



Viva!

LAYING HENS: THE INSIDE STORY

A Viva! report by
Juliet Gellatley, BSc Zoology,
Founder & Director, Viva!

Viva! is a reg charity 1037486

LAYING HENS: THE INSIDE STORY

LAYING HENS: THE INSIDE STORY

A Viva! report by Juliet Gellatley, BSc Zoology, Founder & Director, Viva!

Written by Juliet Gellatley, with additions by Claire Palmer, Viva!

juliet@viva.org.uk

www.facebook.com/juliet.gellatley

Copyright: Viva! 2017

Viva!

8 York Court

Wilder Street

Bristol

BS2 8QH

0117 944 1000

www.viva.org.uk

Viva! is a reg charity 1037486

ISBN 978-0-9571874-7-4



Viva!

CONTENTS

EXECUTIVE SUMMARY	4	FREE RANGE EGG FARMS	31	QUALITY ASSURANCE SCHEMES:	
		A life inside	31	WHAT THEY REALLY MEAN	51
INTRODUCTION	6	'Happy Egg' farms	32	RSPCA Assured	51
The Chicken (<i>Gallus gallus</i>		CASE STUDY: FREE		British Lion Quality Mark	51
domesticus)	7	RANGE FARMS	33	Soil Association	51
Chickens behaving naturally	7	'HAPPY EGG' FARM			
Housing On Modern-Day Farms	10	A. 2010 investigation		THE GLOBAL EGG INDUSTRY	52
Battery (or conventional) cage	10	(Strathruddie Farm and		Retailers	53
Enriched cage	11	Bishophill Farm)	33	Cage Egg Company Suppliers	53
Percheries/barn	12	ROWBOTTOM FARM	34	Noble Foods	54
Free range farms	12			Stonegate	54
Organic	12	ORGANIC	35	Supermarket Policies	54
		Antibiotics and vaccination	35	Ingredients	55
FROM BIRTH TO DEATH IN		Impacts on welfare	36	Vegan Lines	55
JUST A YEAR AND A HALF	13			Egg replacer	55
Chick Production	13	CASE STUDY:		Vegan egg replacers chart	56
Baby chicks	13	ORGANIC FARMS	37		
Male chicks	13	MAC'S FARM	37	EGGS AND YOUR HEALTH	57
Viva! Investigates UK Hatcheries	14	LAWN FARM	37	Heart health	57
Beak trimming	15	FAIRBURN EGGS	38	Diabetes	57
Transport: hatchery to				Food poisoning and	
growing site	17	DEATH, INJURY AND DISEASE	39	contaminants	58
Pullet growing site	18	Calcium deficiency and		Cancer	60
		skeletal fractures	39	Hard-boiled facts	60
WHEN LIFE DOESN'T MEAN		Red mites (<i>Dermanyssus</i>			
LIFE: INSIDE THE SHEDS	19	gallinae)	41	SANCTUARY STORIES	61
Cage Life	19	Lighting	41	The Farm Animal Sanctuary,	
Restricted space	21	Breeding lines (parent birds)	41	Worcestershire	61
Effects of increased		Breeding layer hens	42	Brook Farm Sanctuary,	
productive lifespan	22			Northants	62
Flooring	22	CATCHING AND		The Retreat, Kent	62
Dustbathing	22	DEPOPULATION	43		
Perching	23			CONCLUSION	63
Egg laying and nest box	23	TRANSPORT	45		
Injurious Feather Pecking,		SLAUGHTER	46	REFERENCES	64
Scratching and Cannibalism	24	Shackling and Electrical			
Stereotypic and Abnormal		Stunning	46		
Behaviour	24	Stunning: the water bath	47		
		Controlled Atmospheric			
CASE STUDY: ENRICHED		Systems (Gassing)	48		
CAGE FARMS	25	Halal (Islamic) and Kosher			
RIDGEWAY FOODS	25	(Jewish) Slaughter of Birds	49		
K FRESH	27	UK Legislation and Position	49		
BIRD BROS	29	Pre-stunning	49		
		Closed-Circuit Television (CCTV)	50		
		Position of UK Government			
		and meat suppliers	50		

EXECUTIVE SUMMARY

The vast majority of today's chickens inhabit a shadowy archipelago of enormous warehouses and slaughterhouses surrounded by fences and sealed off from the public. The most engineered animal in history is also the world's most commonly abused.

In the egg industry, hens are assaulted from their first day of life until they are killed. These sensitive, social animals face serious welfare problems on modern-day intensive farms – including maternal separation, the acute and chronic pain arising from beak trimming, the inability to locate resources essential for well-being, a barren environment causing frustration and boredom, feather pecking, cannibalism, foot lesions, and bone fractures (Janczak and Riber, 2015). All this is followed by a brutal and violent death at the slaughterhouse.

Egg consumers have been duped by the farming industry into believing that life for laying hens has improved since the banning of the conventional 'battery' cage across Europe in 2012. Since that time, enriched (or 'colony') cage egg production has increased.

Over the course of a year (between 2015 and 2016), Viva! has carried out a series of undercover investigations inside enriched cage, free-range and organic farms to reveal the reality of life for laying hens in Britain.

Each visit by Viva! investigators at enriched cage units (which supply millions of eggs to consumers each week) has revealed gross conditions and similar welfare problems to those widely acknowledged to be present on battery cage units still in use around the world. The farms visited by Viva! were, at the time, accredited with the British Lion codes of practice (K Fresh website, 2016; Stonegate website, 2016; Bird Bros website, 2016) which should mean they are subjected to regular and independent auditing by personnel qualified to inspect the farms (British Lion Quality website, 2016).

Two of the enriched cage farms visited by Viva! were owned by the companies Bird Bros and K Fresh. Both of which have produced promotional videos featuring misleading statements on the hens in their 'care', and the 'benefits' of cages (K Fresh, 2010; Merial Animal Health website, 2012). Hens in these videos are fully-feathered and appear healthy. A far cry from the sick, featherless birds documented by Viva! at the same farms during this

investigation. The third enriched cage farm visited by Viva! was a Stonegate (now Ridgeway Foods) unit. Stonegate is the second largest egg packer in Britain – supplying millions of eggs each week to consumers.

Footage and stills from the farms visited by Viva! reveal hens with extensive feather loss, the dead lying amongst live birds, evidence of beak mutilation, birds crammed into cages with no privacy or means of escape, air thick with dust, wire cage floors covered in faeces, sick and dying birds, and meagre 'enrichment' that is clearly making little, if any, improvement to the incarcerated hens' lives.

Viva! also obtained footage from a rearing unit where young hens (pullets) were housed in small barren cages. The birds were so small their feet dropped through the wire floors.

The free-range units visited by Viva! in 2015 and 2016 included one of the top two egg producers in Britain – Noble Foods. Investigators visited 'Happy Egg' farms, and revealed birds to be locked inside dark, stinking, filthy sheds. The sheds are similar to those used to house hens laying 'barn' eggs. The hens, whilst uncaged on the free-range farms, had comparable feather loss to birds on enriched cage units. Investigators also documented hens who were extremely sick, and dead birds littering the floors. It was unclear during the investigation whether hens on these farms are able to go outside during the day, though studies show that many of the hens living on free-range farms never go outside because of high stocking densities, competition for access from other birds, and completely inadequate conditions (e.g. Hegelund *et al.*, 2005; Hegelund *et al.*, 2006). Hens can be fiercely territorial and will guard the exit holes (Derbyshire, 2013).

Even on the organic farms visited by Viva! in 2016, investigators revealed conditions that were far from ideal.

Egg consumers are duped by misleading labelling and packaging by the farming industry into believing that hens on free-range and enriched cage farms live a decent life, yet each undercover investigation reveals hens living in the same dismal, hellish environment.

Hens are the only major group of farmed animal in

Britain to remain in cages for all of their 'productive' lives. Unable to escape the close proximity of other hens or fulfil natural behaviours, life in enriched cages, is one consisting of boredom, desperation, frustration and inevitable suffering. Confined in a cruel, intensive production system with no means of escape, the hen is

treated like a mere commodity by the egg industry. This, alongside the fact that around 40 million 'reject' day-old male baby chicks are killed each year in British hatcheries means that eating eggs, from whichever farming system they originated, contributes to unavoidable suffering and death on a massive scale.



INTRODUCTION

More than 20 billion chickens live on the planet at any given moment. That is around three for every human (Lawler, 2015). Add up the world’s cats, dogs, pigs and cows and there will be still more chickens.

The UK laying flock in 2015 was estimated to be at 36 million (Egg Info website, 2016), and around 945 million broiler chickens are killed each year in this country (DEFRA 2016).

Egg consumption in Britain has been steadily growing over several years and, in 2015 alone, according to egg industry data, around 10.02 billion eggs were produced in the UK (Egg Info website, 2016). It has been reported that there has been a high growth rate in egg purchasing by younger people since 2008 (Clarke, 2015).

Department of Environment, Food and Rural Affairs (DEFRA) states that the UK imported 166 million dozen eggs from the EU, and 1 million dozen from the rest of the world (DEFRA, 2016). Imports have been steadily increasing and exports decreasing (DEFRA, 2016a).

Around 12.2 billion eggs were eaten by consumers in Britain during 2015, which equates to 33 million eggs per day (Egg Info website, 2016).

Fifty one per cent of eggs laid in the UK in 2015 were from hens incarcerated in cages, 47 per cent from so-called ‘free-range’ birds (including an estimated two per cent organic), and two per cent from ‘barn’ living birds (Egg Info website, 2016; DEFRA, 2016a). Free-range egg production regained a little more of the market share it had previously lost to enriched cage production.

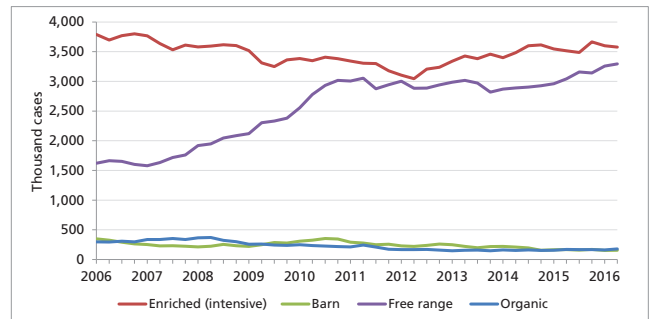


Fig. 1: UK egg throughput by production method (DEFRA, 2016a)

Baby chicks will stay close to the mother hen for warmth and protection



THE CHICKEN (GALLUS GALLUS DOMESTICUS)

The chicken (*Gallus gallus domesticus*) is a domesticated fowl or, more specifically, a subspecies of the red junglefowl of the Indian subcontinent. This bird can live for five to 10 years. Females over a year old are referred to as hens, and younger females as pullets. In the egg industry, a pullet becomes a hen when she begins to lay eggs at just 16 to 20 weeks of age.

