffering during the pre-laying period caused by the frustration of nesting behaviour
- Prevention of foraging leading to frustration
- Inability to maintain bone strength due to restriction of exercise
- Lack of perching opportunities and the prevention of roosting

Other researchers have likewise concluded that some of the most significant welfare problems facing egg-laying hens confined to battery cages include crowding and space limitations, inhibition of natural behaviours (such as nesting, perching, dust bathing or foraging), increased aggression and severe physical ailments. Despite these facts, Canada continues to use the battery system to produce 98 percent of its 6.9 billion eggs each year.

“Conditions such as osteoporosis, foot ailments, frustration, and premature death are common among battery hens.”

Most studies of battery cages weigh the economic benefits against the welfare limitations to determine the appropriateness of battery cages. The function of this paper is to review the current scientific literature and other media to determine

their appropriateness from an animal welfare perspective. Since battery cages house more than 26 million hens each year in Canada, battery hen welfare is a major animal welfare concern that needs to be examined on its own.

THE BATTERY SYSTEM

Devised in the 1940s, battery cages were a response to an increase in hen productivity as a result of major breakthroughs in nutrition and breeding (Duncan, 2001). The movement was towards greater automation with a goal of reducing disease transmission while increasing hygiene in the poultry industry. As a result, there was a huge reduction in the number of producers and an increase in the capital investment needed for egg production and processing (BC Egg Producers, 2001). This led to a system which produced the maximum number of eggs for the lowest possible price, as well as seriously compromising the welfare of hens.

In a battery cage, the rate of food and water, and duration and intensity of light are tightly controlled. There is no access to the natural environment, nor any opportunity to conduct natural behaviours such as perching, dust bathing, wing

flapping or nesting. These cages inhibit almost all the natural behaviours of hens (Rollin, 1995).

Battery barns in Canada hold thousands of cages, each holding five to seven birds, in tiers of two to eight cages high, with farms averaging 17,100 birds. Five farms in Canada have flocks of 100,000 hens (http://www.agr.gc.ca/misb/aisd/poultry/gleg_e.htm).

Although battery cages have succeeded in increasing production and automation, the welfare of the chickens has been severely compromised. The European Union (EU) Scientific Veterinary Committee is highly critical of battery cages and concludes, "It is clear that because of its small size and its barrenness, the battery cage as used at present has inherent severe disadvantages for the welfare of hens," (Stevenson, 2004).



➤ *Hens are kept in battery cages for one to two years*

"Canada continues to use the battery system to produce 98 percent of its 6.9 billion eggs each year."

Worldwide, approximately 80 percent of eggs are produced in battery cages. However, over the last 20 years, there has been greater movement towards other forms of egg production in Europe (Savory, 2004).

For example, in 1988, Sweden created the Animal Protection Act, which called for a phase-out of battery cages (Keeling and Svedberg, 1999). In 1991, Switzerland banned the use of all cages (Bell 2001). The Netherlands created legislation to ban battery cages in 1994 (Preece and Chamberlain, 1993). In the European Union, public opinion did not support the use of battery cages (Savory, 2004), and therefore, in 1999, the EU enacted a ban on battery cages (in favour of enriched cages), which will come into effect in 2012. They also increased the space requirements for hens to 550

cm² in battery cages until 2012, and 750 cm² in enriched cages after that date.

Austria furthered the EU ban in 2004 by stating that all caging will end by 2009, or 2020 if a farm recently invested in new cages (http://www.wein-erzeitung.at/frameless/eng_news.htm?ID=Eng&Menu=7432).

Even labelling has changed in Europe. In the EU, only three terms will be permitted on eggs: “eggs from caged hens,” “barn eggs” and “free-range eggs” (Stevenson, 2004).

Despite the changes in Europe, North America and Asia continue to introduce more battery cages on a huge, industrialized scale (Duncan, 2001).

