

Cage-free Eggs:

Hen Welfare and Housing Challenges





CAGE-FREE EGGS | CONTENTS

Raising hens with intact beaks to produce cage-free eggs.....	4
Pullet rearing is key to cage-free flock success.....	6
Fewer stressors, more stimuli aid untrimmed layer behavior.....	10
Natural hen behaviors lead to better performance	12
Latest cage-free ventilation, lighting and litter tactics	14
How aisle width in cage-free systems impacts hen welfare	19
5 questions about cage-free hen health, welfare	22
Calculating additional cage-free production costs	25
6 common cage-free egg production mistakes	27
3 questions on the future of perches in cage-free housing.....	29
Top cage-free layer hen management tips	31
How to mitigate dust and ammonia in cage-free houses	34
Reducing aggression and floor eggs in cage-free flocks.....	37

WATT Global Media's Focus Series PDF files are for use by the purchaser only, and distribution, reproduction or file sharing is strictly prohibited without the prior written consent of WATT Global Media.

All images are property of WATT Global Media.

Cover images: kentoh | Shutterstock.com; Aleksandar Jovanovic | Dreamstime.com



INTRODUCTION

Cage-free egg purchase pledges made by restaurants, fast food chains and food service companies are directly impacting how producers are managing healthy hens and profit margins. Despite the best education and preparation, the transition to cage-free production is a complex and challenging process, even for veteran egg farmers. This cage-free series focuses on the best general management practices for cage-free pullet rearing.

Raising pullets in cage-free systems makes it more complicated to achieve consistent weight gain, flock uniformity and high livability than in conventional systems. Cage-free birds also run a higher risk of suffering from pecking, cannibalism, smothering and piling than their conventional counterparts as well as a greater risk of enteric diseases from manure exposure.

Successful cage-free flocks come from good management practices. Husbandry skills are essential when transitioning birds from a cage to a cage-free system, because the layer barn is an unfamiliar environment and food and water are hard to find.

The transition requires farmers to spend more time observing the flock's behavior, understand what conditions are causing negative behaviors, and make the necessary adjustments to the environment. Some cage-free hen behavior challenges include, laying eggs outside of the nest and generally aggressive behavior—both of which end up impacting the bottom line, if not addressed properly.

Ventilation, lighting and litter management in a cage-free environment directly impacts the health and performance of flocks and requires a new approach. Movement also creates new issues, too, like controlling dust and ammonia levels and creating a consistent temperature to prevent negative behaviors.

The year 2025 is the most common deadline for the more than 200 food companies and restaurants that committed to switching to cage-free eggs. Cage-free farming demands far different management skills for maximum productivity and will challenge farmers for years to come to achieve maximum productivity of pullets and layers.

It is critical to stay on top of the most important issues impacting the poultry industry today to remain competitive. The WATT Global Media Focus Series was created to help you achieve that objective, and ultimately succeed in reaching your business goals.

RAISING HENS WITH INTACT BEAKS TO PRODUCE CAGE-FREE EGGS

A Dutch egg producer with 25 years of cage-free experience has successfully transitioned to cage-free egg production from hens with intact beaks.

TERRENCE O'KEEFE

The practice of trimming the beaks of laying hens, broiler and turkey breeders, and turkey meat birds goes back decades. Beak trimming was instituted as a management tool to prevent injury resulting from aggressive pecking and feather pecking. In spite of advancements such as infrared beak treatment, animal welfare activists have continued to push for an end to beak trimming.

Germany's ban on beak trimming

The German ban on placing beak-trimmed pullets went into effect January 1, 2017. Johan Bouwhuis' farm, Bouwhuis Agro, houses 73,000 laying hens, all of which are cage free with beaks intact. Bouwhuis has had hens for 25 years and has always housed his birds cage free. This farm is considered a relatively large layer operation in the Netherlands.

Today, the farm houses 46,000 layers in "barn systems," houses with cage-free aviaries. The other 27,000 hens are "free range." In this market, free-range rearing means the hens have a house with cage-free aviaries or floor and nest system and have outdoor access to a "winter garden" and to pasture land with shade trees. The winter garden has a roof and wire screening for walls, but it is not climate controlled. It is similar to the "porches" used in the U.S. by some organic egg producers. Access to the pasture area is through doors in the winter garden.

Hens not beak trimmed

Egg Industry visited Bouwhuis Agro in early November 2016. At that time, all the hens on the farm were DeKalb White, and they were not beak-trimmed. Bouwhuis said all the farm's eggs are sold



Egg producers serving the German market have kept the beaks of their hens intact to meet the beak trimming ban that went into effect for pullets placed after January 1, 2017. *Terrence O'Keefe*

to a customer in Germany unwashed and ungraded. About 70 percent of the eggs produced in the Netherlands are sold in Germany. Table eggs in Europe are not washed or refrigerated.

Bouwhuis said they have implemented some management changes along with the elimination of beak trimming, but that the change has gone smoothly. He said that when a flock is first introduced from the pullet farm to the layer house, they use a product called PICKStein (peck stone), which is a mineral block containing calcium, magnesium, sodium and trace minerals at which the hens can peck.

As the mineral block wears down, so might the sharp point of the hens' beaks. He said that once the mineral blocks are worn down, they place some concrete blocks in the scratch areas of the houses for the hens to peck. By the end of the lay cycle, the concrete blocks have been pulverized by the hens. Alfalfa bales are also placed in a holder that rotates as the birds peck at and eat the alfalfa. The idea is to keep the hens occupied exploring and pecking something other than their flock mates.

Aviary better than floor systems

When Bouwhuis built his first layer house, a floor and nest system was installed. Later, Jansen aviary systems were installed and aviaries are in all of the houses now. Bouwhuis said the birds perform better in the aviaries.

The aviaries have three levels, with feed provided on the first and third levels, and nests and water on the second level. The aisles between the aviaries are almost 8 feet wide (2.4 meters), which provides plenty of scratch area for the hens. Ample scratch area and lots of perch space are thought to contribute to reduced bird-to-bird pecking.

The housing system used to raise the pullets must be matched to how the hens will be housed in the layer house. The pullets need to learn how to jump and fly in the pullet house, otherwise they will tend to stay on the floor in the layer house and excessive floor eggs will result. The pullets raised for Bouwhuis Agro are reared in Jansen Nivo Varia systems.

Good free-range performance

Bouwhuis is raising just its second free-range flock, and on Egg Industry's recent visit, the hens were 30 weeks old. The first free-range flock outperformed the breed standard from week 24 through week 88 in terms of rate of lay. Production peaked at 98.3 percent in week 29 and remained at more than 90 percent through week 74.

When asked about free-range rearing for hens, Bouwhuis said, "It is a nice sight to see the birds outside, but it isn't better for the bird." He said the free-range flocks have 2 to 3 percent more mortality than cage-free flocks. Bouwhuis receives EURO.025 (US\$0.027) more for free-range eggs than for cage free, so while more challenging from a management standpoint and less safe for the hens, so far, it has been more profitable.

Bouwhuis offered one tip for caring for free-range hens: He said it is best if the birds are a little heavier coming from the pullet grower because it takes a little time for the bird to get acclimated to going outside. He said some birds will go out every day, but that more will go out in cloudy weather. The big concern for outdoor access, besides potential exposure to wild



Aviaries offer more places than floor and nest systems for lower-ranking hens to move away from more dominant flock mates. *Terrence O'Keefe*



Alfalfa bales can be placed in a holder to give hens a distraction for pecking. It also rotates to make it harder for hens to camp out on top of it and quickly devour the bale. *Terrence O'Keefe*

birds carrying disease, is predators like foxes and birds of prey. Predators can cause the hens to panic and pile up, which can kill more birds than the predators themselves. ■

PULLET REARING IS KEY TO CAGE-FREE FLOCK SUCCESS

Layer management experts say properly rearing pullets can make the difference between a high-performing cage-free flock and a disaster.

AUSTIN ALONZO

Farmers are looking for three things when raising pullets: consistent weight gain, flock uniformity and high livability. Cage-free husbandry makes achieving these goals much more complicated than in a conventional system.

In a conventional cage system, the amount of food, water and ventilation can be controlled and consistent throughout the pullet house. Dr. Nestor Adriatico, director of technical services for Hendrix Genetics, said in a cage-free pullet house, the birds have the freedom to move where they want, creating tense competition for food and water in some places and next to no competition in others — resulting in poor flock uniformity. Cage-free birds also run a higher risk of suffering from pecking, cannibalism, smothering and piling than their conventional counterparts as well as a greater risk of enteric diseases from manure exposure.

“While we depended greatly on our equipment like feeders, drinkers and ventilating fans in cage production in the achievement of our target body weights, flock uniformity and livability, we now need more animal husbandry skills in cage-free production ... in order to achieve similar results as in cage production,” Adriatico said.

Bill Snow, Big Dutchman’s aviary system specialist for the U.S. and Canada, agreed, saying the birds’ ability to move around in the house is key for the success of the pullets. This puts the onus on farmers to monitor and control several variables — temperature, lighting, litter, equipment layout, aisle space and even the frequency they walk the house — in order to get



A cage-free flock cannot be successful without proper pullet rearing. *Courtesy Big Dutchman*

the best bird performance.

“The better job you do with the management of these variables, the better the welfare of the flock and the better they will be able to make the transition into the layer house,” Snow said.

In order to help farmers gain some of those husbandry skills, Egg Industry magazine worked with bird experts from around the world to put together general best management practices for cage-free pullet rearing.

Avoiding disaster

Essentially, successful cage-free layer flock management starts in the pullet house. If pullets are not raised appropriately, they will not perform well as adults.

According to experts from equipment and genetics companies surveyed by Egg Industry, raising pullets in the same conventional rearing systems and then placing them in a cage-free house as adults will be disastrous. Birds will not be able to get food and water and their bodies will not be ready to survive in the system. Negative behaviors can potentially flourish, more eggs will be mislaid and performance will be

Images and videos courtesy of Big Dutchman:
BigDutchmanUSA.com/cagefree



Learn more about cage-free pullet management in this video:

<https://vimeo.com/301023544>

far below expectations.

Frank Luttels, sales manager for Volito, said if you try and save money by using old cage pullet-rearing equipment with new cage-free laying equipment, then you will end up paying the price in worse performance down the road. Improperly raised birds are at a disadvantage in development and will have weaker muscle and bone structure than properly raised birds.

Adriatico said transitioning from a cage to a cage-free system is stressful for birds because the layer barn is an unfamiliar environment and food and water are hard to find.