Chickens are naturally gregarious, social birds who, in the wild, live together as a flock in long-term, semi-stable groups of four to 13 individuals of varying ages, with a distinct hierarchy or 'pecking order'. This 'pecking order' leads to dominant individuals having priority over food access and nesting locations, and they enforce their leadership by administering a sharp peck of the beak to underlings (Smith and Zielinski, 2014). Removing hens or roosters from a flock causes a disruption to the social order until a new 'pecking order' is established. For example, adding hens, especially younger birds, to an existing flock can lead to fighting and injury.

CHICKENS BEHAVING NATURALLY

Chickens naturally have a communal approach to the incubation of eggs and the raising of young.

They are wide-ranging animals, active from dawn to dusk – spending much of their day foraging for insects and even larger animals such as lizards, small snakes and young mice. Chickens also enjoy scratching the ground looking for seeds.

They frequently utilise tree cover and vegetation for safety from predators, and have evolved several complicated strategies for dealing with threats, and for sending warnings to others in the flock.

Social behaviour in hens includes pecking, threatening, chasing, kicking, fighting, avoiding, crouching and



vocalising. In the wild, hens of different ages live in small groups, forming a cohesive community. In the spring, at the onset of the breeding season, the stronger cockerels maintain a territory with three to five hens. Meanwhile, young cockerels live isolated in twos and threes. The social structure of a flock depends on the physiological and psychological state of each member. It is also influenced by the appearance of the individual, for example whether the animal is ill, injured, moulting or brooding. A stable rank order is formed within a small group of chickens on the basis of personal affiliations, threat and avoidance behaviour, and factors such as age, colour, sex and the size of the comb (Keppler *et al.*, 1997). Social interactions can be friendly, for example a cockerel calling his hens to a food source, or they can be agonistic, for example one hen chasing another hen away from a limited food source. When it is possible, chickens will seek shelter for protection from predators and other aggressive chickens.

Whilst chickens are not capable of long distance flight, lighter individuals are capable of flying for short distances over fences or into trees to roost. They also may occasionally fly to explore their surroundings, and fly if a danger is perceived.

When a cockerel finds food, he calls hens to eat by clucking in a high pitch and manipulates the food with

LAYING HENS: THE INSIDE STORY

his beak. Mother hens also have been observed calling their chicks. Perhaps unremarkably, empathy – in other words the ability to be affected by, and share, the emotional state of another – traditionally thought of as a human-only trait, is now revealed to be expressed by hens. Researchers have studied the behavioural and physiological changes in mother hens when their chicks are exposed to an aversive stimulus, and concluded that the mothers possess at least one of the essential underpinning attributes of empathy (Edgar *et al.*, 2011).

There is also increasing evidence that hens can be deceptive and cunning, possessing communication skills on a par with those of some primates. Christine Nicol, Professor of Animal Welfare at Bristol University, recently reviewed 20 years of research on chicken intelligence and now challenges the convenient ignorance that pervades society about these animals (Nicol, 2015).

Regular new insights into the chicken mind reveal complex cognitive abilities (eg Smith and Zielinski, 2014). Hens have been demonstrated to use sophisticated signals to convey their intentions and, when making decisions, they take into account prior experience and knowledge surrounding situations. In other words, chickens think before they act – a trait more typically associated with large-brained mammals than with birds. They can solve complex problems and can empathise with individuals in danger. It is thought that these traits, or in other words cognitive prowess, originate from the red junglefowl (Smith and Zielinski, 2014) – a bird who developed advanced mental capacities as a result of the need for strategies to deal with the pressure of competition in a 'pecking order', as well as threats from predators such as foxes and raptors.

Perhaps unfortunately for them, the behavioural traits observed in wild chickens continue to be very much present in hens farmed for their eggs or body parts, and this is demonstrated in the lucky few who are rescued by people from farms.

The overwhelming majority of chickens today housed indoors for egg production currently spend almost their entire lives in vast, industrial factory

farm sheds. Here, almost every natural behaviour is denied. Squashed into wire mesh cages, allowing only 750cm² of space per hen, frustrates motivations and the lack of space means a 'pecking order' is replaced by injurious feather pecking (IFP). This behaviour, with its roots in thwarted instincts, can lead to cannibalism and even death. Cannibalism is common in farmed animal husbandry systems, as they are impoverished environments with a lack of opportunities.

Juliet Gellatley, founder and director of Viva! visited an enriched cage farm in October 2015:

"When I entered the Bird Bros farm, I followed the necessary biosecurity precautions – putting on plastic hand and feet protectors. Stepping into the huge warehouse of despair where the birds were caged, the noise struck me. At first from whirring machinery, which made it difficult to hear, but soon after, the heart rending sound of the birds.

Walking down the first aisle, past row upon row of identical metal cages, I didn't stop to look inside, but I noticed very quickly the bars caked in faeces, the flapping bright orange plastic sheets that the industry calls "nest boxes", and flashes of skin, feathers and legs. I wanted to stop, but knew we had to find a good spot for filming. It wasn't until



Juliet Gellatley of Viva! visits an enriched farm to report on conditions for hens living there © Viva!



The term 'battery cage' arises from the arrangement of rows and columns of identical cages connected together, sharing common divider walls, as in the cells of a battery. Battery cages house the vast majority of the world's laying hens but are now banned in the UK (SOURCE: Compassion Over Killing website, 2016)

after, once we had walked down several aisles and started filming, that I was able to properly see inside the cages. There, I saw birds huddled together on 'perches' and walking across gridded metal floors. Some were lying hunched in corners, their lack of feathers exposing the red raw skin underneath. One had lost every feather on her pathetic, fragile body. Many had disfigured beaks and pale combs drooping over their faces. The pain and misery felt by these individuals was, to me, as clear as day, and I wondered how nobody else at Bird Bros could see it. Or, if they did, how could they live with themselves.

As we continued filming throughout the farm, stopping often to get a close-up of the cages, we saw live birds walking over dead, birds who were so sick that they had literally given up on life, and individuals who really, really needed help. One poor hen was unable to stand, and so she just lay there, waiting for the end. It was clear that nobody had come to the aid of those in desperate need, and nobody was going to come for her. What a terribly sad state of affairs – a lifetime of misery all so that people can eat eggs. Another individual had what appeared to be a broken wing, and she lay there motionless... barely alive, but still breathing. I hoped her end was near. One was slouched against the bars with a tumour-looking growth protruding from her head, above her eye. I can't begin to comprehend the suffering felt by this individual, and I knew that she would be entirely defenceless from

the pecks of other birds. In this hell-hole, stress and frustration makes birds peck at each other, sometimes until death. The industry's answer is to mutilate the beaks of day-old chicks. What the birds really need is so obvious. They need freedom.

There is only one way to end the incarceration of birds and their misery in hell-holes like this. And that is to stop eating eggs. Please, choose vegan. Choose kindness."

In so-called 'free-range' farms, birds who would typically live in small flocks are incarcerated in sheds with tens of thousands of others. A potential ten-year life span shortened to just a year and a half, if they survive the horrors of a modern-day farming unit.

Out of sight and out of mind, consumers appear to have forgotten that the hens, forced to endure a lifetime of misery so they can provide eggs for the kitchen table, are even birds. Whilst other species of bird are celebrated and admired for their intelligence, beauty and behaviours, the chicken is a forgotten victim of the farming industry. It is perhaps easier for consumers to forget. Yet chickens are smart and they understand their world, which raises troubling questions about how they are treated today (Smith and Zielinski, 2014).

LAYING HENS: THE INSIDE STORY

HOUSING ON MODERN-DAY FARMS

Hens housed on modern-day farming systems, whether they be categorised by the egg industry as living free-range, or inside enriched cages, face significant welfare assaults throughout their entire productive lives. The increasing demand for meat, dairy and eggs continues to push changes in animal agriculture – including housing animals in even larger numbers.

BATTERY (OR CONVENTIONAL) CAGE

Outside Europe, according to a 2013 report using data provided by the Food and Agriculture Organisation (FAO), more than 90 per cent of all eggs continue to be laid by hens in cages, and the vast majority of these (85 per cent) are conventional, aka battery cages (Windhorst, 2014; Farming UK, 2015).

Inside the battery cage, hens are provided with approximately 550cm² of space – about the area of a sheet of A4 paper, or the size of the report you are holding in your hands. A hen's wingspan is 76-80cm – about the width of four pieces of A4 paper – and so these naturally active animals spend the vast majority of their lives unable to even spread their wings. There is a complete absence of nesting areas in the battery cage, a wire mesh floor, and severe behavioural restrictions. The consequential syndromes such as osteoporosis lead to poor bone strength and fractures.

The evidence against battery cages is overwhelming,



The vast majority of eggs around the world continue to be laid by hens living in cages like this (SOURCE: European Society of Dog and Animal Welfare website, 2016)

and includes an extensive body of independent scientific and socio-economic studies by scientists and experts (Humane Society of United States website, 2015):

“Battery cages for laying hens have been shown (by me and others) to cause extreme frustration particularly when the hen wants to lay an egg” and “Hens in battery cages are prevented from performing several natural behaviour patterns... The biggest source of frustration is undoubtedly the lack of nesting opportunity”

Dr. Ian Duncan, Department of Animal and Poultry Science, University of Guelph, Canada

“Frustration of nesting is a severe behavioural problem for hens in cages”

Dr. Barry Hughes, Roslin Institute

“Battery cages provide an inadequate environment for nesting, lacking both sites which fit these criteria [concealment and separation from other birds] as well as substrates for nest-building. Hens housed in battery cages display agitated pacing and escape behaviours which last for 2 to 4 hours prior to oviposition [laying eggs]”

Dr. Joy Mench

The widely accepted inhumaneness of battery cages led to their prohibition in the European Union in January 2012 under The EU Welfare of Laying Hens Directive (Council Directive 1999/74/EC, 1999), though the European Union made the announcement back in 1999. Within Europe, countries varied in their response to the announcement of the 2012 ban, and some had already banned the battery cage prior to that.