HEN BEHAVIOUR & ENVIRONMENT

CROWDING

Space restrictions of hens in battery cages have a significant effect on hen welfare (Duncan, 2001). The area occupied by an average hen at rest is approximately 600 cm² (Appleby and Hughes, 1991; Baxter, 1994). According to the Recommended Code of Practice for the Care and Handling of Pullets, Layers and Spent Fowl, hens in Canada are allocated between 432 cm² and 483 cm², depending on the breed (Canadian Agri-Food Research Council, 2003). This means that hens must frequently overlap and have their feathers compressed by the cage or the bodies of other birds. In theory, the only way hens can move is by changing places with another bird (Appleby and Hughes, 1991).

In these conditions, 50 percent of a hen's activities are restricted, as they require more than two and half times the amount of space allocated (Baxter, 1994). It would take a minimum of 750 cm² of space per bird to create any ‘free space’ that a bird could move into (Appleby and Hughes, 1991). For a bird to flap her wings it would require 2000 cm² since hens have a perception of space that is larger

than what is physically required to wing-flap (Baxter, 1994). This makes wing flapping relatively impossible in cages (Duncan, 2001).

Some industry groups in Canada have concluded that birds prefer to be in extremely close proximity to one another, and therefore the density of hens in battery cages is acceptable (Alberta Farm Animal Care Association, 1998). While it may be true that, in their natural environment, birds congregate during certain activities, these activities make up less than half of their daily actions (Appleby and Hughes, 1991), and battery cages are not their natural environment. Appleby and Hughes (1991) found that in cages, the birds' stress increased linearly with group size, as did mortality and other indices of animal welfare. Correspondingly, chickens will space themselves apart when given the opportunity (Duncan,

“The EU enacted a ban on battery cages... which will come into effect in 2012.”

2001). Faure (1991) found that when hens were able to enlarge their cage by pecking at specific loci, hens showed a clear preference for larger cages over smaller ones.

According to Dawkins and Hardie (1989), vertical space is also important to hens since they make many head movements above 40 cm when unconstrained. Battery cages have between 35 and 40 cm vertical space. As a result, body parts of hens are often trapped in parts of the cages, which causes severe trauma or death (Appleby and Hughes, 1991).

Another use of space by birds is for avoidance of aggressive behaviour by other birds. When victimized, birds need areas where they can escape to and avoid feather pecking (Freire et al. 2003). Battery cages fail this need as well.

Because of the behavioural limitations, Dawkins and Hardie concluded, “by no definition of the term can 450 cm² be said to give adequate freedom of movement,” (Baxter, 1994). Currently, 432 cm² to 483 cm² (depending on the breed) is the accepted allocation given to battery hens in Canada (Canadian Agri-Food Research Council, 2003).

NESTING

One of the biggest sources of frustration for laying hens is the lack of opportunity to nest (Duncan, 2001; Baxter 1994). When given the opportunity to use nest boxes in cages, Smith et al. (1993) found that approximately 95 percent of eggs were laid in nest boxes. Under natural conditions, hens will leave the social group and search out a suitable nesting site prior to egg-laying (Baxter, 1994). Such behaviour has been shown to be highly motivated (Appleby and Hughes, 1991), and Cooper and Appleby (2003) found hens placed a higher value on gaining access to a discrete nest site than gaining access to food. In fact, nesting motivation is so strong that, deprived of nests, hens show extreme frustration during the pre-laying period (Baxter, 1994; Appleby and Hughes, 1991; Duncan, 1970). This frustration can manifest itself through various behaviours including vacuum nesting behaviour (going through the motions of nesting without the presence of nesting material) or feather pecking (Baxter, 1994). Baxter (1994) even concluded that the frustration of being unable to nest would cause acute pain in egg laying hens.

Nesting, therefore, is an important need for laying hens that is not met by battery cages (Appleby and Hughes, 1991).



➤ *Extremely crowded conditions do not allow for freedom of movement*

“Body parts of hens are often trapped in parts of the cages, which causes severe trauma or death.”

PERCHING

Hens are behaviourally and physiologically adapted to perching, and under natural conditions, hens will roost at night in perches or tree branches (Baxter, 1994). As well, Appleby et al. found that when perch space was limited, hens struggled vigorously to secure perching space for the night (Baxter, 1994). Perching is an important means of protection from predators, but it also may prevent excessive claw growth while improving foot conditions (Appleby and Hughes, 1991) and bone strength and mass (Baxter, 1994).