Watch this video to see how health and performance of the mature flock is influenced by rearing:

<https://vimeo.com/301021468>

“This will result in a deterioration of flock uniformity as a significant number of birds will have a harder time learning how to jump to where the feed and water are located,” he said. “This will result in delayed onset of egg production, lower and less persistent peak egg production, more floor eggs and higher mortality.”

Salmat went one step further in its response.

“Cage-reared birds being moved into cage-free production systems will not work at all,” the company said. It will “lead to weak birds, cannibalism of weak birds, enormous amounts of floor eggs and, at the end, loss of the results of the entire flock.”

Additionally, more labor will be required to manage the house as workers will be tasked with collecting more floor eggs and placing the birds into the higher tiers of an aviary system to roost every night. More time will be spent on the floor and lower tier rather than the upper tiers and perches, and therefore more droppings will be



The rearing phase is critical in the success of a cage-free flock. *Courtesy Big Dutchman*



Pullets need an environment similar to where they will lay their eggs when mature. *Courtesy Big Dutchman*

deposited in the litter area rather than the manure belt, this can lead to more problems with ammonia and wet floors.

Creating the proper conditions

Successful flocks come from good management, and good management starts when day-old chicks are placed in the pullet house.

Pullets must be raised in a system that matches where they will live in the layer house. If a farmer is using an aviary, pullets need to start their lives in an aviary rearing system that teaches them about that environment. The same goes for a floor system. With proper training, the birds will already be accustomed to life in the laying barn by the time they are ready to lay.

Systems differ with the manufacturer, but an aviary pullet rearing system needs to teach the birds how to



Watch this video to see an example of how moving through the house can encourage proper bird movement:

<https://vimeo.com/301022691>

move up and down the tiers and how to perch. Some systems utilize winch-able platforms to provide a tiered living area for the pullets. In these systems, water and feed lines are raised along with the tiers as the pullets age, steadily building their strength as they grow. Placement of feed and water inside the tiers of a fixed aviary system encourages birds to enter and move up in the system to feed and drink.



Watch this video to see an example of how a rearing house should compare with a layer house:

<https://vimeo.com/301019468>

Starting off right

When birds are first placed in the house, they may not be given the run of the entire aviary or floor system for three to six weeks. This can be true for aviary and floor pullet housing systems. Dr. Anna Concollato, of FACCO's poultry science technology department, said starting the birds in a smaller area will create the strongest and most uniform pullets for when the pullets are given more space later. Training the pullets to move throughout the aviary system can save labor in the layer house as the hens will be less likely to lay floor eggs and more likely to return to the aviary to roost at night.

If very young pullets are not enclosed in a housing system, she said, they will get lost in the pullet house and it will take too long for them to learn where the food and water are. Workers will also be tasked with rounding up the birds every night and putting them up to roost because they will not be strong enough to move from the scratch area to the housing system on their own. Additionally, enclosure makes it easier to vaccinate birds.

Potters Poultry agreed that temporary enclosure can help with improving bodyweight and flock uniformity, but "equally good results can be achieved



Cage-free flocks require greater animal husbandry than conventional flocks. *Courtesy Big Dutchman*



The pullet house should be designed so the environment closely matches the layer house.

Courtesy Big Dutchman

by floor rearing pullets with access to tiers." Regardless of which rearing system is used, farmers need to promote movement among the tiers to avoid dehydration and starvation in the layer barn.

Movement, lighting and ventilation

Potters said farmers should also weigh their pullets every week to make sure they are growing according to breeder specifications and feed amounts should be adjusted accordingly. A "good level of bright lighting" is also necessary in the pullet house to encourage mobility and activity. More activity leads to more feed and water consumption, which in turn means better growth.



Watch this video to see how placing similar equipment in the layer house and the pullet house helps lower stress:

<https://vimeo.com/301020591>

Adriatico also mentioned the importance of spacing and consistent ventilation inside the pullet house. Using pens or partitions inside the house can help minimize the risk of birds overcrowding some areas and abandoning others. Uniform ventilation is also helpful in keeping pullets evenly distributed throughout the house.

Getting into the layer barn

Moving from the pullet house to the laying house can put significant stress on the animal. Farmers need to take steps to minimize stress and therefore maximize performance. Potters said less stress means lower mortality



Watch this video to see an example of how lighting helps:

<https://vimeo.com/301022129>

during lay and better overall flock performance. Farmers should carefully match the positioning of their feeders, drinkers, lighting and slats in the pullet and layer houses in order to minimize stress.

The experts said pullets should be moved into the layer barn at about 16 weeks of age. Potters said 16 weeks is the best age because it gives birds time to regain bodyweight they may have lost in the move before the beginning of lay. It also allows time for the birds to learn their new environs before the onset of lay and reduces the potential for mislaid eggs. Adriatico agreed, saying the onset of egg production is often 18 weeks of age.

There is some variance, however. Snow said the transition can take place between 14 and 16 weeks and most farmers are moving at 16 weeks. Salmel and Dr. Jasper Heerkens, a poultry specialist for Jansen Poultry Equipment, said sometimes birds aren't fully grown at 16 weeks so 17 weeks works best to ensure the animals are big enough to reach food and water in the layer barn.



Minimizing stress eases the transition from the pullet house to the layer house. *Courtesy Big Dutchman*



Lighting is a key element of cage-free bird management.

Courtesy Big Dutchman

"The sooner you can get that bird used to where the feed, where the water, where the nest is, where they are going to roost at night ... the better," Snow said. "You bring them over to a new environment where the bird quantity is much larger and the social order is different so there's a lot of stress on the bird. It's a lot harder on the bird when you move them to that layer environment, so you want to get them over before they are even getting into that laying cycle."

Most birds will know to find food and water, but sometimes a farmer will need to pick up a few birds and place their mouths on a nipple drinker or in a feeder in order to show that bird, and others, how to use the equipment. Farmers must remember that lighting can help promote positive behaviors, too. During daylight hours, brighter lights under the system can prevent birds from laying floor eggs and dimmer spaces around the nests can promote nest acceptance. ■

FEWER STRESSORS, MORE STIMULI AID UNTRIMMED LAYER BEHAVIOR

As beak trimming becomes increasingly unacceptable, new layer management techniques are already being tried.

MARK CLEMENTS

Injurious pecking may be reduced in layers with intact beaks by reducing stressors in the layer house and giving birds more to do.

Beak trimming is banned in several countries and is under consideration in several more. At this year's trade event EuroTier, held in Hanover, Germany, research and on-farm experience was presented.

Germany is due to phase out beak trimming in 2017, and the country's egg producers are looking to minimize feather and vent pecking and cannibalism as the regulatory environment changes.

Mona Giersberg of the University of Veterinary Medicine Hannover pointed out that beak trimming was never a cure for injurious pecking, it simply made any resultant injuries less serious. The key to reducing the behavior, she argued, was to discover which factors encouraged birds to exhibit this behavior.

Various contributing factors

Her research has found that there are various contributing factors that encourage birds to peck each other, and that the way pullets are managed will influence how they behave during the layer phase.

For example, research on pullet farms in Germany found that, too often, stocking densities were too high, there was insufficient litter, birds were always kept indoors, and there was a lack of uniformity, little stimulation and too much dust.

Similar weak points were identified during the layer phase but, additionally, Giersberg cited lack of access to the scratching area and boredom, issues with feed, light, genetics, stocking densities and air quality.



She also pointed out that modern feeding systems, by making feed so easy to access, result in birds not pecking as much as when they have to look for food. During the light phase, birds can peck up to 15,000 times, and today's management systems do not encourage them to satisfy this need.

Trial and error on-farm

As part of Germany's beak trimming phase-out, some farmers are experimenting with management systems to prevent injurious pecking.

The Mardy family, which has a flock of 20,000 birds, stopped beak trimming in 2014, and has experimented with various stimuli.

Most have been relatively simple, but have, nevertheless, been through a period of trial and error.

For example, carrots scattered on the floor of the layer house encouraged birds to peck, but were consumed within half an hour, making the stimulation short-lived. Now, carrots are hung in wire baskets a little higher than is comfortable for the birds to reach. This means they must work to access them, helping to reduce boredom.

Similarly, 16 alfalfa bales are hung throughout the house. Initially, bags of straw were also hung in the house, but these have subsequently been moved to

the patio area. There are also pecking discs distributed throughout the house.

In addition to the permanent stimuli, layers are also given corn silage shortly after feeding. While this has proved beneficial, how it is delivered has had to be adjusted to find the optimal level.

Initially, corn silage was dropped from two “enrichment lines” seven times a day, but this has now been reduced to five deliveries. The more regular deliveries were problematic because feed consumption fell. Birds ate too much silage and this influenced growth but, in their excitement to access the silage, birds were jump-

ing on top of each other to reach it, resulting in scratching injuries.

Stocking density in the house is relatively low. Although the house has a capacity for 24,000 birds, only 20,000 are reared.

Mardy notes that the various stimuli introduced into the flock have worked for him, but recognizes that the approach may not work for all farmers. He cautions that while giving birds corn silage results in a great deal of stimulation, this must not be at the expense of a significant change in feed consumption. ■

NATURAL HEN BEHAVIORS LEAD TO BETTER PERFORMANCE

John Brunquell, of free-range egg company Egg Innovations, offers tips on how to stimulate birds for better performance.

AUSTIN ALONZO

Just like people, chickens need to be challenged a little to perform at their best.

That's what John Brunquell, president and founder of Warsaw, Indiana, free-range egg producer Egg Innovations told the Organic Egg Farmers of America Symposium on March 14, 2017. The event took place in St. Paul, Minnesota, in conjunction with the Midwest Poultry Federation Convention. Brunquell is the president of the farming association.

Allostasis

While the growing movement toward producing cage-free, free-range and organic eggs is relatively new, the chicken's desire to express natural behaviors is not. Hens inherently want to dust bathe, perch, forage, scratch and socialize, and when they get to, good things happen, Brunquell said. Egg Innovation's birds have access to pastures year-round and, because of it – along with experienced management – the birds perform better and experience lower mortality than their breed standards.

Brunquell said the natural behaviors help release the genetic potential of the bird to lay more eggs. It relates to allostasis, or the concept that putting a consistent amount of limited stress on an animal can be beneficial to its health. He compared it to how regular, moderate exercise can benefit people's overall health.

The birds, he said, need only about two hours a day to lay their eggs, eat, drink and defecate, meaning they have 14 other daylight hours with nothing to do. Chickens are naturally curious and



they want to go outside, or at least be engaged inside the house. When they are allowed to express their natural behaviors, negative behaviors like feather pecking and cannibalism can be reduced, he said.