In 1992, Switzerland effectively banned the battery cage (Appleby, 2003) and, in 1994, Sweden's Animal Protection Act outlined a phase-out of conventional battery cages.

In the same year, The Netherlands banned the battery cage. Germany followed suit and banned the battery cage in 2007 (Andrews, 2012) – introducing a ‘family cage’ instead, which has more space than the enriched cage used in other countries.

Luxembourg banned all cages for laying hens in 2007 and, in 2009, Austria also banned the battery cage, and is set to ban the enriched cage by 2020. Belgium has also banned the battery cage and proposes to ban enriched cages by 2024 (European Egg Packers and Traders Association website, 2016).

In total however, 14 European Member States still failed to meet the January 2012 deadline and the EU Health Commissioner issued legal warnings to these countries on their lack of effort to enforce the ban. In the UK, farmers had more than a decade to phase out battery cages, yet in January of that year, it was reported that up to 500,000 hens continued to languish in the cages (BBC News website, 2012). Across Europe, in 2012 there were approximately 46 million hens remaining incarcerated in battery cages, despite the ban. This is around 14 per cent of the total number of birds (BBC News website, 2012).



An enriched cage unit visited in 2015 by Viva! investigators © Viva!

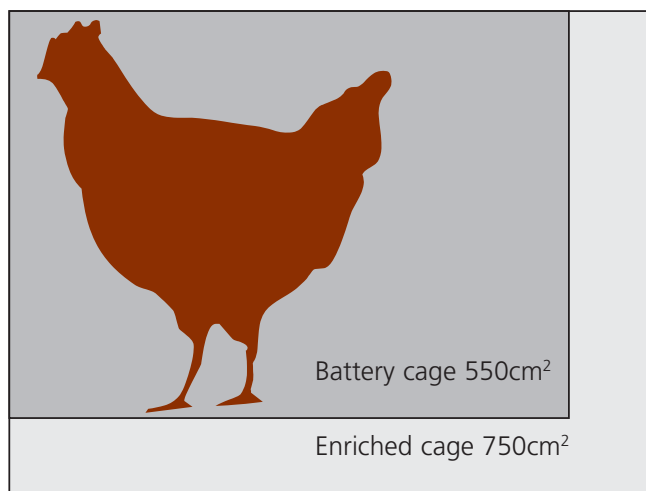
ENRICHED CAGE

The newly introduced enriched cage, which replaces the battery cage in many countries, means hens are forced to live in close confinement with between 40 and 80 other cramped and frustrated hens.

The enriched cage (750cm² of cage area) provides hens less than a postcard size extra space than the battery cage (550cm²), which is around 50cm² more useable space per hen.

A minimum cage height of only 45cm is provided (FAWC, 2007). The birds continue to stand on excruciatingly uncomfortable and injurious sloping wire mesh floor. A so-called 'nesting box' is provided, along with perches and a litter area. These 'enrichments' provide little stimulation and may never be used by some of the birds due to competition from other hens in the cage. The flaws in the enriched cage system are highlighted by the fact that beak trimming continues to be carried out as routine on day-old chicks.

The enriched cage imposes gross restrictions on basic movements and fails to cater for the hens' physical and behavioural needs on a staggering scale. It is widely condemned by scientists, experts, Viva! and other animal protection organisations – the public, however, remain blissfully unaware of the painful and frustrating daily reality for thousands of hens housed on enriched cage farms.



Enriched cage units reveal a striking similarity to the conventional battery cage units © Viva!



A free range unit filmed by Viva! in 2015 © Viva!

PERCHERIES/BARN

Similar to enriched cages, percheries (or barns) provide perches, litter and nests, although the EU Welfare of Laying Hens Directive stipulates there need only be one nest for every seven hens (Council Directive 1999/74/EC, 1999) – leading to the same problem of competition for space that exists in enriched cages. Percheries constructed after 2002 may provide 1,100cm² of floor space per hen, which is equivalent to about two pieces of A4 paper. Older percheries provide as little as 830cm² per hen (DEFRA, 2005). As with the enriched cage system, barn egg consumers are duped into believing hens lead a happy life – this time in straw filled, light and airy out buildings adjacent to traditional farmyards. The cage is gone, yet competition, overcrowding, injuries and frustrations remain. Hens continue to live their lives inside huge, filthy sheds, never feeling sunlight or carrying out behaviours that are so important to them.

FREE RANGE FARMS

Free-range farms have increased stocking densities and intensification in recent years. Today, European legislation permits high stocking densities – up to 2,500 birds per hectare (European Directive 1999/74/EC, 1999).

On free-range farms, farmers are required to provide ‘pop holes’ for birds. This should, in theory, enable all to leave the shed. The reality is, however, that many birds

will never step outside. In fact, one study revealed that less than 10 per cent of hens go outside at any given time (Hegelund *et al.*, 2005). In a 2006 study in 18 Danish commercial organic egg-producing flocks consisting of 1,200–5,000 hens each, only between seven and 38 per cent of the hens in a flock used an outdoor run, with a mean of 18 per cent (Hegelund *et al.*, 2006).

ORGANIC

Laying hens on organic farms are categorised as free-range, but with additional standards set out by an approved certification body. Organic standards generally focus on sustainability issues, which include soil health and biodiversity. As of November 2014, there were nine approved UK organic control bodies in Britain, with Soil Association Certification being the largest. According to the Soil Association, in 2014 the sale of organic eggs was up by 16 per cent from 2013 (Ranger, 2015). Male chicks born into the egg industry are still killed at a day-old, and ‘spent’ hens still are sent to the slaughterhouse. Even though organic and free-range hens may be sent to the slaughterhouse later than 72 weeks, this is still a fraction of their natural lifespan. The minimum age at slaughter for organically reared chickens is 81 days – twice the age of ‘standard’ chickens, but still far short of their natural lifespan. The journey remains a terrifying ordeal for the birds, as is the process of slaughter, whether it’s at an organically approved abattoir or not.

FROM BIRTH TO DEATH IN JUST A YEAR AND A HALF

CHICK PRODUCTION

BABY CHICKS

During the month of May 2016 alone, 2.9 million baby layer chicks were transported from UK hatcheries and placed on farms (DEFRA, 2016).

Eggs develop inside industrialised incubators. At around 21 days, the chicks hatch in tiered racks of trays, using their egg tooth to break out of the shell. In the wild, the mother hen would help with this. After hatching, the babies receive prophylactic vaccination either as a mist or injection in, for example, the back of their necks. Commonly administered vaccines in a typical vaccination programme for laying hens throughout her life include Marek's disease, Infectious Bursal Disease (IBD), Bronchitis, Newcastle disease and Avian encephalomyelitis.

At the hatchery, baby chicks are placed on a conveyor belt to be sorted according to colour. From birth until they reach the farm, which can be up to 36 hours later, they are denied food and water. This is highly unnatural for chicks and can cause problems later in life.

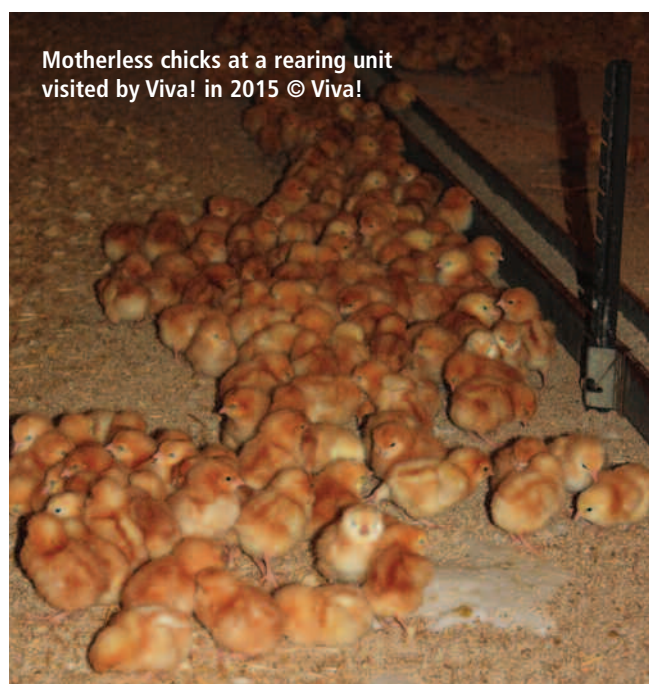
At this stage, sick, weakly and male chicks are pulled out as 'rejects' and gassed to death.

The female chicks who survive the hatchery will never meet their mothers. Instead they will be forced to live amongst unrelated individuals. An increasing body of evidence reveals that there are important, life-changing benefits of rearing baby hens with their mothers, or foster mothers.

A study in 2015 revealed that the behavioural development of chicks is promoted remarkably by the presence of a broody hen, and effects at an early age persist after maturity (Shimmura *et al.* 2015). Whilst brooded chickens showed more brooding and lower egg production than non-brooded chickens, feather pecking and aggressive interaction are decreased in brooded hens (Shimmura *et al.* 2015). Another study has revealed that changes in the brain that are induced in very early life can be detected in adult hens (Nordquist *et al.*, 2013).

MALE CHICKS

In the egg industry, females are allowed to live and males are not. Prior to the development of modern



Motherless chicks at a rearing unit visited by Viva! in 2015 © Viva!



LAYING HENS: THE INSIDE STORY

'broiler meat' breeds, most male chickens were slaughtered for meat, whereas females would be kept for egg production. Today however, chickens are either selectively bred to reach adult weight at just six weeks so they can be turned into meat, or to be as skinny as possible to save space and to channel all energy into laying eggs. This means that the egg industry's male baby chicks are considered useless as they cannot lay eggs or grow big and fast enough for the meat industry.