Perches may also act as a refuge for birds from aggressive persecution (Appleby and Hughes, 1991). Duncan et al found that in cages with perches, birds tended to have less feather wear than in cages without (Baxter, 1994).

Battery cages do not have perches, and even if they were placed in cages, the height of the cage would not permit adequate space for their use.

FLOORING

Battery cages have slanted wire floors. The slope is to ensure that when an egg is laid, it will roll into the collection tray. The wire floors are to ensure that hens' feces pass through the floor onto a conveyor belt below to be carried away.

With wire floors, hens frequently show signs of severe behavioural problems such as feather

pecking and hysteria (Appleby and Hughes, 1991). This was consistent with Dawkins and Lagadic's observation that, when given a choice, hens preferred a litter substrate to a wire floor (Faure, 1994).

Wire floors have also been recognized as being responsible for some foot ailments seen in hens such as lesions, fissures and hyperkeratosis (thickening of the skin) (Appleby and Hughes, 1991).

DUST BATHING

Dust bathing is a highly motivated behaviour in poultry (Lindberg and Nicol, 1997) and occupies a significant amount of time for hens in a natural environment (Baxter, 1994). Wild fowl use various substrates, while domestic fowl tend to use only dust (Baxter, 1994).

Dust bathing is extremely rare in battery cages, which is most likely the result of an absence of substrate and space to perform the action (Bubier and Bradshaw, 1995). The desire to dust bathe is still so strong in caged hens that, if there is space available even in a barren cage, they will sometimes attempt "vacuum dust bathing" (Baxter, 1994). Vacuum dust bathing occurs when a hen goes through the motion of dust bathing, but since there is no substrate to bathe in, its actions are only motions on a bare floor.



➤ *Slanted wire flooring causes twisted and overgrown claws*

The inability to dust bathe has been assessed as being a significant welfare problem with battery cages (Appleby and Hughes, 1991). Duncan (2001) suggested that if battery hens were able to dust bathe, it would reduce some of their overall suffering.

FORAGING

Under natural conditions, fowl spend the majority of their daytime hours foraging for food (Appleby and Hughes, 1991; Duncan, 2001). This includes ground scratching, stepping back and pecking at the scratched location. Savory et al. observed bantam hens made more than 14,000 pecks at the ground during a 10 hour period while foraging (Hughes and Channing, 1998).

When hens are deprived of litter, they often redirect some of their ground-pecking toward the feathers of other hens (Baxter, 1994). In battery cages, there is no litter substrate for scratching and foraging, and this could be one of the major reasons feather pecking is very common amongst battery hens (Appleby and Hughes, 1991).

Instead of foraging in substrate, battery hens are allocated 10 cm per bird of feeding space in a trough outside their cage, which they can only access by pushing their heads through metal bars

(Canadian Agri-Food Research Council, 2003).

After reviewing various feeding systems, Appleby and Hughes (1991) concluded that 10 cm of feeding space in battery cages is inadequate. They further suggested that if access to food were limited for any reason, aggression and cannibalism would likely result. Since battery cage systems are highly mechanized and the feeding and watering systems are mechanical, any breakdown could result in severe welfare problems.

FEATHER PECKING

Feather pecking in battery hens is often a result of genetic and environmental factors, and a frustration response to behavioural restrictions such as crowding or lack of ability to nest, perch, or forage naturally. One of the most significant problems with feather pecking is that it leads to open wounds which are then subject to infection and can trigger a cannibalistic response in other hens. Cannibalism is a major cause of death in battery operations (Appleby and Hughes, 1991).

Jones et al. (2004) suggest however, that with appropriate breeding programs, the expression of feather pecking and cannibalism could be minimized in hens.



➤ *Crowding and excessive feather loss*

“Cannibalism is a major cause of death in battery operations.”

FEATHERS

Birds' feathers are important for thermoregulation and protection from injury. When undamaged, feathers trap air pockets, which serve as insulation from cold weather. For injury protection, feathers provide an initial defence against abrasion. Since birds' skin is highly sensitive and extremely delicate, the slightest abrasion can lead to excessive bleeding (Proctor and Lynch, 1995).