How to engage the birds

All chicken farmers can make simple changes, or get creative with items found on their farm, to engage their animals' natural curiosity.

Brunquell said the road to good engagement starts in the pullet house. He said as young as four days old, pullets can start learning to interact with engagements in their housing. For instance, Egg Innovations uses rods in its pullet houses to teach pullets how to perch. Perching trains the birds how to jump up and down, and further down the line helps promote evenness of the flock by giving less dominant birds a way to avoid more dominant birds.

Another key engagement is the scratch area which, he said, must be wide enough for the birds to actually use them for scratching. Additionally, litter needs to be present in the area, but it must be shallow enough that the birds do not see it as a nesting area and start dropping floor eggs in the scratch area.

Scratching can help wear down the hens' claws.

Similarly, birds can also be given objects to peck at that can blunt their beaks. One Egg Innovations farmer uses a stone wheel with feed placed on top of it so birds can forage for food and shorten their beaks at the same time.

Inside and outside the house, birds should be given curiosity objects that stimulate them and give them something to do. Egg Innovations encourages its farmers to get creative, and they've hung old compact disks or swings inside the houses to give the birds something to play with. One even used a soda bottle drilled with holes and filled with oats to get the birds engaged.

Outside, birds want to be engaged in three dimensions. Free-range farmers used to think shade and water were enough, but Egg Innovations learned that curiosity and engagement are valuable outside as well. Birds, of course, want a place to hide if they spot a predator, but they also want things to crawl under, perch on and jump over. Again, it doesn't need to be complex. Fallen tree limbs or hay bales are sufficient, he said.

Farmers must also remember what looks good to a human farmer – a mowed pasture used to collect farm income – doesn't look good to a chicken. The birds want dense, deep vegetation. The birds know to come home to the safety of the barn at night.



John Brunnquell, president and founder of Egg Innovations, speaks to Organic Egg Farmers of America members and allies on March 14, 2017 in St. Paul, Minnesota. *Austin Alonzo*

Farmers and flock managers must also change their own behavior to keep birds engaged and active inside the house. He encouraged farmers to make a little noise while walking the house in order to make birds less afraid of loud noises and disturbances when they are in the pasture. Additionally, farmers should try walking in different directions or wearing different colors at different times of the day. All of these management practices help build up a flock's stress tolerance. The more their environment changes, the calmer they are. ■

LATEST CAGE-FREE VENTILATION, LIGHTING AND LITTER TACTICS

Beyond new housing systems, cage-free egg farming requires farmers to change how they approach familiar elements in the house: ventilation, lighting and litter management.

AUSTIN ALONZO

Cage-free farming elevates the importance of aspects that were almost afterthoughts in a conventional house, augmenting the challenge of the transition.

Along with stronger husbandry skills, cage-free management challenges farmers to think how ventilation, lighting and litter and manure management affect the health and performance of their flocks. Removing birds from cages takes away the relatively standardized rules surrounding those three elements and challenges farmers to change their management tactics to use them to their advantage.

Ventilation becomes even more important

As far as providing an adequate air supply and temperature, the rules for ventilation have not changed in cage-free production. However, the birds are now free to move wherever they feel most comfortable — ensuring the center of heat production is always changing. Movement creates new issues, too, like controlling dust and ammonia levels and creating a consistent temperature to prevent negative behaviors.

Generally, ventilation must be consistent throughout the house. Maintaining the same airflow and temperature is important for optimal bird performance and avoiding unwanted behaviors. The experts who spoke with Egg Industry said specific ventilation needs change depending on the size of the house and the type of equipment. They recommended working with a ventilation company or other experts to establish a plan for remodeling an existing layer house or building a new one.



In cage-free systems, lighting, ventilation and manure management are important management tools that can stimulate positive behaviors and discourage negative ones. *Austin Alonzo*

The importance of consistent airflow and temperature

Patrick Stacklin, caged and cage-free layer building and equipment sales representative with poultry equipment distributor Northeast Agri Systems Inc., said avoiding hot and cold spots will keep birds from crowding into one area or another. Like in a caged house, ventilation must also keep moisture and ammonia levels low to maintain dry litter.

Potters Poultry recommended keeping an ambient temperature of about 70F. Nevertheless, air quality, it said, is more important than temperature to animal health.

“If the environment is comfortable for the stockman, then it is acceptable for the birds,” Potters said. “If the farmer is not comfortable — with eyes stinging, etc. — then the birds will be suffering. This in turn will affect mortality and performance.”

Dr. Jasper Heerkens, a poultry specialist for Jansen Poultry Equipment, said cold spots in the house lead to wet, sticky litter and create a disease risk inside the house. Air needs to flow all over, rather than being concentrated in one area of the house. If one part of

the house — like the top tier — gets a colder, heavier airflow, the birds in that area will be chilled and potentially develop health problems.

Dealing with seasonal change

Dr. Anna Concollato, of FACCO's poultry science technology department, said the rules can change with the seasons. In the summer, a heavier airflow will be needed to remove excess heat and keep litter on the floor and manure on the belts dry. In the winter, the airflow can decrease but not so much that it doesn't remove dust, carbon dioxide and ammonia and provide fresh oxygen. She said dust can be a bigger problem in winter as well.

Salmat said the house must be as air tight as possible to avoid drafts from outside, especially during the winter in colder climates. Free-range houses have no choice but to have openings to the outside that disturb the negative pressure system and airflow in the houses. Free-range farmers need extra ventilation capacity and should consider a positive pressure ventilation system, it said.

Providing enough space

There must be enough empty space inside the house for air to flow properly. Bill Snow, Big Dutchman's aviary system specialist for the U.S. and Canada, stressed the importance of "nothing," or providing enough aisle space between rows of housing equipment and horizontal distance between tiers of aviary housing. Otherwise, the house cannot be properly ventilated and bird performance and welfare will suffer.

Farmers want to maximize the amount of birds inside the house, but providing empty spaces leads to improvements in lighting, litter quality, bird movement, livability and mobility for workers inside the house, Snow said.

Concollato recommended leaving about 24 inches of space between the ceiling and the top of the system to allow for optimal air circulation. Salmat said about 50 centimeters, or 19.7 inches, should separate each tier while aisles should be about 100 centimeters, or 39.4 inches, wide.

Lighting throughout the house

In a conventional system, farmers lit the house and



Lighting plays an important role in attraction and stimulating activity. Lights should be placed near drinkers and feeders to ensure hens use the equipment. Placing drinkers and feeders inside the system also encourages birds to leave their droppings on the manure belt. *Austin Alonzo*

birds lived in the level of light that permeated to their cage. In cage-free production, lighting is much more important thanks to the birds' freedom of movement. Experts say lighting, and the intensity of light, plays a role in nixing unwanted behaviors and encouraging hens to lay eggs in nest boxes.

The experts said the following fundamental approach should be taken to maximize productivity:

- Lighting should be as uniform as possible throughout the house. Some areas must be kept brighter while others must be darker, but uniform brightness in those specific areas is important. Irregular light can lead to irregular behaviors. Excessive brightness can stimulate aggression.
- Activity areas — where feeding, drinking, scratching, dustbathing and socializing occur — should be kept brighter than areas for rest or nesting.
- Nest areas must be dark. Hens want to lay their eggs in a dark place. Conversely, areas inside the house that are not bright enough can become an attraction to lay floor eggs.
- Lights must be placed inside the system to direct birds to food and water and placed underneath the system to keep birds from laying floor eggs.
- Lights can encourage birds to move up into the higher tiers and perches of an aviary at night

and descend down to nest boxes in the morning. Dimming the lights at the proper rate to create dawn and dusk lighting periods is important to this principal.

- Farmers must be careful to replace broken or non-uniform lights as soon as possible to promote consistent lighting.

Lighting to promote good behavior

As the fundamental recommendations suggest, lighting can be a powerful tool to control bird behavior. However, farmers need to remember the bird eye is different than the human eye. Concollato said a bird's sight is more developed and sensitive than a human's, so breeder guidelines concerning lighting intensity need to be followed for the best performance.

For the same reason, Heerkens said, house lights need to be high frequency. A hen sees a low-frequency light as a flicker. A warm, white LED light with about 40 lux of intensity at the floor level is best.

Nests must be kept dark for hens to feel comfortable enough to lay in them. Heerkens said farmers need to pay attention to how much light is flowing into the nests and whether their light fixtures are placed so close to the nests that birds are discouraged from using them.

To avoid mislaid eggs, Heerkens said, farmers need to keep birds from sleeping on the floor or the lower levels of an aviary or inside the nests. House lights must be dimmable to help establish a dawn and dusk cycle for the birds. Heerkens added a dimmer is helpful when farmers are trying to figure out what level of light works best for their birds, too.

LIGHTING ... PLAYS A role in nixing unwanted behaviors.

Generally, Snow said, lights should turn on quickly in the morning. At night, Frank Luttel, sales manager for Volito, said lights should be dimmed off to help move the birds off the ground and onto the perches and the higher tiers of the housing system for the night. This prevents smothering, too.



Ventilation and temperatures should be consistent throughout a cage-free house. This reduces dust levels, helps establish a proper litter moisture level and maintain bird health. *Austin Alonzo*

The role of colored and natural light

LED lighting gives farmers the option to use different colored lights, like white, blue, red or green, but are these colors useful in management?

Concollato said research shows red light has a significant influence on egg-laying performance. Red is best for accelerating sexual maturity, increasing egg production and reducing aggression. Blue light can improve growth and reduce activity levels. Green light discourages feeding but promotes exploratory activity like foraging. Potters said red bulbs work best for dusk and dawn lighting as they can attract birds into the system at night.

Conversely, Salmel said different colors are "often introduced for marketing reasons. There are no real benefits." Providing a bright white light is important, and LED provides that at the best cost, it said. Potters said LED and florescent lights work well.

Natural light is not needed inside the house, but it is not detrimental, either. Potters said organic farmers who must have natural light inside the house need to be able to completely black out the house before illuminating it with natural light during their daily routine.

Re-learning manure management

Egg farmers have a new challenge in providing a litter area — a space on the floor for birds to scratch, forage and dustbathe — inside the house. Manure is complicated by cage-free production, too. Rather than having no choice but to use the manure belt, birds can leave droppings anywhere.

In general, the litter areas should be kept dry, friable, loose and attractive to the birds for dust bathing and scratching. However, litter cannot become an invitation to lay eggs on the floor. Placing the feeders, waterers, engagements and perches inside the system's slats can encourage birds to use manure belts and simplify manure management.

Essentials of litter management

Litter quality is key to bird health, the experts said. Poor-quality litter can contribute to serious problems like ammonia blindness and enteric disease. Moisture is the most important indicator of quality and it can be affected by ventilation, the season, drinkers and fecal buildup.