Tragically, 40 million baby male chicks are killed annually in Britain, and at just a day or two old (Humane Slaughter Association, 2006). On the production line male chicks are identified soon after birth by down colour, and separated from their siblings to be killed by gassing – the routine method of killing in Britain. A member of staff at hatchery business, Joice & Hill Poultry, has stated that killing male chicks with argon gas is the 'best method available' (Davies, 2016). Unlike the killing of adult birds using gas, it is still legal for chicks to be killed using a source of 100 per cent carbon dioxide (Humane Slaughter Association, 2006). Carbon dioxide is an acidic gas observed to be highly aversive to birds at concentrations at 20 (CIWF, 2013) to 25 per cent (Humane Slaughter Association, 2006) yet adult chickens are allowed to be killed in slaughterhouses with a concentration of 30 per cent carbon dioxide under UK legislation (DEFRA, 2007).

In hatcheries, chicks are thrown live onto conveyer belts and into gassing machines. Their bodies are often used for reptile food in the pet trade.

There have been attempts by the industry to produce 'combi chickens' – in other words, normal layers, but the males grow on to slaughter weight. In Europe, however, there is no market for the smaller males. Billions of animals are rejected each year because the European chicken industry desires the largest male 'meat chickens' as possible. Either way, all males die young.

Moves have been made outside Britain to end the killing of baby male chicks. In June 2016, it was announced that United Egg Producers, an organisation that represents 95 per cent of all eggs produced in the United States, will eliminate by 2020 the 'culling' of male chicks at hatcheries (Matthews, 2016). The technology of in-ovo sexing was developed in Germany and the Netherlands, and involves analysing chemical biomarkers to determine the sex of a chick on the ninth day of incubation so that the gender of a future chick inside a fertilised egg can be identified. In Germany, where much of the research has taken place, policymakers committed



Baby chicks on conveyer belt and into gassing machine at hatcheries filmed by Viva! in 2010 © Viva!

last year to use the technology to eliminate chick culling by 2017 (Shelling, 2015). Statements have also been made by the egg industry in Australia (Han, 2016), and Canada (Poultry World, 2016).

The British egg industry has, however, shown resistance, with the recent agriculture director for Noble Foods stating: "There's a lot of investment being made on the sexing of chicks .. as I understand it, it's currently incredibly invasive which dramatically reduces egg hatchability, and therefore the viability of using the technique on a commercial level .. I wouldn't want to suggest a timescale, but I don't think it's going to be a viable option soon." (Davies, 2016).

VIVA! INVESTIGATES UK HATCHERIES

In 2010, Viva! carried out an extensive undercover investigation at two hatcheries and revealed workers to be macerating male baby chicks (Viva! website, 2010). There are two main designs of Instantaneous Mechanical Destruction (IMD) that have been used in Britain – the roller type and the knife type (Humane Slaughter Association, 2005). Since this investigation, the industry claims to have ended this practice – an abhorrent method of killing approved by both the Royal Society for the Prevention of Cruelty to Animals (RSPCA, 2011) and the Humane Slaughter Association (Humane Slaughter Association, 2005).

The fate of male chicks was one of the egg industry's best kept secrets until Viva! carried out an undercover investigation in 2010 at two hatcheries in Lancashire. One of which (Fresh Farm Hatchery) was RSPCA approved. The other, Tom Barron Hatchery – which supplies Noble Foods – claims to be the 'pioneer of the British Egg laying industry' (Tom Barron website, 2016).



Baby chick beak mutilation at hatcheries filmed by Viva! in 2010 © Viva!



Baby chick beak mutilation © Viva!

At one of the hatcheries, chicks were being gassed to death and, at another, chicks were being thrown alive into an electronic mincer, turning them into a paste.

Following this investigation, in March 2015, the British Egg Information Service (BEIS) denied that the practice of maceration routinely takes place inside hatcheries. A BEIS Spokesperson stated: “All plants have to have a macerator by law but they aren’t used for culling” (Saul, 2015).

In the *Farmers Weekly* magazine, it is also reported that the practice has been discontinued in Britain (Davies, 2015) following the Viva! investigation. However, all male chicks continue to be killed by gassing.

BEAK TRIMMING

Hens subjected to the pain and stress of modern-day farms perform injurious feather pecking (IFP). IFP is a consequence of the abysmal conditions in which hens are housed which results in them being unable to do what hens would naturally do. In the wild, chickens have the freedom to escape each other, and to form a normal ‘pecking order’. On farms, aggressive pecking is directed at the head of another bird and feather pecking is directed at the plumage. This is obviously extremely painful for those on the receiving end, and can lead to death. The industry’s answer to this widespread and serious problem is not, as it should be, to re-evaluate our treatment of hens, but to mutilate them instead. So, whilst the motivation to peck remains, the ability to do so does not. Or that is the theory – in fact every caged unit Viva! filmed, clearly shows that although the birds have had their beaks mutilated, feather pecking is still rampant.

Day-old chicks have their beaks cut off inside hatcheries. This highly invasive procedure is referred to by the egg

industry as ‘beak trimming’ or ‘beak treatment’ (Coalition for Sustainable Animal Agriculture, 2015). Beak trimming is performed, like the vast majority of farmed animal mutilations, without anaesthesia. The baby birds have their sensitive beaks rich in blood vessels and nerve endings sliced off by a machine, and this can lead to deformities later. Not only is beak trimming an incredibly painful procedure, it also causes difficulty eating properly later in life (Davis *et al.*, 2004). The partial amputation of the beak can lead to inactivity and loss of appetite (Dennis and Cheng, 2012) – it is painful at the time (European Food Safety Authority, 2005), in the days and weeks following (Marchant-Forde *et al.*, 2008; Honaker and Ruszler, 2004) and potentially long-term, depending on the age of cutting.

In 2007, the Farm Animal Welfare Council (FAWC) listed the potential impacts of the mutilation as being: trauma, chronic pain, loss of a sensory tool, and loss of integrity of a living animal by the removal of part of her beak (FAWC, 2007a). Today, hens destined for free-range, enriched cages and barn units all have their beaks trimmed as standard. The few who are raised on organic farming units escape this painful mutilation because it is prohibited by organic control bodies such as the Soil Association.

UK legislation allows beak trimming before the age of 10 days, and up to a third of the beak can be removed during the procedure (DEFRA, 2010). Yet beak trimming is already either prohibited, or does not generally take place in several European countries such as Austria, Denmark, Finland, Sweden, Norway and Switzerland (eg Janczak and Riber, 2015).

The egg industry whitewashes the painful removal of the beak tip with lies and promotion. In the United

LAYING HENS: THE INSIDE STORY



Extensive feather loss was documented on many birds at Bird Bros farm, which was visited by Viva! several times in 2015 © Viva!

States, a video by The Coalition for Sustainable Agriculture has been produced which includes a statement that pecking is a 'normal part of all bird behaviour' and that 'beak treatment' is 'best for the bird' (Coalition for Sustainable Animal Agriculture, 2015). On the contrary, many studies reveal that beak trimming is entirely inhumane (eg Janczak and Riber, 2015). Despite the overwhelming evidence that IFP is caused by thwarted motivations, the egg industry claims: "The reality is, that until science can explain and predict the underlying causes of feather pecking and cannibalism, responsible beak treatment is the most humane solution for this most serious welfare issue and ultimately what is best for the birds" (Coalition for Sustainable Animal Agriculture, 2015). The lack of studies on the efficacy of beak trimming in fact means that claims regarding the necessity of beak trimming are poorly substantiated (Janczak and Riber, 2015).

Due to the substantial body of evidence against the humaneness of beak trimming, a ban in Britain was due to come into force in early 2011. On November 2010, however, the Coalition Government, following advice from the FAWC, announced that a beak trimming ban would be postponed until at least 2016 (Barclay, 2012) or when it can be 'demonstrated under commercial conditions that laying hens could be managed without beak trimming' (Ares, 2014).

There was an intense campaign by the National Farmers' Union (NFU) and the British Free-range Egg

Producers Association to have the proposed ban for 2016 postponed. In November 2015, it was reported that the ban would be delayed (The Poultry Site, 2015) and finally, in December 2015, it was reported that the Farm Minister, George Eustice, had decided not to implement the 2016 ban (Clarke, 2015a). The 'Beak Trimming Action Group', comprising of representatives from the egg industry, animal welfare groups, DEFRA and scientific and veterinary professions, will advise the Government on the feasibility of a beak trimming ban and implement strategies to reduce IFP in flocks of laying hens. A study carried out at Bristol University has also made recommendations following trials into managing 20 non-beak trimmed flocks which, according to the magazine *Poultry World*, concludes that a ban should not go ahead (Clarke, 2015a). Sales director of Joice & Hill Poultry stated in February 2016 that: "The UK layer sector quite rightly gave a collective sigh of relief late last year as fears of a Government-imposed beak trimming ban receded" (Cumbers, 2016).

IFP is a consequential behaviour to a severely sub-optimal environment and it is this which must change. It also clearly demonstrates that no system for eggs exists which has no negative welfare impacts on hens, and is one reason why Viva! advocates a vegan diet.

There is some evidence to suggest that hens laying brown-shelled eggs are more likely to engage in feather pecking than hens laying white-shelled eggs (Jacob, 2015). For example, it has been stated by Fröhlich (cited

by Pickett, 2008) that the majority of laying hens in Switzerland are white-feathered strains, which are less prone to IFP than brown hens. Human preference for brown or white eggs differs considerably from country to country and also from continent to continent. 2011 data reveals that 95 per cent of eggs produced by laying hens are white, in the United States 93 per cent, Canada 90 per cent and in Brazil, 75 per cent. Brown eggs dominate in Europe; the highest percentages are found in the United Kingdom (99 per cent) (Windhorst *et al*, 2013).

TRANSPORT: HATCHERY TO GROWING SITE

Day-old chicks are transported en masse from hatcheries to growing sites, and may be transported onwards again as 'pullets' to a farm for laying. Their final route of transportation, at depopulation, will be to the killing floors of the slaughterhouse.

The welfare and development of hens is now known to be influenced by the first episode of transportation, between hatchery and growing site (Mitchell and Kettlewell, 2004). Therefore, how day-old chicks are treated during transportation can have long-term consequences for these sensitive individuals later in life.

According to the Humane Society of the United States (HSUS): "Unlike adult birds and mammals, who are able to regulate body temperature metabolically, recently hatched chicks cannot fully self-regulate their body temperature. As a result, they are sensitive to heat

stress and are especially prone to becoming chilled, thereby requiring an external heat source" (Humane Society of the United States, 2008).