Extensive feather loss is usually an indicator of major physiological or behavioural stress, and can greatly increase the danger of injury to exposed skin being injured. Battery-caged hens generally show greater feather loss than hens in other systems. Hughes concluded that most feather loss is a result of feather pecking, with some loss due to abrasion (Appleby and Hughes, 1991).

Feather pecking is socially transmitted, and exposure early in life may affect the occurrence of pecking behaviour later on (Huber-Eicher and Sebo, 2001). Many scientists have suggested that feather pecking could be greatly reduced through selective breeding programs (Jones et al., 2004; Webster, 2004; Duncan, 2001b; Appleby and Hughes, 1991; Webster and Hurnik 1990).

FEET

Foot and claw damage is a major problem observed in battery-caged hens (Appleby and Hughes, 1991). Examples include lesions, fissures and hyperkeratosis on the feet, and twisted, broken or overgrown claws (Appleby and Hughes, 1991). Hyperkeratosis of the toe pads is a consequence of caged hens spending all their time on sloping wire floors (Duncan, 2001).

BONES

Confinement in battery cages has been shown to significantly reduce bone strength in battery hens (Baxter, 1994). Of all types of commercial laying operations, battery caged hens have the lowest bone strength (Leyendecker et al, 2001; Duncan 2001). Hens must be able to move normally to

maintain proper bone strength (Baxter, 1994). This may include hopping up and down on a perch (Baxter, 1994) or wing flapping, all of which are inhibited or impossible in battery cages. Most caged hens suffer some kind of painful bone fracture during their first laying cycle (Webster, 2004).

Hens are susceptible to structural bone osteoporosis due to their high egg production (Webster, 2004). Gregory and Wilkins found low bone strength in spent hens from cages, with 30-50 percent of birds suffering broken bones during catching, handling and transportation (Appleby and Hughes, 1991). According to Webster (2004), studies by Whitehead and Wilson, Cransberg et al. and Rennie et al. found that 80 to 89 percent of battery-caged birds had osteoporosis. Despite these findings, there is still little information on osteoporosis in hens, and this may itself foster inadequate management of the disease and lead to increased welfare problems (Webster, 2004).

Cage-layer fatigue is a paralysis occurring around the time of peak production, and results from fractures of both the fourth and fifth thoracic vertebrae, causing compression on the spinal cord (Duncan, 2001). It is brought on by a lack of exercise. Hens suffering from cage-layer fatigue, exacerbated by osteoporosis, generally die if there is no medical intervention, which is invariably the case in commercial battery cages (Webster, 2004).

Identifying pain reactions due to bone breakage in battery hens is extremely difficult, because the behavioural responses are almost impossible to see in a cage. However, Webster (2004) concluded that "until there is evidence to the contrary, it is reasonable to expect that the chicken experiences acute pain when a bone breaks."

"Most caged hens suffer some kind of painful bone fracture during their first laying cycle."

DEBEAKING

A chicken's beak is highly innervated and is used for various functions including foraging, preening and defence. When the beak is damaged, chronic pain results (Webster, 2004).

To control outbreaks of feather pecking and cannibalism, many chickens are de-beaked (also known as beak trimming) using a hot blade or laser shortly after hatching (Appleby and Hughes, 1991). Despite the role of genetics in feather pecking and cannibalism (Duncan, 2001b), many countries including Canada, still use debeaking as a management tool to control aggression in birds kept in battery cages (Appleby and Hughes, 1991).

Ironically, a laying hen has been bred that does not require beak trimming even when housed in cages, yet its use has not been adopted by industry (Muir and Craig, 1998).

FORCED MOULTING

Under natural conditions, hens undergo moulting in the fall after they raise their chicks. "Moulting" is when hens stop laying and shed feathers. After the feathers have grown back, the hens begin laying eggs again. This process usually takes approximately 16 weeks (Duncan, 2000)

Forced moulting, also known as "controlled moulting," is a procedure where hens are shocked into an extra laying session after their normal cycle is completed. To do this, they are deprived of food, light and stimuli for up to 12 days and water for three days, causing a change in hormone levels, rapidly ending the laying cycle. The shock of these changes forces hens out of laying condition and into a moult where old feathers are pushed out. When this is complete and feathers have begun to grow back, a new laying cycle begins (Rollins, 1995).