Quality litter, Snow said, gives the birds something to do when they are not laying, and attracts the birds to move around the house. Essentially, good litter gives the birds more places to be and increases the amount of space birds will utilize inside the house.

Luttels said new litter, made of wood shavings or sand or a similar material, should be placed ahead of every flock and not replaced during the flock's life. If conditions are poor, Salmets said the litter can be refreshed once or twice during the cycle. More litter may need to be added periodically, Potters said, to maintain quality litter. After each flock, the litter should be removed and the barn should be sanitized.

Litter depth should fall between .5 and 2 inches, Concollato said, to avoid floor eggs. Scrapers can be deployed to keep the litter levels lower.

Keeping the litter dry

To control moisture, Potters said drinkers must be monitored to avoid excess dripping and leaking. Water pressure must be correct and the placement of drinkers must be at the right height. The air flow should stimulate dryness and keep cold spots from



Hens feel most comfortable nesting in dark areas. Nests should be kept far away enough from light sources that hens won't be discouraged from using them. *Austin Alonzo*



In a cage-free system, farmers get a new challenge in litter management. Litter depth must be deep enough that birds want to use the scratch areas but shallow enough that its not so comfortable hens want to lay eggs on it. *Austin Alonzo*

forming. Air-moving stir fans can help stimulate proper airflow. In winter, Concollato noted, farmers need to watch for wetter litter due to a lower ventilation rate and higher humidity.

Potters said drying agents and disinfectant powders can be spread directly onto the litter to dry out the bedding. Additional bedding material can have the same effect.

The birds themselves can promote dry, quality litter just by scratching and dustbathing. Concollato said opening the doors underneath the tiers of an aviary can allow birds to roam around and keep the litter

moving and dry. Spreading whole grains in key areas of the barn can stimulate birds to peck and scratch in areas where litter is not loose enough.

Encouraging use of the manure belt

To keep birds using manure belts like they did in caged housing, farmers need to place feeders, drinkers, engagements and perches over the belts and ensure enough air flows over the belts to dry out the manure.

Salmet said light management at dusk to push birds up into the system and over the manure belts can be helpful as well. Concollato said farmers can occasion-

ally run the feed chain for one minute in between normal feedings to stimulate birds and bring them over the belts as well.

Manure belts should be run regularly to avoid excess odor and ammonia buildup inside the house. The belts should be run at least twice a week. ■

THE BIRDS THEMSELVES CAN promote dry, quality litter just by scratching and dustbathing.

HOW AISLE WIDTH IN CAGE-FREE SYSTEMS IMPACTS HEN WELFARE

Cage-free specialists discuss the need for space in aisle ways that often gets overlooked in planning.

DEVEN KING

“When you are planning your cage-free operation, you must understand the importance of aisle width and how it will affect your flock,” said Bill Snow, Big Dutchman’s cage-free specialist during the webinar “Learning the fundamentals for cage-free egg success,” which was sponsored by BASF and Big Dutchman and hosted by WATT Global Media. Aisle width affects lighting, ventilation, litter, flock movement and management, which will directly affect the welfare of the birds.

“Aisle space is nothing and it can often times be over looked in the planning stages,” Snow said. He refers to it as nothing because of the availability of room it offers the birds. “Workers are more likely to spend more time in the houses because they can move around and monitor things easier,” he said.

In each system that producers consider they should find out how tall it is, how wide it is, the location of the nest, how many hens it will accommodate, where the lights will be located and what kind of ventilation system will be used. “All of these should be carefully thought out when deciding what aisle width should be,” said Snow. The bigger the aisle is, the better it is for management to step back and analyze the system and how birds are responding to it, without forcing as much stress on the birds.

Jasper Heerkens, Ph.D., poultry specialist with Jansen Poultry Equipment, agreed with Snow during the same Webinar. “Use the room to sit or stand still in the house and observe the overall picture every other day so that birds are used to you being in the house,” he said. Make sure that your staff is properly trained to read bird behaviors, he added.



Allowing birds enough space to express natural behaviors and peacefully coexist is essential to avoiding aggression. *Courtesy Salmat*

While every bird has daily necessities, facilities to meet those requirements should be found in the house, Heerkens explained. This means there are different functional areas of the house, but they all serve a specific purpose.

How much space is really needed

Fifteen percent of the space that a hen is given is too little to have in the aisle ways, Snow explained. Birds gather in the aisle ways for numerous reasons. Space under the systems is still available space, however, birds will come to the aisles. Overseas they allow for more room, but currently 15 percent is the required U.S. allotment per bird.

This number may be affected by how much employees are in and out of the houses moving the birds. “I’m not one to tell you that 15 percent is just not enough, you [producers] may just have to manage those houses better,” Snow said.

Traditional cage houses had three-foot aisles. “If you have that amount of space you’re going to wish you had more,” said Snow.

“I know it costs more to have that extra space, but

in the long run it should be worth it," Snow said. More space per bird does not mean there are fewer birds in the house; it all depends on how big your system is. To have the optimum house for the birds, producers should design the dimensions of the house around the aviary system they're using.

Lighting in wider aisles

"Lighting should be as uniform as possible," Snow said. The wider the aisle, the more opportunity there is for light to reach each tier. If there are darker areas of the house, then you are creating a choice for the birds; while choice is good, you don't want too many birds to choose one area of the system and create congestion.

"Congestion may lead to problems with ventilation, mislaid eggs and litter quality," said Snow.

Heerkens agreed that good light improves performance, behavior and welfare. "Lighting regulates biorhythms, physiological processes [e.g., sexual maturation], stimulates feed intake and laying behavior," Heerkens said.

'CONGESTION MAY LEAD TO problems with ventilation, mislaid eggs and litter quality.'

— **Bill Snow, Big Dutchman's cage-free specialist**

However, Heerkens noted that it might be of value to have different light conditions in different functional areas. Those lighting options should be controlled by management and may vary on the time of day. "Nesting areas should be darker," he said.

For birds to have a smooth transition from rearing to production, housing management should use the same feeding and lighting schedule that was used in the last week of rearing, Heerkens suggested. Even the same feeders and drinkers may be beneficial.

Some producers are trying different colors of lights and natural light. Natural light is harder to manage in terms of uniformity and may not be the best option, Snow noted.

Wider aisles allow for better ventilation

Proper aisle width allows for a more uniform temperature, optimal flock spacing, improved air quality and flow, better bird movement and a more ideal litter quality. "You can have the perfect ventilation system set up for you, but if you don't have the proper aisle width, it will not be as effective," Snow said.

The floor space that is between the system rows is always going to be a little more crowded than underneath the system itself. With a wider aisle, birds have more room to separate and allow air to move through the litter. You are not only ventilating the house for the birds, but you are drying your litter quicker. "You want birds engaged in the litter," said Snow. Greater aisle space creates more room for dust bathing and foraging.

Add substrates and scatter feed to use to your advantage. "Forty percent of the birds' daytime activity is spent on foraging," said Heerkens. The hens using the litter this much will only help dry it out.

Litter quality control in wide-aisle systems

"Litter and ventilation really work hand-in-hand," Snow said. More space results in a dryer litter. The more hens that are packed in the given space of an aisle, the harder it is to control the quality of litter, Snow explained. The better the litter is, the more the birds will use it.

"Wet or excessive litter in your house is a risk for health problems for your personnel as well as your animals," Heerkens said. Litter should be no deeper than 2 to 3 inches, he added. Excessive litter may create a greater risk for floor eggs; an attractive nest will help eliminate this issue.

If litter is a bit wet producers, should add stir fans and move through the house themselves to get the birds to circulate more. Dry litter is important so that birds have something to do to occupy their time, as Heerkens previously suggested. By doing this, producers are reducing the risk of feather picking and cannibalism.

Navigation in such systems

"Cage-rearing [of pullets] is definitely unsuitable for preparing hens for cage-free systems during production,"

Heerkens said. Aviary housing is more complex housing than what pullets raised in cages would be accustomed to. Birds need to learn to go up high to look for water and feed as soon as possible, not only to fill their nutritional requirements but also to strengthen their physiques and to learn navigation systems and what jumps to take. This will ultimately lead to less injuries later, Heerkens explained.

Rearing systems can be relatively simplistic if you can provide a training system that's realistic to the expectations the birds will need to meet in their produc-

tion houses.

Dimming of the lights at the end of the day in the house may teach the birds to go up high, he added.

Management should watch birds closely to make sure they are properly using the system, Heerkens noted. Place yourself in the shoes of the bird to figure out what works.

"Flock movement is what we are after," said Snow. This results in less competition, more activity and fewer mislaid eggs while still directly improving the welfare of the hen. ■

5 QUESTIONS ABOUT CAGE-FREE HEN HEALTH, WELFARE

Cage-free egg farming experts answer questions about mortality, stocking density, perching and food safety.

AUSTIN ALONZO

Cage-free egg production is quickly changing the egg industry and challenging farmers to elevate their bird management skills to achieve the best possible productivity. In July, Egg Industry magazine examined how to manage negative behaviors such as aggression, smothering and mislaid eggs. This month, the experts answer questions about mortality, perching and food safety.

1 Is higher mortality a part of cage-free farming?

There is no consensus on whether farmers need to accept higher mortality as a given in cage-free conditions.

Dr. Nestor Adriatico, director of technical services for Hendrix Genetics, said mortality will always be higher in cage-free production because of the hen's direct contact with manure, exposure to pecking behavior, smothering and injuries from collisions with the perches. He estimated mortality is only slightly worse than conventional housing on well-managed cage-free farms but could be twice as high in poorly managed farms. Salmat said approximate mortality in caged housing is 3 percent. In cage-free housing, mortality is 7 to 8 percent and possibly higher than 10 percent in free-range conditions.

Dr. Anna Concollato, of FACCO's poultry science technology department, said mortality varies substantially in cage-free settings, between 4 to 13 percent at the end of the cycle. Generally, she agreed, cage-free conditions experience higher mortality than cages due to hazards of the environment.

Potters Poultry argued that higher mortality is not a fact of life in cage-free production. It said, in a



Cage-free hens are free to move around the house, raising questions about how best to stock the house, how to utilize perches, avoid mortality and maintain a high level of food safety. *Courtesy Salmat*

well-managed cage-free farm, the target mortality at 72 weeks is 2 percent. If stress, enteric issues and disease are kept to a minimum through good flock management, mortality can be limited.

2 What effect does stocking density have on behavior?

The experts agree lower stocking density is needed to prevent stressful conditions inside the barn and promote flock health.