Chicks usually endure transit in disposable cartons to long distance destinations, with the aim of maintaining the temperature inside the boxes within the chicks' thermoneutral zone, or what is called their 'optimal' environment. Some companies deliver day-old chicks from hatcheries to farms over great distances in vehicles that are several years old and may not have advanced ventilation and internal air mixing systems (Fernandez, 2015). This leads to uneven air distribution and air exchange, and consequently heat or cold stress on the baby chicks (Fernandez, 2015).

The detrimental effects of such conditions is proportional to journey duration. Chicks have a limited store of nutrients at hatching, and the duration of transport has a significant impact on the animals' physiological condition.

Council Regulation (EC) No 1/2005 on animals in transport came into force in the UK during 2007, and is implemented by The Welfare of Animals (Transport) (England) Order 2006 and by equivalent national legislation in Scotland, Wales and Northern Ireland. Shockingly, the legislation does not specify a maximum journey time for birds, only that journey times are kept to a minimum, and that water is provided after 24 hours. There is no requirement for inspections of bird



LAYING HENS: THE INSIDE STORY

containers, even for journeys longer than eight hours (DEFRA, 2011).

Shipments of newly-hatched chicks may be comprised of both early and late hatching chicks, meaning the animals can vary in age by 21 to 36 hours (Decuypere *et al.*, 2001; Qureshi, 1991). As a result, early-hatching chicks may be deprived of food and water for a longer period of time before transport. Dehydration has been reported as being problematic for newly-hatched chicks transported long distances, as is temperature-related cold stress (Salahi *et al.*, 2011).

Whether by lorry or airplane, and regardless of scale, commercial or speciality breed, transport can subject newly-hatched chicks to substandard environmental conditions which may be detrimental to their welfare, and can result in death (Humane Society of the United States, 2008). Chick mortality occurs prominently during the first week following delivery due to the combined stress of handling in hatcheries, transport, and failure to thrive at the destination farm.

PULLET GROWING SITE

It is well documented that early experience in animals has long-term effects on the development of behaviour, including abnormal behaviour (Janczak and Riber, 2015), and some of the welfare issues affecting laying hens are influenced by the rearing environment of the pullets at growing sites (Janczak and Riber, 2015). For example, studies suggest that early exposure to an outside area during rearing should increase the use of outdoor space by adult hens in organic egg production (Janczak and Riber, 2015).

According to the Soil Association, however, pullets can remain housed inside up to 18 weeks prior to being sent to organic or free-range farms.

Chicks start pecking and learning about appropriate food during the first 24 hours of life, as well as imprinting on other hens and developing fear-related avoidance of unfamiliar objects and sensitivity to potential stressors (Hess, 1959; 1964; Phillips and Siegel, 1966; Dawkins, 1968). Perch use also starts in the first few days of life (Riber *et al.*, 2007).

These facts underpin the importance of the early rearing environment for the hen's adaption to the farm where she will spend her laying life (Janczak and Riber, 2015).

Plumage condition during lay is also said to be improved when feather pecking had not started during the rearing part of a hen's life (Gilani *et al.*, 2013; de Haas *et al.*, 2014). Feather damage is also associated with earlier onset of severe feather damage during lay (Drake *et al.*, 2010).

It has been stated that the rearing system may directly affect the welfare of the adult birds if the transition from the rearing system to the layer system induces fear, stress, emaciation, and dehydration, and this is more likely to occur if the rearing system is very different to the laying farm (Janczak and Riber, 2015).

Viva! visited a Shrewsbury farm in 2016 and found four week old (beak-trimmed) pullets destined for egg production in barren wire cages. The investigation was featured in the Independent (Jeory and Forster, 2016).

Conditions at this farm were condemned by leading veterinarian and Professor of Animal Welfare and Ethics, Andrew Knight, who said: "It would be against the law to keep adult hens in these conditions. We know that hens adapt to perches and other facilities more successfully if they are introduced to them at a much earlier age. Failure to do so can induce fear, stress, and increase risks of injury. If the battery cage has been banned it should be a total ban. No exceptions."

Research has also revealed that pullets raised in a non-cage housing system demonstrated even earlier perch utilisation at a higher frequency than caged pullets, and the earlier pullets are exposed to perches, the faster they adapt to perching (Appleby and Duncan, 1989).

However, despite evidence indicating that the rearing environment has profound effects on later life, even when pullets are provided with perches during rearing, this does not prevent a high incidence of keel (sternum) bone fractures at end-of-lay (Hester *et al.*, 2013).



This hen, on a K Fresh farm, has a drooping comb © Viva!

WHEN LIFE DOESN'T MEAN LIFE: INSIDE THE SHEDS

Laying hens face serious welfare assaults on farms during their short and miserable lives (and for information on how chickens raised for meat also suffer, see Viva!'s upcoming report on Britain's intensive broiler industry, 'Life is Cheep').

Foraging is a natural behaviour that hens are motivated to perform (Duncan and Wood-Gush, 1972). Preening is both a maintenance and comfort behaviour where feathers are cleaned with the beak, and it has been observed to be performed more often in the presence of familiar hens (Nicol, 1989). Yet on the overwhelming majority of modern-day farms, these behaviours are either not possible for hens, or extremely restricted.

CAGE LIFE

Egg-laying hens are the only major species of farmed animal to remain in cages for all of their 'productive' lives. In the enriched cages, hens are severely restricted, and are unable to stretch or flap their wings.

"A drooping comb usually indicates poor body condition. This could be related to poor nutrition, parasites, or stress caused by temperature extremes or a lack of proper food and water. A drooping comb indicates poor management"
Dr. Lee Schrader, DVM, veterinary internal medicine specialist.

"A drooping comb can be caused by dehydration"
Andrew Knight DipECAWBM (AWSEL), DACAW, PhD, MRCVS, SFHEA.

Enriched cages offer a 'nest box' (which is, in practice, a set of plastic flaps hanging down from the top of the cage), a litter area, perching space, a scratching pad, a feed trough, and drinking system. The lack of space in the cages means that hens are sometimes unable to use these meagre facilities.

FAWC have stated: "The main welfare concerns about enriched cages involve the view that such cages still do not satisfy the hens' needs in terms of continuous confinement, restrictions on movement and expression of some behaviours, and a lack of true or meaningful enrichment" (FAWC, 2007b).

LAYING HENS: THE INSIDE STORY

“Again there is marked feather loss, and the bristled surface certainly would not be very comfortable”

Andrew Knight DipECAWBM (AWSEL), DACAW, PhD, MRCVS, SFHEA

Enriched cages do not satisfy even the hen's most basic behavioural and physical needs such as ground scratching, wing stretching, and locomotor activities such as walking, running, jumping, fluttering and flying. There is no meaningful 'enrichment' in the enriched cage. It is an assault and battery, and these sentient, intelligent animals continue to suffer because of the stack 'em high, sell 'em cheap mentality.

All of the major animal protection organisations in Europe continue to push for a complete ban on cages. Undercover investigations carried out by Viva! between 2010 and 2016, have revealed a hell-like existence for hens in cages stacked up to the ceiling. Hens were crammed into cages with no access to range or sunshine, all were subjected to beak mutilations and countless individuals were suffering extreme feather



loss. In 2015, Compassion in World Farming (CIWF) carried out another investigation into enriched cage units in four EU Member States (CIWF website, 2016). They exposed the suffering faced by millions of hens stuck in what the organisation described as the 'Cage Age' (CIWF website, 2016a).

Undercover investigations often reveal the obvious – that a cage is an entirely inappropriate and cruel housing environment for an animal.



RESTRICTED SPACE

A study by Dawkins and Hardie in 1989 revealed that the average space used by hens to perform certain common behaviours such as turning, stretching wings, wing flapping, feather ruffling, preening and ground scratching is between 540 and 1980cm². Almost all normal hen behaviours require more space than the 600cm² of usable space given per bird in the enriched cage. It has also been revealed that hens may walk up to 1.5km per day, and fly to and from elevated places should they have the opportunity to do so (Keppler and Fölsch, 2000).

The space allowance in both the horizontal and vertical dimensions of the enriched cage impedes movement, which in turn limits important natural behaviour. Most are built for vertical stacking with the height of each being 45cm – only 10cm more than that provided by the battery cage. A greater height is necessary for the hens to be able to perform behaviours such as head stretching and body shaking which lead to stronger wing bones, and it has been demonstrated that bone strength in hens is only improved where height is over 60cm (Broom, 2001). In 2004, DEFRA stated that there are no significant health or welfare benefits in terms of the birds' ability to express 'normal' behaviours merely by increasing the height of cages above 35cm (DEFRA, 2004; FAWC, 2007b).

Preventing, or restricting, laying hens from performing certain important behaviours such as wing-flapping,

dustbathing, or gaining access to a nest box prior to egg laying, leads to frustration and suffering. Basic comfort behaviours such as feather ruffling, head scratching, body shaking, wing stretching and flapping all require more space than the enriched cage permits. To turn around it is reported that hens will occupy on average 1,316cm² (Mench and Blatchford, 2014). Yet it is difficult for hens to walk even a few paces without obstruction by other hens in an enriched cage.

In the wild, flight enables hens to reach roosting areas at sunset within trees, or any other high and safe place free from ground predators, and to escape from immediate danger during the day. Denying hens the ability to carry out this behaviour, particularly when faced with threats from other frustrated hens, is cruel and unethical.

In enriched cages, birds can be crammed into these wire prisons with 80 other hens (Council Directive 1999/74/EC, 1999). Yet studies of natural spacing behaviour measuring the distance between hens demonstrate that they use a relatively large amount of space when provided with the opportunity to do so. In one study by Keeling and Duncan (cited by Humane Society of the United States, 2010) of small flocks of a medium hybrid strain, the distance observed between two birds varied from 1.15ft when the birds were standing and ground pecking, to more than 10.8ft when they were moving whilst foraging. Another study concluded that any space allowance of 5.4ft or less per bird imposes at least some constraint on hen behaviour (Savory *et al.*, 2005).

In the enriched cage, hens only have 45cm of head space. That's only 10cm more than the height provided to hens in the battery cage © Viva!





Rescued egg laying hens able to dustbathe at a sanctuary in the United States (PHOTO: iStock website, 2013)

EFFECTS OF INCREASED PRODUCTIVE LIFESPAN

Studies by Nicol (cited in RSPCA, 2005) revealed that when denied the ability to flap their wings over a period of one or two months, the motivation of hens to perform this behaviour increases proportionately and that hens housed within small cages for three months usually avoid such confined conditions more strongly than hens who have had no prior experience of such conditions. This indicates that they do not adapt to their environments, that they find the conditions they are forced to live in aversive, and that this is accentuated as times goes on.