Forced moulting shortens a normal moulting period from 16 weeks to eight, and is traumatic to hens, causing severe stress and suffering, as well as disease susceptibility and mortality (Farm Sanctuary, 2004).

Despite being banned in most of Europe, forced moulting is still legal in Canada when done following procedures of the Commercial Moulting Programme (BC Egg Marketing Board Standing Order, 2002). However, forced moulting is not a common practice in Canada, and methods involving deprivation of food are to be voluntarily phased out by 2005 (Canadian Agri-Food Research Council, 2003).



➤ *A typical four-tiered battery cage egg operation in Canada*

"Many chickens are de-beaked (also known as beak trimming) using a hot blade or laser shortly after hatching."

Through selection for higher egg production, the egg industry in Canada has incidentally selected for a bird that exhibits hysteria (CANFACT, 2002), and has a nervous personality, which contribute to cannibalistic behaviour and other forms of aggression (AFAC, 2003). Jones et al. (2004), Webster (2004) Duncan (2001b), Appleby and Hughes (1991) and Webster and Hurnik (1990) all believe that genetic selection could be used to reduce feather pecking and cannibalism. Webster (2004) further suggested that genetic selection has considerable potential to alleviate bone breakage in laying hens.

If genetic selection has already been used to produce a battery hen that does not require debeaking, it would seem strange that this hen has not become standard in battery cage operations (Muir and Craig, 1998). One possible reason could be, that in order to use genetic selection for improved welfare traits, breeding companies would have to relax some of their selection for economically-beneficial traits and accept some decrease in production, which they are reluctant to do (Duncan, 2001b).

LEGISLATION IN CANADA

In Canada, the use of battery cages is legal. Both the Criminal Code of Canada and provincial animal-welfare laws specifically exempt farming practices considered standard industry practice, even if it can be established that they are inherently cruel. Instead, on farm animal care is guided by the Recommended Codes of Practice for the Care and Handling of Farm Animals, which are voluntary (Canadian Agri-Food Research Council, 2003).

Since battery cages are considered standard industry practice, there are no laws or regulations in Canada to prohibit the use of battery cages. This contrasts with 1999 European Union legislation, which bans the use of battery cages after 2012.



➤ *Hens in lower tiers become covered in feces - note dead bird in background on right*

“There are no laws or regulations in Canada to prohibit the use of battery cages.”

In a more natural environment, chickens spend most of their day foraging, pecking and scratching at the ground, dust bathing, and nesting if they are near oviposition (preparing for egg laying). Hens create complex social systems, which influence spacing and movement patterns. At night, most of their time is spent resting on perches, a genetic adaptation for avoiding predators.

Battery cages inhibit almost all of chickens' natural behaviours. Hens are confined to extremely small, barren spaces where they can barely move. Their bones are weak, feathers are chafed or pecked off, beaks are cut, and feet are plagued with lesions and deformities. The result is extreme pain and frustration, which is often manifested through feather pecking and aggressive social behaviour such as cannibalism.

Despite the suffering hens are subjected to in battery cages, Canada's egg industry continues to promote their use, and shows no signs of changing

to another, more humane system anytime in the near future.

In his study of pain in chickens, Gentle (2001) concluded that any considerations afforded to mammals regarding pain should also be afforded to birds based on physiological and behavioural similarities. With this in mind, if society does not place dogs, cats, or other mammals in battery cages for fear of pain or suffering, the egg industry and government need to address the unsuitability of battery cages and to seek alternatives. The animal welfare problems are significant and impact negatively on the well-being of laying hens. European governments have made substantive legislative changes, with initiatives to ban battery cages. Canada should do the same.

“Despite the suffering hens are subjected to in battery cages, Canada’s egg industry continues to promote their use, and shows no signs of changing to another, more humane system anytime in the near future.”

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