Birds need sufficient space to express natural behaviors; overcrowded conditions lead to more aggression and unproductive behaviors. If the stocking density is too high, hens cannot reach feed, water or nests properly. Greater space on the floor, in the nest and at the waterer and the feeder reduces competition in the flock and encourages uniformity.

Potters encouraged providing 1.2 to 1.5 square feet of housing per bird to allow the animals the freedom to move, dustbathe and perch and reduce stress and aggression. Salmat said the European standard is 9 birds per square meter of floor and slatted area

space. Concollato said stocking density in alternative systems can range between 6 to 9 birds per 10 square feet of usable area.

3 What are the welfare and management benefits of perching?

The perch is an important, yet easily overlooked, element of the cage-free house. Perches, often built as bars extending from the housing system, are seen as an animal welfare benefit because they allow birds to grasp onto something with their feet and fulfill the animal's natural need to perch.

From a behavior management perspective, the experts said perches have a generally calming effect for flocks. Perches allow birds to escape aggressive behavior from more dominant birds, encourage more movement inside the house, and help the animals develop a stronger bone structure. By getting the birds off the ground and onto a perch, the farmer gets the benefit of additional usable surface area inside the barn and decreased density of birds on the floor.

Concollato said perches encourage hens to move vertically through the house, fostering the development of muscles and bones in the body. Jumping through the house is a positive for daily nesting behavior and is particularly useful in multi-tiered aviary housing. Along with reducing social stress, the devices give birds a place to roost overnight and can possibly reduce piling behaviors.

Potters Poultry said farmers should provide as much perching as possible inside the barn in order to reduce overall negative behaviors like aggressive pecking and cannibalism. Additionally, moving birds off the ground and onto perches leads to higher litter quality and better bird health. Stress reduction created by the perches improves feather wear, which reduces flock mortality, too.

Perches are also helpful with other aspects of house management. Frank Luttels, sales manager for Volito, said perching behavior — particularly overnight — is necessary for good ventilation, as spreading the birds out keeps airflow consistent and reduces hot spots in the house. Salmat noted placing perches over manure belts can encourage birds to use the belt. This helps maintain better litter quality and improve manure management.



Lower stocking density prevents stress and aggression in the house while promoting general flock health by giving birds the space to carry out natural behaviors. *Austin Alonzo*



Experts disagreed on whether higher mortality is a fact of life in cage-free farming, however free-range conditions present the highest potential flock mortality.

Terrence O'Keefe

4 Is there an ideal perch design?

A perch can vary in shape and material, but often it is a round metal tube. Potters said the metal tube is actually the best shape for the bird. Concollato said the varying shapes and construction materials all have their own pros and cons, but the key is to ensure birds can get a good grip on the perch, can perch comfortably, and that the perch properly supports the foot by maximizing the contact area and minimizing the strain placed on a particular area of the footpad.

While perches are required by cage-free certification programs, there are concerns collisions with the

devices harm birds' bodies — particularly the foot pad and keel bone. Injuries to the feet and the keel are perceived as welfare drawbacks and are associated with lower productivity. Concollato cautioned the shape of the perch can affect the amount of strain placed on the foot pad and the keel bone. Over time, the perches' shape can lead to deviation in the keel bone's shape or footpad lesions.

Setting the proper distance between perches is also important to bird health. Concollato said hens are able to jump between perches set about 20 inches apart. Potters said round tube perches are the best for the animal. The company recommended perches be placed about 11 to 12 inches, or 27.9 to 30.5 centimeters, apart from one another to encourage birds to use them. A gap should also be provided on both sides of the perch to allow hens to grip it without trapping their claws.

5 What's the best way to maintain a high level of food safety?

Critics of cage-free housing say one of the biggest drawbacks compared with conventional egg farming is a lower level of food safety. Taking the birds out of cages potentially places the eggs in contact with feces and other disease vectors. The experts said the food safety challenge can be met through a combination of strong flock and house management, application of biosecurity principles, and vaccinating pullets against *Salmonella*.

In a cage-free environment, biosecurity becomes even more important. Concollato said farmers need to follow three basic biosecurity principles: isolation, or keeping enough distance between houses or farms to limit disease spread; traffic control, or restricting human, animal and equipment movement into chicken houses; and sanitation, or regular cleaning and disinfection of production areas, equipment and personnel.

Dr. Jasper Heerkens, a poultry specialist for Jansen Poultry Equipment, said the cleanliness of the house plays a large role in food safety. Farmers should keep a clean nesting area and run the egg belt to make sure it stays clean. By controlling those two aspects, he said, the risk of contamination is significantly reduced. Along with surfaces that are in contact with the eggs, farmers need to regularly disinfect and flush their water lines to remove contaminants from the wa-



Perches are an essential part of a cage-free house, but farmers should be mindful of placing perches in order to maximize their utility and minimize the possible harm caused by repeated collisions with perches. *Austin Alonzo*



Preventing mislaid eggs is the best way to maintain food safety, but drier litter can prevent litter from caking on the egg. *Austin Alonzo*

ter supply. He added that farmers must closely monitor their flock and act quickly when there are any signs of illness. An eye for unusual behavior will develop over time, he said, but farmers can find some signs of disease in irregular droppings. Salmeter added that along with watching for signs of illness, farmers need to remove dead birds as quickly as possible to prevent disease spread around the house.

Mislaid eggs can also be a food safety risk. Adriatico said proper training and optimal litter conditions will help prevent mislaid and floor eggs. Good litter quality comes in handy when eggs wind up on the floor, he said, as wet litter tends to cake on the egg. ■

CALCULATING ADDITIONAL CAGE-FREE PRODUCTION COSTS

Cage-free egg production requires additional labor and feed, but exactly how much? Experts offer their estimates.

AUSTIN ALONZO

Along with greater attention to bird management and environmental settings, cage-free egg production demands greater resources than conventional production. Quantifying exactly how much extra labor and feed is needed, however, isn't that simple.

Over the past few months, Egg Industry profiled best practices for rearing pullets, setting up the layer house and managing a cage-free flock. This installment will calculate the amount of additional resources needed for a successful operation and review mistakes farmers commonly make and how to avoid them.

Evaluating labor differences

Removing birds from cages means more work is needed than in a traditional layer barn. The experts surveyed for this story didn't reach a consensus about exactly how much more is needed. They agreed more labor is generally needed when the birds are being moved from the pullet house into the layer house. Additionally, flock management experience gained over time can reduce the amount of labor needed to manage the flock.

Patrick Stacklin, caged and cage-free layer building and equipment sales representative with poultry equipment distributor Northeast Agri Systems Inc., said about two to three times more labor is needed in a cage-free environment. Dr. Nestor Adriatico, director of technical services for Hendrix Genetics, said cage-free conditions generally require more skilled laborers with a strong understanding of best practices for poultry husbandry.

Dr. Anna Concollato, of FACCO's poultry science technology department, said labor needs rise by more



Cage-free hens need considerably more feed than their conventionally raised counterparts, thanks to their increased mobility. *Austin Alonzo*

than 40 percent, to 0.52 man hours per hen from 0.35 man hours per hen in a caged environment. The cage-free environment generally calls for more time spent performing routine bird management and flock inspection. Over time, farm workers and farmers will develop better management skills, which can potentially reduce the amount of labor needed and boost productivity. She warned that improper pullet rearing techniques will lead to greater labor needs in the layer house.

Potters Poultry said the amount of labor needed will spike the first few weeks after the transition into the layer house. Additional workers are needed to collect floor eggs and establish proper nesting and roosting behaviors, as well as deal with any other problems. The effort put in during the weeks after the transition will pay off for the rest of the flock's productive life. Conversely, if those issues are not properly addressed, more labor will be needed for the remainder of the cycle.

Salmet agreed, saying that cage-free operations do not necessarily require more labor than caged operations for the entire life of the flock. More labor is needed to ensure the successful introduction

of the hens into the barn, but the establishment of good behaviors early on will pay off in the future.

Staff with a keen sense for animal husbandry are invaluable in a cage-free setting. Potters said the best workers will have a compassionate attitude toward the animals and be able to anticipate, and adequately respond to, any animal welfare challenges. The best workers will establish a methodical routine for daily management tasks.

The experts offered varied estimates of how many birds can be cared for by a single worker. With the right environmental conditions inside the house, Potters said one worker can handle 32,000 birds or more. Concollato said one worker can handle 40,000 birds in the layer house and as many as 120,000 birds in the pullet house. Adriatico said one worker can handle 50,000 birds in an aviary, and Salmel said one can handle more than 50,000 birds, depending on the size and the layout of the barn. Snow said it takes 1.6 people working for about eight hours a day to handle a 50,000-bird flock. After the more demanding first few weeks of laying, Frank Luttels, sales manager for Volito, said one worker can handle as many as 60,000 birds.

Gauging additional feed and water needs

Cage-free hens are more active than their caged counterparts, so increased feed and nutrition needs are an inherent part of the transition. The experts offered differing explanations of just how much more feed is needed.

Concollato, as well as Luttels and Stacklin, said cage-free birds need about 5 to 10 percent more feed. Adriatico and Potters said the need can range from 10 to 15 percent more feed. The additional feed is needed to support increased mobility as well as maintained shell quality and egg-laying performance.

To keep aggression in check and promote flock uniformity, the experts stressed providing adequate space for each bird to eat without competition and monitoring daily feed consumption. Without adequate space, only the most dominant bird will be able to feed. Potters recommended providing 4 linear inches



Cage-free farming will require more labor than a conventional operation, especially when transitioning a new flock from the pullet house to a layer house. However, the need for labor will shrink as farmers and their workers become more skilled in cage-free husbandry. *Courtesy FACCO*



Hens don't need more water in a cage-free setting than in a conventional house, but they need ample access to the resource to promote flock uniformity and reduce competition for the drinkers. *Courtesy Big Dutchman*

for chain feeding, or 2 inches of circular feeding space, per bird.

Generally, Concollato said, cage-free flocks require more crude protein, total sulfur amino acids, methionine and lysine than caged hens. For economic reasons, farmers should work to provide an adequate amount of feed for cage-free flocks rather than a more nutritionally dense ration.

Cage-free birds do not necessarily need more water than caged birds, but housing systems need to provide enough drinker space to prevent competition promote flock uniformity. Generally, one nipple drinker is needed for every 10 birds. ■

6 COMMON CAGE-FREE EGG PRODUCTION MISTAKES

Cage-free egg specialists describe the six most common mistakes they see on farms and provide tips on how to avoid them.