Hens on commercial farms are bred to lay more eggs and for longer periods than they ever have done before. The company Hendrix Genetics has stated that: “In layers, ISA (part of Hendrix Genetics) breeds hens that can live and produce for longer. Therefore, for the same number of eggs produced fewer hens are required and fewer hens leave the system as spent hens” (Hendrix Genetics website, 2016). Hendrix Genetics has also stated that one of the goals of the company is to produce hens who are ‘spent’ at 100 weeks, as opposed

to 72. These birds are likely to suffer from this longer duration of productivity and confinement.

Similarly, one of the farms visited by Viva!, ‘Sunny Farm’ (owned by the company Bird Bros) claim to house hens with longer cycles of egg laying – until the birds are 84 weeks of age.

FLOORING

The cage substrate in the enriched cage is a sloping wire mesh so that eggs can roll to the side of the cage which causes extreme discomfort and health problems for hens. This substrate is not designed with the hens’ welfare in mind, only ease of management as faecal matter can fall through it.

DUSTBATHING

Dustbathing is both a maintenance and comfort behaviour characterised by the act of grooming whilst the hen rolls or moves around in dust or sand. It is an important behaviour for chickens, and especially for laying hens. The dust absorbs excess oil and subsequently falls or is shaken off. Dustbathing helps the plumage maintain good insulating capacity, helps

control ectoparasites, and enables hens to maintain a comfortable body temperature.

Food particles for litter substrate is used on egg farms. The feed is dropped in small amounts on scratching mats by an automatic transporting system. A 2014 study revealed, however, that because dustbathing behaviour is meant to remove stale lipids (fats) from hens' plumage, food particles are not a suitable substrate due to their fat content. Food particles in fact lead to lipid accumulation on the plumage (Scholz *et al.*, 2014).



Dustbathing is also a social behaviour for chickens (Lundberg and Keeling, 2003), yet on modern-day farms, enriched cages do not provide enough space or appropriate substrate for these birds to dustbathe comfortably, which results in displays of dominance and rivalry leading to birds lower down in the pecking order never even reaching the dust bath.

Deprived hens may be more motivated to dustbathe (Widowski and Duncan, 2000) and thus increasingly motivated to dustbathe the longer they are without the ability to do so.

PERCHING

Modern-day hens retain many of the characteristics of the junglefowl. One of these characteristics is roosting. Fowl would naturally perch at night to avoid predation and conserve heat. If hens are unable to reach roosting sites, they show signs of unrest (Olsson and Keeling, 2002). Captive chickens have even been observed pushing open doors that are 75 per cent of their own body weight in order to gain access to a perch (Olsson and Keeling, 2002).

Laying hens are motivated to use elevated perches for sleep and resting during the daytime (Newberry *et al.*, 2001; Schrader and Muller, 2009). In enriched cages, the requirement of perches was adopted on the basis of the knowledge that roosting is a high behavioural priority of the birds, yet the plastic perches provided are far from ideal. Investigators from CIWF visited farms using enriched cages in 2015, and found perches to be slippery (CIWF website, 2016a). Perches, by law, must be 5cm off the ground, yet research reveals that perches intended to

serve as resting places should be elevated above the standard 5cm to be 'adequate' (O'Connor *et al.*, 2015). A study by Tauson (cited in CIWF, 2007) revealed that low perches in cages are not even perceived as perches by hens, but as a different quality of floor.

Perches improve bone strength (Fleming *et al.*, 1994), facilitate symmetrical growth (Campo and Prieto, 2009), and allow hens a safe refuge from perceived dangers (Newberry *et al.*, 2001). However, in enriched cages, hens with access to elevated structures, no matter how high, are still at risk of keel bone breakage from collision injuries (Wilkins *et al.*, 2011; Nasr *et al.*, 2012), and sitting on perches prior to ossification (or 'bone remodelling', where mature bone tissue is removed from the skeleton and new bone tissue is formed), which causes pain and discomfort to the hens (Nasr *et al.*, 2012a).

EGG LAYING AND NEST BOX

Hens will go to great lengths to gain access to suitable nesting sites. In an enriched cage, the birds are provided with a single nesting box which is not actually a box at all, but a set of plastic flaps hanging down from the top of the cage. It attracts a great deal of competition between hens, with some hens choosing to seek refuge there to be away from other hens, causing even more competition.

Hens are also likely to be unable to spend time inside the nest box after laying, as other hens will be attempting to enter. Subordinate hens may not easily be able to reach the box, which is a cause of great frustration and suffering, and some hens are forced to lay their eggs on the wire mesh floor outside the box.

INJURIOUS FEATHER PECKING (IFP), SCRATCHING AND CANNIBALISM

Correlations between the behaviour of the animal and the internal physiology and emotional state have been demonstrated (Daigle *et al.*, 2014). IFP is essentially a 'misdirected' ground pecking behaviour (Blokhuys and Arkes, 1984) and if hens are denied the ability to spend a major portion of the day engaged in foraging activities, they will peck, pull and tear at objects or other birds. It is an indication that the housing conditions are not corresponding to the behavioural needs of hens (Huber-Eicher and Wechsler, 1997) and a direct consequence of the inability of hens to move away from others who are bullying them.

Feather pecking can commence when chicks are just a few weeks old and develop into IFP. It can also spread rapidly within a flock as a learned behaviour. A visibly open wound or blood can then drive them to cannibalism.

IFP is recognised as being a major problem in all egg laying systems. Enriched cages have failed to stem the problem, and so it continues unabated. The cages they are still restrictive and hens cannot fly up to a high perch to be safe from feather pecking. Despite the widespread prevalence of IFP, enriched cage facilities house tens of thousands of birds, stacked from floor to ceiling, making it virtually impossible for workers to provide the attention and care that hens desperately need (particularly for those in higher up cage stacks).

There have been several studies on genetic selection as a solution to IFP, including selection that includes the indirect genetic effects to improve plumage condition in laying hens (e.g. Brinker *et al.*, 2014). The reality is, however, that there is no solution for this widespread and serious problem on commercial, modern-day egg farms which invariably house large numbers of hens in small spaces. The industry-led 'solution' of amputating up to one third of a chick's beak to reduce injury and death from pecking and cannibalism highlights the fact that there is something intrinsically wrong with the egg industry today.

STEREOTYPIC AND ABNORMAL BEHAVIOUR

As demonstrated, the enriched cage provides no significant or worthwhile welfare benefits above and beyond the battery cage. The minimal facilities in an enriched cage means hens continue to live highly unnatural and frustrating lives. The thwarted motivation of hens to carry out activities which are so important to them means these birds exhibit abnormal behaviours, and these can become stereotypic – in other words fixed, repetitive, and indicative of poor welfare.

All hens naturally show elements of the typical nesting-and-laying behaviour sequence: separating from the flock, examining potential nest sites, scratching and pecking at nest material, building a nest or choosing an already formed nest, entering the nest, forming a hollow, laying an egg, rolling the egg under the body, lying on the egg, getting up, standing, leaving the nest and cackling. If no adequate nest site is available, hens will develop abnormal nesting and laying behaviours; and possibly stereotypic activity patterns.

Abnormal behaviours observed in caged hens also include sham dustbathing where hens go through the motions of dustbathing but in an empty space, or 'vacuum'. The birds do not therefore gain any physical benefit of this behaviour. When animals cannot adapt, cope or control their environment, their welfare suffers.

One 2011 study revealed that laying hens are susceptible to the effects of frustration as measured in terms of redirected pecking behaviour (Kuhne *et al.*, 2011). In general, any situation in which a desirable goal is obstructed or an expected reward is omitted may lead to frustration-related activities, such as redirected behaviour, which could in turn lead to abnormal behaviour and welfare issues for the animals (Kuhne *et al.*, 2011).

CASE STUDY: ENRICHED CAGE FARMS

RIDGEWAY FOODS (EX-STONEGATE), WOLVERHAMPTON

In both 2016 and 2015, Viva! investigators visited an enriched cage farm in Wolverhampton and dismal conditions were documented for the caged birds housed there. Findings from the 2016 visit were featured in Independent in October 2016 (Jeory and Forster, 2016).

In 2016, it was announced that Stonegate's caged egg production was taken over by Ridgeway Foods, and it retained its free-range and organic egg production (which means these eggs continue to trade under the Stonegate brand) (Davies, 2016a). Both the cage and free-range parts of Stonegate have supplied the UK's leading supermarkets with eggs, including Sainsbury's, Waitrose, Tesco and Asda. The company has an annual turnover exceeding £100 million. It is unclear which supermarkets Ridgeway Foods now supplies with their caged eggs.

Stonegate claim that controlling feed, water, temperature and lighting intensity reduces stress to a minimum, and there are no images of hens in cages (Stonegate website, 2016b).

Thousands of birds had been debeaked, and were living in crammed, filthy cages. As with all the farms visited by Viva! many individuals were suffering feather loss, and some had skin underneath that was red and sore. Some were almost entirely bald.

"Beak trims cause tissue and nerve damage, as well as removing receptors for touch, taste, pain and temperature. Removing the tip of the beak causes acute and possibly chronic pain, and is a practice that is inhumane and unnecessary. Birds that are properly cared for and have sufficient space do not need to have this painful procedure performed"

Dr. Lee Schrader, DVM, veterinary internal medicine specialist



The Stonegate website features images of uncaged hens despite the fact that the company has sold its free range and organic part of the business (Stonegate website, 2016a) © Viva!



Conditions at Stonegate farm are anything but 'enriched' for the thousands of birds crammed into cages there © Viva!

LAYING HENS: THE INSIDE STORY

“The poor alignment of upper and lower beak edges indicates sloppy beak trimming – which will make it difficult for this hen to pick up food. The upper trim is probably excessive”

Andrew Knight DipECAWBM (AWSEL), DACAW, PhD, MRCVS, SFHEA

“The number of birds seen with feather loss indicate poor management and poor welfare of the birds in this facility”

Dr. Lee Schrader, DVM, veterinary internal medicine specialist

The cage floors were covered with faeces, and dead hens were documented rotting underneath the cages. These conditions are a far cry from those portrayed on the Stonegate website (Stonegate website, 2016b).