AUSTIN ALONZO

Despite the best education and preparation, the transition to cage-free production is a complex and challenging process, even for veteran egg farmers. Husbandry experts were asked about what errors they've seen most often in the field, and steps farmers can take to ensure they don't make the same mistakes.

1 Improper pullet rearing

The experts agreed the biggest potential pitfall is raising pullets in an environment that does not look exactly like where the hens will spend their adult lives. Potters Poultry said closely matching the two settings can lower the stress of the move and avoid delay in the onset of egg production.

Another mistake in pullet rearing can take place shortly after releasing pullets into the litter area. Dr. Anna Concollato, of FACCO's poultry science technology department, said allowing pullets to try and roost in the system by themselves, without picking them up and placing them in the system, can hamper their ability to learn how to move up into the system and roost. In the days after releasing the pullets, they must be physically placed in the system to learn how to move into it.

2 Not doing the homework

Dr. Nestor Adriatico, director of technical services for Hendrix Genetics, said some farmers are picking a breed of bird that isn't primed for success in a cage-free environment, which can lead to more mislaid eggs, aggressive behavior and higher flock mortality. He said these errors can be avoided by working with a breeding company, and possibly conducting additional research, to figure out which breed will do best in the cage-free environment.



Cage-free egg farming is difficult even for veteran farmers. Learn from others' mistakes to make the transition smoother. *Austin Alonzo*

Salmet said farmers and their staff need to remember that cage-free production requires a new mindset, and they should not expect to be able to manage a cage-free house the same way as a conventional operation. If farmers are still considering which equipment to purchase, they shouldn't pass up the chance to work with a company that offers additional management training with experience starting up cage-free operations.

3 Overpopulating the house

Bill Snow, Big Dutchman's aviary system specialist for the U.S. and Canada, said a major error is expecting to fit a similar number of birds into a cage-free house as a conventional house. Putting too many birds in a house leads to challenges for workers — like tighter aisles and tougher working conditions — and lower animal welfare as well as comparatively lower productivity. Farmers need to place fewer birds in a cage-free house, and provide more space between aisles, in order to ensure the health of their birds, retention of their employees, and the profitability of the operation.

Luttels echoed that sentiment, adding that farmers need to resist the urge to think only with their wallet when making decisions about stocking and housing.

4 Not taking time to observe the birds

Dr. Jasper Heerkens, a poultry specialist for Jansen Poultry Equipment, said it's easy for farmers to not take the time needed to observe the flock's behavior and understand what's going on inside the house when people aren't around. When starting a new flock, or starting a new breed of bird, he recommended taking a chair, putting it in the middle of the scratch area and just sitting there for a while to see how the birds behave without human stimulus. This way, farmers can find out about a variety of factors affecting the flock including bird health, bird behavior and litter quality.

5 Not using an effective vaccination program

Salmet underscored the importance of a solid vaccination program in order to control disease and the spread of pathogens inside the layer house. Disease can spread much easier in a cage-free environment, and the risk can accumulate over time.

6 Mismanagement of mislaid eggs

Another misstep is not properly managing the flock to prevent mislaid eggs. If a flock is consistently mislaying eggs throughout its life cycle, Potters said, the profitability of the operation will be significantly reduced. Regular walking of the house, removal of mislaid eggs and proper light management can avoid this problem.

Concollato added that farmers shouldn't collect mislaid and floor eggs only once a day. Instead, inspection for mislaid eggs should take place multiple times a day early in the laying cycle to establish positive behavior in the flock. ■



Although it is tempting to put as many birds as possible into a layer barn, overpopulation will cause a slew of problems leading to worse performance.

Austin Alonzo



Mislaid eggs can be avoided if the proper management tactics are used soon after moving the pullets into the layer house. If not, the problem is difficult to solve. *Austin Alonzo*

THE BIGGEST POTENTIAL PITFALL is raising pullets in an environment that does not look exactly like where the hens will spend their adult lives.

3 QUESTIONS ON THE FUTURE OF PERCHES IN CAGE-FREE HOUSING

Perches are a simple, yet integral, part of cage-free housing systems. How will they evolve to offer the most welfare and management benefits?

AUSTIN ALONZO

Perches are a necessity in cage-free housing systems, but changing them may be necessary, too. As cage-free egg farming is expanded around the world, some in the field are asking if the current round, metal tube perch design is the best for bird performance and welfare. On the welfare side, perches fulfill the hen's natural desire to perch and give less dominant birds a way to escape more aggressive ones. From a management standpoint, including perches reduces aggressive behaviors and gives the farmer more usable space inside the layer house.

At the Egg Industry Center's Egg Industry Issues Forum, the attendees asked whether the perch is as beneficial as it can be for the hen and the farmer, and discussed innovations that could improve the devices. The conference took place April 19 and 20, 2017 in Columbus, Ohio.

1 Is the metal, round perch the best design?

Dr. Lars Schrader, the leader of Germany's Institute of Animal Welfare and Animal Husbandry, shared the results of a national study comparing hens raised in enriched colony housing with those raised in aviary housing. The study was conducted in response to growing concern in Germany about keeping hens in cages. The country is banning keeping layers in cages starting in 2025.

As part of the research, Schrader explained, the team examined how the birds interacted with different types of perches — varying in shape and material — in both settings. He observed that the birds often have trouble making a clean landing moving from a higher perch to a lower one, causing them to collide with the perch or fall off of it completely. He noted as the



Austin Alonzo

perches get more use, they lose their friction and birds slip off more easily.

With this in mind, Schrader said the team designed a "soft" perch. Essentially, the soft perch is a standard metal bar wrapped with a rubber material. Once wrapped, the perch was larger and easier to grip for the hens moving downward. A video he screened at the conference showed one hen moving down onto a traditional perch then instantly struggling to keep a grip and falling off the perch. The hen moving down onto a soft perch landed easily and maintained its grip.

While the soft perch was only mentioned in passing, those in the audience were intrigued with the concept and asked more about it. Schrader said the research showed the thickest perches made for the best foot stability. Going forward, the most important thing about a "soft perch" is providing a material that is easily gripped and somewhat soft to the touch.

The design was just a prototype and, he said, is not yet in use in any commercial operations in Germany.

2 Are perches causing keel bone damage?

Schrader and others discussed whether the perch might be causing bodily harm to the hens living in a cage-free environment — specifically to the keel bone.

The keel bone is an extension of the sternum that provides an anchor for the bird's wing muscles and

provides leverage for flight. Keel integrity is increasingly seen as an indicator of animal welfare. Damaged keels are associated with increased mortality, reduced egg production and egg quality, and keel damage is likely associated with pain for the animal.

As part of his research, Schrader explained, the study examined how birds interacted with perches and where the pressure was actually located on their footpad and keel bones. The study showed that perching hens tend to rest on their keel bones more than their footpads.

In a separate presentation on her research, Dr. Maja Makagon, assistant professor of applied animal behavior at the University of California, Davis' Department of Animal Science, discussed the results of a study conducted to analyze keel bone damage in an enriched colony layer environment.

Makagon said 74 percent of the observed collisions were with perches located inside the enriched colony and 30.5 percent of those collisions occurred while birds were ascending onto the perch. The study also determined the number of collisions — rather than the number of keel bone impacts, strength of impacts, or presence of previous fractures — was most likely to negatively affect keel bone integrity.

She said the study highlights the need for additional research to understand what aspects of the perch, such as height, design and location, are associated with the risk of keel bone damage and if other variables outside the scope of the study — like the hen's breed and its housing type — play a role.

"I don't want the takeaway from this to be, 'Let's take out the perches.' Certainly not," Makagon said. "There's a lot of good things that they do, but certainly it underscores that really we need to think about how we are designing the systems."

Not everyone is convinced the perch is causing keel bone damage. In a separate presentation on bird management, Maikel Veron, vice president of North American sales for Vencomatic, argued that the science surrounding perches and keel bones is outdated and inaccurate because it doesn't study how hens really do in a commercial, cage-free setting.

He said keel bone strength can be influenced by diet, genetics and the type of housing system the hen was reared in as a pullet, among other factors.



Dr. Lars Schrader, of Germany's Federal Research Institute for Animal Health, speaks about research comparing hens living in cage-free and enriched colony cage environments as part of the Egg Industry Center's Egg Issues Forum in April in Columbus, Ohio.

Austin Alonzo

Damage can come from numerous sources aside from the perch such as collisions with other parts of the system or other birds, or poorly executed jumps moving up and down in the system. More research in a real-world environment is needed before one can say perches are causing keel bone damage.

3 Can a perch do more?

In his remarks, Veron mentioned Vencomatic's launch of a new product — called the Q-Perch — which offers what he said is a superior design as well as a novel technology to kill the poultry red mite (*Dermanyssus gallinae*).

The Q-Perch is mushroom-shaped, he said, which offers superior comfort for the birds, as well as better stability and grip. The shape also conceals two channels on the underside of the perch with an electrical current that is lethal to mites crawling up the perches and onto the birds. A Vencomatic release promoting the product said the barrier keeps the mites from eating, and therefore reproducing, which effectively controls the mite population without the use of pesticides.

The release said field tests of the concept began in 2013 and all trials demonstrated the Q-Perch's effectiveness against mites. The pests, which can be more common in cage-free than conventional layer housing, carry diseases and sap productivity from a flock. ■

TOP CAGE-FREE LAYER HEN MANAGEMENT TIPS

Five egg industry professionals offer insights on managing pullets, layers and their surroundings for maximum productivity.

AUSTIN ALONZO

Cage-free egg farming will challenge the skills of farmers for years to come, as the rapidly emerging housing style demands far different management practices.

At the Egg Industry Center's Egg Industry Issues Forum, a panel of equipment manufacturer professionals with expertise on cage-free housing and management offered quick tips on managing a cage-free house. The panel, part of the April 19 and 20, 2017 event held in Columbus, Ohio, featured Dr. Anna Concollato of FACCO's Poultry Science and Technology Department; Bill Snow, aviary systems specialist for USA and Canada at Big Dutchman; Maikel Veron, vice president of North American sales for Vencomatic; Derrick Ament, regional sales manager for Val-Co; and William Huelsewiesche, director of operations for Farmer Automatic of America.

Feeding and watering

Moving to cage-free from conventional egg farming requires a total change in mindset, Huelsewiesche said, and forces the farmer to pay more attention to every single detail in the process. One of the largest changes comes in access to feed and water.

Cage-free hens must have access to feed and water and be trained to find and use the feeder and the drinker. Huelsewiesche said the freedom of movement creates new challenges for the farmer. Feed chains must be run in order to attract the bird to the trough, and the level of feed in the device must be high enough that the chain is not exposed. Low feed levels can cause mechanical problems and hens can also latch on and ride the chains, causing obstructions.

Water is an essential tool for training the birds to find feed and perform other key behaviors in the layer barn. From the earliest age, Huelsewiesche said, water



Cage-free husbandry is challenging even for egg industry veterans. *Austin Alonzo*

should be raised as high as possible so pullets can be accustomed to climbing up into the system. Farmers need to monitor the level of water pressure in their water lines because excessive pressure can make it difficult for pullets with freshly trimmed beaks to break the seal of a drinker. Once the seal is broken, too much water will come out and create a cleanliness issue.

Avoiding problems with hen crowding and migration

In a cage-free system, birds have the freedom to go wherever they want but, Snow explained, diligent management is required to make sure they are moving enough to promote a productive environment. When the birds aren't moving enough, meaning they are crowding into some areas and abandoning others, it can lead to problems like increased competition for food, water, nesting and roosting; increased stress and aggression; and lower litter quality.

Proper lighting

Lighting plays a major role in flock behavior. If lighting is too intense, it can lead to aggression and stress in the house. Generally, lighting levels should be uniform

throughout the house, and the system should be dimmable so it can be adjusted if the lighting level is contributing to aggression.

In the morning, rather than gradually brightening, Snow recommended quickly switching on the lights. This will get the birds out of the tiers and into nest boxes more quickly.

Feeding schedules

The first feeding of the day should happen right as the lights turn on in the morning, and the second feeding should come an hour after the first — in the pullet and layer facilities. Snow said this schedule keeps the birds from being drawn out of the nest to feed. When the birds know a second opportunity to eat is coming, they will be more likely to use the nest and lay the egg. Conversely, birds will eat first thing in the morning because they know a nest spot will open up in a short time.

Stacking feeding, rather than waiting four or five hours in between feedings, helps to avoid mislaid eggs, promote bird movement and reduce crowding.

Walk the flock

The most important method for promoting movement is simply walking around in the cage-free house in order to stimulate the birds to move. Snow said this is easier said than done because of the growing size of barns and flocks, but is essential for promoting movement and familiarizing the birds with the workers. In the rearing and layer houses, walks should be performed multiple times a day at random intervals, starting when the lights switch on in the morning.

Formulating a cage-free ventilation strategy

One thing farmers may overlook when designing a cage-free house, Ament said, is ventilation and heat distribution. In a caged system, heat generated by the birds stays in fixed areas, making for easier temperature control. Now, the birds are free to move around and the centers of heat generation fluctuate constantly.

For that reason, farmers need to consider how their house design — including the use of catwalks,



Bill Snow, center, speaks about the importance of flock movement as William Huelsewiesche (from left), Dr. Anna Concollato, Maikel Veron and Derrick Ament listen during a management panel at the Egg Industry Center's Egg Industry Issues Forum. *Austin Alonzo*

manure belts and other solid obstructions — will influence the air flow and ventilation of a cage-free house. When ventilation — especially in the lower levels of the house — is not sufficient, it can lead to the creation of hot and cold areas that can affect the bird distribution inside the house and contribute to piling. Additionally, farmers need to consider if the strength of the air flow, or the temperature, is negatively affecting how the birds use the nest boxes and contributing to mislaid eggs.

Ament said ventilation is one of the things farmers are likely to skimp on in order to cut back costs, but it must be considered as an integral part of a successful cage-free house. Ventilation should be carefully designed to react to changing conditions in order to create the proper environment for optimal egg production.

Training pullets how to move around the house

Good pullet rearing is a key part of a successful cage-free flock. Along with being raised in rearing barns that closely match their surroundings in the layer barn, Concollato said farmers need to take extra steps to train the birds how to properly interact with the system, move vertically through it and move around the rest of the house.

Open the system in steps

When farmers raising pullets in a multi-tiered, aviary-style system in the rearing barn are ready to open up the doors and allow the pullets to leave the system and

start interacting with the environment, Concollato recommended using a phased approach. The first tier should be opened on both sides; three days later, the second tier should be opened; three days after that, the final tier should be opened.

In this period, the pullets will need to be physically lifted and placed into the system at night to teach them where they should be spending the night. Some farmers prefer to open all of the tiers at once, but this is not the best approach.

Use ramps

Ramps are important in the pullet house because they can speed up and ease movement through the tiers, especially when the birds are too small or too weak to move vertically. However, Concollato said once the birds have learned how to use the ramps, have the size and strength to ascend the tiers, and have the training to spend the night in the system, the ramps should be removed.

Avoid corners

Piling, an unpredictable phenomenon in the layer house, can be an issue in the pullet house as well. For this reason, Concollato said farm-



Regular walking of the flock stimulates movement, which avoids crowding of certain areas and the problems associated with it like piling and aggressive behavior. *Austin Alonzo*

ers should avoid corners particularly close to the gates where workers enter and exit the house. Birds like to pile up in these spots because they are attracted by the lights coming from the service areas — which are typically always on for workers' convenience — and the noise made by workers. She recommended using lights in the service areas only when necessary. ■

HOW TO **MITIGATE DUST AND AMMONIA** IN CAGE-FREE HOUSES

A slew of novel technologies aiming to control dust and ammonia levels inside cage-free houses are arriving to the market, but are they effective?

AUSTIN ALONZO

Cage-free farming brings inherent air quality challenges, so farmers need to adapt in order to protect the health of their flock and their workers.

On April 20, Dr. Hongwei Xin, director of the Egg Industry Center, spoke about the results of research surrounding devices and methods designed to mitigate airborne pollution inside cage-free layer houses and emissions coming from them. Xin, a distinguished professor at Iowa State University's College of Agriculture and Life Sciences, spoke as part of the Egg Industry Center Issues Forum in Columbus, Ohio.

Roots of the issue

As the U.S. egg industry rapidly shifts from conventional cages and enriched cages to cage-free operations, more bird activity inside the house is leading to increased airborne pollutants like dust and ammonia. Simply, Xin said, birds are moving around in litter areas — scratching, foraging and dustbathing — as well as flapping around the house stirring up dust. The hen's freedom to move, and evacuate waste, wherever she pleases is another challenge. This means the manure belts in houses are no longer as effective as they once were in collecting and drying waste to simplify disposal and reduce ammonia emissions.

That raises the question of how farmers can mitigate dust and ammonia levels that can harm the workers and the birds. The issue, he said, should be examined in the sense of indoor air quality — which affects hens and farm workers, and emissions from the house — which can raise issues with pollution and its impact on the environment and local ecosystems.



The free movement of hens in a cage-free system creates dustier conditions and air quality issues inside the barn. *Austin Alonzo*

Reducing ammonia through feeding and management

Xin said changing what the bird eats can affect the amount of ammonia present in the house. He covered the results of studies showing the efficacy of the following methods:

- Reducing dietary protein: By reducing dietary proteins by about one percent and maintaining nutritional balance in the feed, farmers can reduce ammonia emissions by about 10 percent. Dietary fibers reduce the pH value of manure, meaning less ammonia is mobilized from the manure.
- Adding dietary fibers: Adding fiber, like wheat middling and soy hull, can reduce emissions from layer manure between 40 and 45 percent.
- Adding supplements: DDGS, or distiller's dried grains with solubles, and EcoCal, a proprietary feed additive designed to control ammonia emissions, can work as well. A study with a 10 percent DDGS feed mixture dropped ammonia emissions by 14 percent and a 7 percent EcoCal mixture reduced ammonia by 39 percent.

Beyond feeding, drying manure on the belts is important to reduce the level of ammonia in the air. This can be done with air circulating over the belts, but that comes at the cost of about \$120 per day for a 200,000-bird layer barn. He said using the exhaust air to dry manure may be a cheaper way to provide the needed airflow.

Along with manure, litter moisture must be kept in check as well to keep ammonia levels down. This is a potential double-edged sword, however, because drier litter creates more dust. Nevertheless, Xin said wet litter gives off ammonia and cakes, creating numerous health issues for the birds. Ideally, the litter moisture content should be below 20 or 30 percent to keep ammonia levels in check. A scraper can be used to keep litter from getting too deep — and becoming an invitation for floor eggs. Consistent airflow in the house is essential to keeping litter dry, too.

Devices for controlling dust and ammonia

Xin profiled a number of devices and methods to mitigate dust and ammonia. The techniques and technologies come with varying cost and effectiveness. Some are not economically viable for egg farming. For indoor air pollution mitigation, fixed electrolyzed water spray is the most effective on a cost basis, reducing dust levels by 50 percent for the cost of 10 cents per bird per year. For exhaust pollution mitigation, an electrostatic precipitator is the cheapest option.

Indoor pollutant mitigation

- Sprays: Several sprays are on the market that use a similar strategy of spraying a liquid, either a water or oil, directly onto the litter in order to reduce dust levels. The major drawback to all sprayer systems, Xin said, is the limitation of how much area a sprayer can cover and the fact that more moisture leads to wet litter, which can lead to health problems with the birds. Liquids can have modified pH levels to modify their effectiveness in controlling ammonia — because pH plays a role in converting ammonium to ammonia — and a low pH liquid can be corrosive to layer equipment. Neutralized electrolyzed water, to control ammonia emission, combined with a litter additive, to control moisture, may be the best spray-



Dr. Hongwei Xin speaks at the opening of the 2017 Egg Industry Center Issues Forum in Columbus, Ohio.

Austin Alonzo

ing strategy for controlling dust and ammonia.

- Electrostatic options: Two types of electrostatic devices — like an electrostatic air ionizer, electrostatic space charge system and electrostatic precipitator, work by attracting dust particles to the surface of the devices either to control indoor air quality or emissions. Xin recommended using these devices inside the house in order to reduce emissions and improve the air quality for the birds and the workers. The devices can reduce exhaust from cage-free houses by between 45 and 50 percent.
- Dry filters: Dry air filters, like the kind found in a household HVAC system, can be effective in filtering the air inside a house as air is pumped through the filter. Studies show a dust reduction ability of about 40 percent.

Exhaust pollutant mitigation

- Bio-Curtain: Xin explained a Bio-Curtain is a sort of canvas cover placed over the exhaust fan used by some hog and broiler farmers to control emissions. The curtain catches the dust and other emissions and can be used with an electrostatic system. It's a relatively low-cost option that can reduce dust emissions by about 40 percent and ammonia by about 10 percent.
- Vegetative buffer: Planting trees, shrubs and bushes around a layer house is a popular strategy in the Midwest and Southeast, Xin said, for controlling dust and ammonia emissions from layer houses.