Beak trimming is a routine mutilation carried out on egg laying hens when they are only a day old. The consequences of which can last a lifetime © Viva!



One of the birds observed at a Stonegate farm with extensive feather loss © Viva!



A dead bird lies in the ‘nest box’ area of the Bird Bros farm in Bedfordshire. The company states that hens lay eggs inside quiet, dark nest boxes (Bird Bros website, 2016a) © Viva!

K FRESH, WITHERNSEA

K FRESH COLONY CAGE FARM

In 2015, Viva! visited an enriched cage unit at Withernsea on the East coast of England owned by K Fresh – a company claiming to be ‘enriched colony specialists’, pioneers of this type of housing for laying hens, and which has ‘invested heavily in the UK adoption of the enriched colony system’ (K Fresh website, 2016a).

Like many egg supply companies, K Fresh supplies retailers with both free-range and ‘value’ eggs, and their brands include ‘Eco Option’ and ‘Simply Eggs’. The company states on its egg boxes that the hens live in a sustainable, low carbon footprint, enhanced climate environment. Grass is illustrated on the boxes, even though hens on the K Fresh farm will never experience it.

A 2010 YouTube promotional video by K Fresh of the farm visited by Viva! shows apparently healthy, fully-feathered birds in cages besides the director of K Fresh (Meepmeepcreative, 2010). In the video, K Fresh makes several statements about the benefits of enriched cages which could be construed as misleading on the basis of the footage obtained by Viva! on the same farm.

In one huge, dusty and filthy shed, 20,000 birds were crammed in cages stacked from floor to ceiling. Hens in the shed were severely restricted in their movement and Viva! investigators documented the birds frantically flapping in apparent frustration inside the cages.



K Fresh eggs mask the cruelty behind misleading labelling



One of several dead hens documented at K Fresh

The hens at K Fresh have no mental stimulation, nothing to keep themselves occupied, no privacy from others, and are living on harsh, sloping wire floors. Investigators documented individuals suffering extensive feather loss, and dead birds who had been left to rot in front of cage mates. This level of contempt for the well-being of animals supposedly in the care of this company is appalling.

“Multiple dead birds are seen in the facility. Several bodies are infested with maggots. Dead birds are a source of infection and will attract insects and vermin which can carry disease to the other birds. The presence of dead birds indicates poor management and poor monitoring of the birds”

Dr. Lee Schrader, DVM, veterinary internal medicine specialist

“There is marked feather loss, and feathers are in poor condition. Possible causes and contributing factors are injurious pecking, abrasion, malnutrition, chronic illness”

Andrew Knight DipECAWBM (AWSEL), DACAW, PhD, MRCVS, SFHEA



K Fresh 2010 promotional video outlining the ‘welfare benefits’ of enriched cages. Viva! reveals this to be a whitewash (SOURCE: K Fresh, 2010) © Viva!

LAYING HENS: THE INSIDE STORY

In the 2010 video, K Fresh state: "Colony birds have the best feathers at end of lay" (K Fresh, 2010). Viva! however, documented extensive feather loss and evidence of beak trimming.

K Fresh claim that their birds are 'relaxed', of the same 'family', and also 'sisters' who recognise each other (K Fresh 2010). Also that the reason for housing 90 birds to one cage is that this is the maximum number of individuals who can recognise each other (K Fresh, 2010).

"This bird has a prolapse of the oviduct. This can be caused by forcing the birds to begin laying when they are too young, trying to pass eggs which are too large, or poor nutrition. A prolapsed oviduct is difficult to treat and causes pain. It is a sign of poor management"

Dr. Lee Schrader, DVM,
veterinary internal medicine
specialist

"This hen has a cloacal prolapse. The very high rates of egg-laying that occur in hens genetically selected for very high productivity probably increase the risks of this. The prolapsed tissue is vulnerable to dessication (drying out) and injury, and is likely to be pecked by bored, frustrated hens, which can lead to injury and ultimately, cannibalism"

Andrew Knight DipECAWBM
(AWSEL), DACAW, PhD, MRCVS,
SFHEA



Viva! investigators documented beak trimmed hens at the K Fresh farm with evidence of IFP, despite past claims by the company that there is 'no aggression', and that birds are 'relaxed' and living in 'harmony' © Viva!



The company evokes the notion that birds live in harmony in the cages, that 'there is no aggression', and the birds are 'completely at peace' © Viva!



A hen with a prolapse observed on the K Fresh farm © Viva!

BIRD BROS, BEDFORDSHIRE

Viva! investigators, as well as founder and director of Viva! Juliet Gellatley, visited the ironically-named ‘Sunny Farm’, owned by the company Bird Bros in Bedfordshire twice during 2015. In 2016, the investigation received huge media coverage in a leading newspaper, the *Daily Mail* (Poulter, 2016).

Bird Bros supplies over 3 million eggs a week nationally to independent shops, high street multiples, caterers and wholesalers. The company has invested £4.5 million on a packing centre and offices and has vehicles that transport over 150 million eggs a year. Leading British supermarket chains are stocked with Bird Bros eggs, and the company states that up to 20 per cent of their eggs are supermarket branded (PackagingBR website, 2015). Bird Bros has over 40 different lines of eggs, including the brand ‘Bloomin’ Big Eggs’.

The farm visited by Viva! houses 455,000 ‘Bovan brown’ hens and the sheds were upgraded in 2011 after an investment of over six million pounds (Farming UK, 2015a).

“This hen has a large tumour on her head. This will affect her ability to see, as well as to eat and drink. This hen is suffering and should be humanely euthanized”

Dr. Lee Schrader, DVM, veterinary internal medicine specialist



A hen with a head tumour, filmed by Viva! investigators © Viva!



Viva! Bird Bros investigation in Mail Online during 2016 (Poulter, 2016)



Bird Bros farm (2015) © Viva!

“It is likely that this bird is suffering from a head tumour. A tumour of this size is definitely likely to be causing some discomfort to this individual. Other possible causes are an abscess (in which case the bird would be very ill), or a non-cancerous tissue overgrowth (which is extremely unlikely, to impossible)”

Andrew Knight DipECAWBM (AWSEL), DACAW, PhD, MRCVS, SFHEA

Bird Bros states: “This enriched colony design has been carefully developed over the last ten years to provide the best possible conditions for large groups of laying hens” (Bird Bros website, 2016a). Conditions in the huge, filthy, dusty shed on Sunny Farm could hardly be the ‘best possible’ however.

The company states that the cage design allows hens to behave naturally by perching, scratching and nesting, also that “hens can stand on comfortable perches and lay eggs inside the quiet, dark nest boxes” (Bird Bros website, 2016a). Yet the company provides the bare minimum enrichment required by law, as investigators

LAYING HENS: THE INSIDE STORY



A hen filmed at Bird Bros by Viva! with overgrown claws – an indication that the scratch pad is inadequate © Viva!

have documented. 'Nest boxes' consist only of two flaps of plastic hanging down from the top of the cages, and some cages had nest boxes with no comfortable substrate under the plastic flaps. Frustration at not being able to nest comfortably is a severe problem for caged hens.

Viva! also documented hens at the Bird Bros farm with overgrown claws which curled around the excruciatingly uncomfortable and injurious sloping wire mesh floor. One bird had an apparently broken wing, and others lay dying on the cage floor. As with all the enriched cage farms visited by Viva!, investigators filmed birds with severe feather loss. Dead birds left to rot were filmed decomposing underneath the cages.

This is a thoroughly depressing, frustrating and painful existence for these birds. Worryingly, Bird Bros claims that their hens have longer cycles of egg laying – until they are 84 weeks of age – which means the birds will be confined in these conditions for longer.

Viva! investigators observed an extensive red mite presence, which may have led to this extent of feather loss. However, IFP or an inadequate diet may also be contributors.

"There are multiple causes for feather loss in birds. Poor health, stress, lack of water and food, parasites, and damage caused by other birds can be factors. The number of birds seen with feather loss indicate poor

management and poor welfare of the birds in this facility"

Dr. Lee Schrader, DVM, veterinary internal medicine specialist

"This is severe feather loss which was most likely caused by feather pecking and abrasion from the cage. Subordinate chickens cannot escape dominant chickens in these small confines and resultant feather pecking. To avoid this, and related outbreaks of cannibalism, chickens are routinely beak-trimmed, which is acutely painful, and likely causes significant long-term, ongoing pain. This chicken is clearly beak-trimmed but the other shown is not or minimally trimmed, which may indicate the cause"

Andrew Knight DipECAWBM (AWSEL), DACAW, PhD, MRCVS, SFHEA



FREE RANGE EGG FARMS

The free-range sector is now a big, and growing, business for the egg industry. Forty seven per cent of eggs laid in the UK in 2015 were from hens housed in free-range units (including an estimated 2 per cent organic) (Egg Info website, 2016).

Eggs sold as free-range are laid by hens who have access to an outdoor range via pop holes. However, competing prices and high demand has led to egg prices falling and farmers housing huge 'flocks' to yield a greater output of eggs. The EU Welfare of Laying Hens Directive states that stocking density can be up to 2,500 hens per hectare (Council Directive 1999/74/EC. 1999).

Undercover investigations by organisations such as Viva! into the free-range egg industry have revealed conditions for birds to be a far cry from those which many consumers would expect from the words 'free-range'. The reality of commercial free-range egg production means birds are often free ranging in name only. Aside from a miserable life on farms, consumers are also often unaware that supporting the free-range egg industry means supporting the mass killing of baby male chicks, beak mutilations and a brutal death at the slaughterhouse. Companies operating free-range units also often operate cage units and so consumers are often unwittingly supporting this side of the industry too. Such companies include Bird Bros Ltd. (Bird Bros website, 2016) and Noble Foods (Noble Foods website, 2016).

Information on how individual non-cage laying hens use space and the spatio-temporal variation in their space use is poorly understood (Daigle *et al.*, 2014); however, it is clear that IFP remains a widespread problem, and beak trimming is still the standard 'solution'. A practice that is aggressively defended by the free-range egg industry. When efforts have been made to ban beak trimming, the Chairman of Ranger Magazine, of the British Free-range Egg Association (BFREA) (which is sponsored by companies such as Noble Foods, Hy-Line and Stonegate), stated: "We must keep lobbying our MPs so that they are fully aware that our industry is not ready for this legislation to be put into place" (Ranger, 2015a).