Vegetation can help with both problems, but not the smell. However, the “out of sight, out of mind” principle seems to work for vegetation and chicken house odors. The cost of installing vegetation is low as well.

- Wet scrubbers: The most sophisticated, and likely expensive option, is using one- or three-stage wet scrubbers to clean exhaust before it is expelled from the chicken house. A single-stage scrubber — where air is forced through a solution to clean it — can reduce

dust emissions by about 40 percent and ammonia by about 80 percent. A three-stage scrubber, with separate phases to take out the dust, the ammonia and the odor, can reduce dust emissions by more than 70 percent and ammonia by 95 percent, but it is far more expensive than a single-stage scrubber. Both options, Xin said, are prohibitively expensive without some kind of subsidy to offset the cost of the technology and its operation. ■

REDUCING AGGRESSION AND FLOOR EGGS IN CAGE-FREE FLOCKS

Cage-free egg farming experts suggest ways to avoid negative behaviors that reduce bird health and productivity.

AUSTIN ALONZO

Arguably the most difficult aspect of the transition to cage-free farming is the re-introduction of the dynamics of hen socialization and behavior to egg farming. Farmers now need to understand it and manage it in order to consistently achieve the healthiest and most productive flocks.

Keeping birds in cages limited activity and allowed the establishment of a social hierarchy inside the cage. Now, birds are free to interact with a larger group and are exposed to a wider range of conditions, which can cause antisocial behavior and lead to lower productivity. Bird experts say the transition requires farmers to spend more time observing the flock's behavior, understand what conditions are causing negative behaviors, and make the necessary adjustments to the environment.

Roots of negative behaviors

Egg farmers are faced with three key behavior challenges: hens laying eggs outside of the nest, hens piling in one area or smothering one another, and generally aggressive behavior.

The experts said the root causes for these issues come from the chicken's nature. Bill Snow, Big Dutchman's aviary system specialist for the U.S. and Canada, said hens — prey animals in their natural habitat — are social animals that are also aggressive by nature, meaning they are flighty and likely to group together for defense and predisposed to exhibit aggressive, destructive behavior toward each other.

Dr. Nestor Adriatico, director of technical services for Hendrix Genetics, said environmental stresses inside the house can contribute to negative behavior too. Poor lighting, ventilation, beak trimming, litter



Perching allows less dominant birds to escape more aggressive ones, creates more usable space inside of the layer house, and helps alleviate possible piling.

Courtesy Big Dutchman

quality, or feeding and drinking conditions, as well as the presence of disease and parasites can also stimulate negative behaviors.

These negative behaviors often don't manifest, or can't be observed and understood, when walking the house during routine management. Farmers need to sit and watch for a few minutes to see how the birds behave and interact on their own. That way, farmers can better understand the specific challenges, what in the environment may be causing them, and how they can change the conditions to control them.

Taking steps to control aggression

Aggressive behavior, like cannibalism and vent pecking, will always be present in hens, but farmers can change the environment to contain it.

Snow said taking steps to avoid aggression is the most important thing cage-free farmers can do to foster a healthy, productive flock. However, almost everything in the house can trigger aggressive behavior. He listed stress, lack of space, litter quality, lighting, temperature, flock migration, lack of proper

feed ingredients or feed amount, lack of movement, or poor management.

Proper lighting is important because excessive brightness can stimulate aggression. When aggressive behavior is present, Dr. Anna Concollato, of FACCO's poultry science technology department, and Adriatico said lighting intensity should be reduced. Red lights can help with aggression, too.

Birds also need room to express their natural behaviors and space to escape aggressors. Snow said hens are calmer when there is more empty space to move around. Potters Poultry said birds behave best when they have plenty of room to dustbathe and express natural behaviors. The experts agreed perches are necessary to add usable space inside the house and give less dominant birds an escape route from aggressors.

Regular walking of the house, generally recommended in cage-free farming, can help with aggression as well as other issues. Potter said regular trips down the aisles and more time spent with the flock by farm workers will reduce flightiness and the birds' stress level when humans are present in the barn.

Feed and water access and aggression

Diet plays a role in aggression. Concollato said the level of energy, protein, amino acids, calcium and salt in the feed ration must be in balance. She said low salt and calcium levels in the feed generate cravings that result in more pecking behavior. When adding sodium, Adriatico said, farmers should shoot for about 0.5 to 1 kilogram of salt per 1,000 liters of water. He recommended administering extra vitamins, minerals and amino acids through the water supply.

Enough feed and water should be supplied to limit competition that can stimulate aggression. Along with promoting uniformity and avoiding dehydration, feed and water plans need to be designed to minimize aggression.

Concollato said the feeding program can be modified to limit the number of feedings on the top tier of the system. Birds should be motivated to move down to lower tiers to feed, instead of crowding the top tiers. Frank Luttels, sales manager for Volito, said farmers can use a device that shakes roughly milled grain



Allowing birds enough space to express natural behaviors and peacefully coexist is essential to avoiding aggression. *Courtesy Salmat*



Providing enough feeder and waterer space reduces competition, and potentially aggressive behavior, between hens. *Austin Alonzo*

onto the floor periodically. By dispersing some feed onto the ground, hens are stimulated to scratch around and forage rather than peck.

Using diversions to control aggression

Aggression can also be addressed through diversions, or simple devices that attract the hens and give them something to peck at. Diversions can be simple, like hay bales left in the aisles and scratch areas, or more complex, like compact discs hung on string inside the house. The idea is to give the birds something to do besides peck at each other.

The experts said hay bales can be used as diversions. They can add additional fiber to the hens' diet, but they require an additional expense and bring possible biosecurity risks into the barn. Luttels and Snow said a hard cement block can be used to give the birds something to peck at and to blunt their beaks. Luttels said this is a popular option in Europe, where beak trimming limitations are rising.

A possibly cheaper option is to look around the farm and find something that may work as a diversion. Concollato said improvised devices include string hung from the system, plastic bottles and other objects left in the house simply to entertain the birds. Potters recommended using a five-gallon bottle with black dots drawn onto it to attract the birds' attention.

Potters said not to use diversions that hang from something, as they can excite and scatter birds, leading to injuries and piling. Suspended discs can create good interest, but light reflected around the barn can excite birds and cause some birds to be pecked due to reflected light showing up on them.

Methods to avoid floor eggs

To avoid floor eggs, farmers need to start early. When pullets are maturing and coming into lay, steps must be taken to train the birds to consistently use the nest boxes to lay eggs. Conditions inside the nest must be attractive, and conditions outside must be made unattractive or inhospitable for egg laying. Breeders are working on improving a hen's nesting ability, but for now birds want to lay where they feel comfortable, and sometimes that's in the litter or in the system.

THE FLOCK WILL NEED until it is 30 to 32 weeks old to settle into its laying habits.

When the lay begins, farmers need to search diligently for floor eggs and mislaid eggs and collect them as soon as possible. Birds want to lay in clutches, meaning one mislaid egg is an invitation to more. When birds are laying, they should not be disturbed. Neither feeding nor flock inspections should take place at this time. Concollato said litter should be



Farmers must set up the proper conditions to encourage hens to use their nests rather than laying eggs on the floor. *Austin Alonzo*

kept shallow enough — or no deeper than 2 inches — that hens won't want to lay in it. Dark corners and areas should be limited, or blocked off, to avoid becoming nesting areas. When allowed, farmers should consider using electrified wires or other pen dividers to keep the aisles separated and prevent birds from laying under the system.

Nests must be attractive to the hens and easily accessible. Adriatico said ramps should be used when possible. Feeders and drinkers should not be a physical barrier between the bird and the nest. When birds are laying, farmers should observe and find out where mislaid eggs are collecting. Those areas should then be denied, using an electrical device or a physical barrier made of plastic or wire.

Potters said the feeders should be run first thing in the morning and then not again until later in the morning. After the first feeding, the hens experience a four-hour peak laying period. When birds are first coming into lay, minimal disruption during this period is needed to establish nesting habits and avoid the tendency to lay floor and system eggs. Too much feeding during this time can draw birds away from the nest and lead to more mislaid eggs.

At dusk, birds should be encouraged to climb up into the tier and roost overnight. This can be achieved by using a phased lights-out program where lights under the system turn off first and lights on the progressively higher tiers turn off afterward. If necessary, birds should be physically moved off the floor and onto the higher tiers.

As the flock ages, Potter said, regular walking of the house and removal of floor eggs will keep mislaid eggs limited. Persistence is necessary because the flock will need until it is 30 to 32 weeks old to settle into its laying habits.

Controlling space and climate to avoid smothering

Piling, also called stacking or smothering, is when a mass of hens crowds into a single area due to fear, excitement or a common need to evade danger. While it's a routine phenomenon and the potential reasons are legion, it's unpredictable with potentially serious repercussions for animal welfare and overall productivity.

Concollato said the motivations for piling include an area being too hot or too cold, too bright from sunlight entering the house, or birds being too panicked from farm workers entering the house. Adriatico said birds may also pile because they feel curious and attracted to something new in their environment. Sleeping behavior, he said, may also spur piling as birds will crowd together to keep warm during the night, maintain a social link or form a common protection against a perceived danger. Concollato said when piling is observed, farmers need to document where it happens, figure out the reason behind it, and take steps to solve that specific problem.

Adriatico said several methods help avoid the issue:


- Corners in the house should be limited or blocked. Wire mesh-covered triangles or electric devices can be used to keep birds out of these areas.
- Light distribution should be as even as possible, and light must not leak in from outside.
- Construction partitions should be built with wire



Piling is an unpredictable phenomenon caused by fear, excitement or a common need to evade a perceived danger. Documenting occurrences and addressing specific causes for piling can help avoid the problem in the future. *Austin Alonzo*

mesh to prevent suffocation if a bird is trapped against a partition. Electric fencing can be used to discourage collection around partitions.

- Music can be played in the house to keep the birds from being too excited by unfamiliar noises.
- Birds should be fed one hour before the lights go off to assure they are spread evenly about the house near dark.
- Enough perch space should be provided for the birds.
- Ventilation should be kept consistent to create a uniform airflow and temperature and avoid drafty areas. ■



Stay up to date on all the latest news and insights
featuring cage-free eggs on
WATTAgNet.com and **WATT Poultry Update eNews**.

Watch for future WATT Global Media Focus Series releases
highlighting other critical poultry industry topics coming soon!

Did you like this report?
Please let us know what other topics you would like
to see offered in future reports here:
www.surveygizmo.com/s3/3377460/
Focus-Series-Customer-Satisfaction



401 East State Street, 3rd floor
Rockford, Illinois 61104 USA
Tel: +1.815.966.5400
www.WATTAgNet.com