The problems affecting free-range hens are not restricted to the UK. A 2013 study on Australian free-range farms concluded: "Most of the "free-range"

eggs currently available in supermarkets do not address animal welfare, environmental sustainability, and public health concerns but, rather, seek to drive down consumer expectations of what these issues mean by balancing them against commercial interests. This suits both supermarkets and egg producers because it does not challenge dominant industrial-scale egg production and the profits associated with it" (Parker *et al.*, 2013).

A LIFE INSIDE

Most hen flocks on commercial free-range farms run into many thousands. As mentioned, it has been demonstrated that, on average, less than 10 per cent of the hens on free-range farms are outside at any given time, and many never go outside at all (Hegelund *et al.*, 2005).

The same problem faces free-range broiler chickens (see Viva!'s upcoming report on Britain's intensive broiler industry, 'Life is Cheep'). A study of approximately 800,000 free-range broilers revealed that, whilst regulations require birds to have access to outdoor areas for at least eight hours a day, "the maximum number observed outside during daylight hours at any one time was less than 15 per cent of the total flock" (Dawkins *et al.*, 2003).

Farmers have admitted themselves that most hens never leave the sheds (e.g. Michael, 2015), and a 2006 literature review by Organic Research Centre (ORC) – which claims to be the UK's "leading independent research centre for the development of organic food production" (Organic Research Centre website, 2015) – has stated: "Many of the birds in free-range poultry production systems do not the leave the house" (O'Brien, 2006).

This means that the vast majority of hens on farms spend most of their lives in vast, stinking, overcrowded sheds.

There are several reasons why a hen will not venture outside. Mainly it is due to the unnaturally large number of birds coexisting, and a failure to provide the conditions necessary to encourage them to utilise the outdoor space. Laying hens use an outside range more if it is of good quality, for example with presence of cover in the form of trees, bushes and hedges (Nicol *et*

LAYING HENS: THE INSIDE STORY

al., 2003), yet even birds who do go outside onto the range often stay close to the shed because of the frequent lack of such cover.

Hens who are able to access an outside range from an early age are also more likely to range later in life, as was admitted to a Viva! investigator during the 2010 'Happy Egg' investigation. Overwhelmingly, however, hens on free-range farms are housed inside until they are between 12 and 18 weeks before they reach their productive life on a free-range farm.

According to DEFRA Organic Standards 2006 based on, and complying with, Council Regulation (EEC) No. 2092/91, as amended, hens can be housed inside until 18 weeks. Soil Association also allows pullets of 18 weeks old considered 'non-organic' to be used when farmers are establishing a herd or flock for the first time and 'suitable organic animals are not available' (Soil Association, 2014).

As hens are sent to slaughter at just 72 weeks of age, a large proportion of their lives will be spent walking around inside dark sheds with limited or no natural sunlight.

Another reason that hens will not venture outside onto a range is because hens can be fiercely territorial, and so dominant individuals will guard the pop holes. Subordinate birds may never pluck up enough courage to venture out of the shed.

'HAPPY EGG' FARMS

The Happy Egg Company, belonging to the company Noble Foods, is one of the UK's largest free-range egg brands. This company produces 60 million eggs a week, including those from caged laying hen farms, one of which was visited by Viva! in 2010 (Viva! website, 2015a). Noble Foods supplies almost all of the major supermarket chains such as M&S, Tesco (including over a thousand Tesco Metro's), Morrisons, Co-op and Asda. It also supplies 'Woodland' eggs for Sainsbury's.

The company describes itself as being 'independently monitored for welfare' by the RSPCA's 'Freedom Food' standard (or, as it is now called, 'RSPCA Assured') and has received the leading industry accolade 'The Good Egg Award' from CIWF and is a member of the European Animal Welfare Platform (Noble Foods website, 2016a). Happy Egg promotes itself as an ethical company operating high welfare standards (Happy Egg website, 2016).

The public, in short, are being sold a lie. The adverts used by Noble Foods to sell their 'Happy Eggs' bear little relation to the truth. One advert illustrates a small-scale egg farm (with a modest shed in the opening shots), which is very different from the highly-intensive method used by the company to produce eggs. During the Viva! investigation, a Noble Foods worker even admitted to the investigator that the advert is misleading and the reality, in fact, is very different.

CASE STUDY: FREE RANGE FARMS

'HAPPY EGG' FARM

2010 INVESTIGATION (STRATHRUDDIE FARM, LOCHGELLY AND BISHOPS HILL FARM, KINNESSWOOD)

In 2010, at one of the 'Happy Egg' farms filmed by Viva!, hens free to roam on lush fields, but featherless individuals on muddy concrete, wading through water. There were crowded masses at the pop hole entrances, refusing to go outside. 'Environmental enrichment' on the range, such as the swing, was admitted by a worker be a "gimmick." Other forms of 'enrichment' were not maintained, including outside sandpits which were so water-logged they had become dirty paddling pools.

Viva! observed that the vast majority of birds chose to stay inside the sheds and workers confessed that they dissuade the hens from laying outside as this increases their workload.

One of the sheds housed 7,800 birds in conditions that were so bad some hens were scrawny and practically bald – which goes against the image of healthy free-range birds. Feather pecking by other birds was almost endemic on the visited farms – a sign of stressed birds in an unnatural environment. Workers admitted that, despite the routine beak trimming being carried out, IFP is common.

One shed visited by the investigator was infested with red mite. At least one dead bird was observed, and another so ill she was unable to walk. This individual was abandoned to a so-called 'sick pen' and left on bare wire mesh with other sick and injured birds.

On the farm, birds were shocked into compliance with wires. This disturbing practice is prohibited by RSPCA, as outlined in the Freedom Foods guidelines (RSPCA, 2013). The use of wires was being used to prevent birds smothering each other (a symptom purely of over-crowding), and to deter birds from defecating near feeders and drinkers. Viva! filmed a worker stating that RSPCA inspectors would be lied to when they came to visit, by being told that the electric wire was always turned off.



Viva! carried out an investigation at two Scottish farms supplying the Happy Egg company and found conditions to be far from those depicted on the company's TV adverts and egg packaging © Viva!



This major Viva! investigation into the egg industry shows a very sad story – one of disease, incarceration, mutilation, short lives and electric shocks © Viva!

When their time on this Happy Egg free-range farm came to an end, the hens faced a gruelling 214 mile trip to the slaughterhouse at just 72 weeks of age.

ROWBOTTOM FARM, SPALDING

In 2015, Viva! visited another free-range and barn unit – Rowbottom Farm – in Spalding which supplies Glenrowan Farm eggs to local retailers.

The floor inside the shed was gridded metal, and the air filthy and dusty. Extensive feather loss was observed.

“These carcasses represent both an infection hazard, and also a food source for rats, which can then attack living hens, especially if ill or weak”

Andrew Knight DipECAWBM (AWSEL), DACAW, PhD, MRCVS, SFHEA

On another free-range farm, Viva! investigators found a bird who was clearly very sick. She was swaying on the spot and apparently unable to walk.

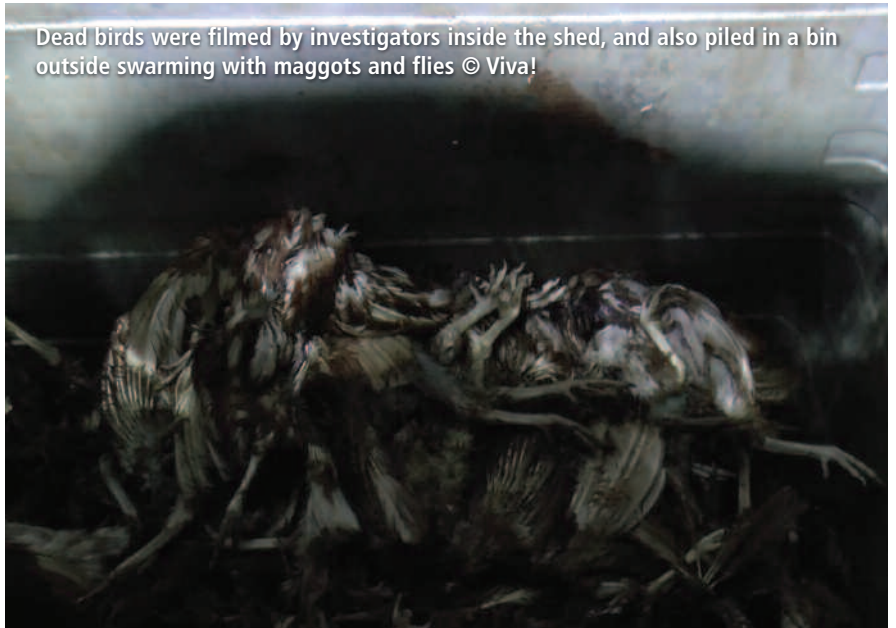
“This bird, who was housed on a free range farm, was suffering very severe feather loss. Most likely causes to this are injurious feather pecking. An immediate consequence of this extent of feather loss is an inability to thermoregulate (stay warm) unless fat, but subordinate (pecked) birds might also have less access to food. Investigators reported this individual was apparently unable to move, and swaying. Another common consequence from persistent pecking is skin injury and ultimately cannibalism”

Andrew Knight DipECAWBM (AWSEL), DACAW, PhD, MRCVS, SFHEA

Investigators documented hens trapped in a huge, windowless and filthy shed. Investigators visited this farm in the day, and no hens were observed outside. It is therefore unclear how many hens go outside the shed, if any © Viva!



Dead birds were filmed by investigators inside the shed, and also piled in a bin outside swarming with maggots and flies © Viva!



ORGANIC

Organic food production is currently regulated by legislation in the EU. This requires each Member State to have a Competent Authority that is responsible for ensuring the rules on organic production are correctly applied. DEFRA is the Competent Authority for the UK. Farmers must be registered with an approved organic control body, and must also be inspected at least once a year to ensure that they meet the EU-wide standards.

All food sold as organic in Britain must be produced in accordance with the European standards set out in European Council Regulation 834/2007, Commission Regulation 889/2008 (as amended) and Commission Regulation (EC) 1235/2012 (as amended).

In March 2014, the European Commission adopted legislative proposals for a new Regulation on organic production and labelling of organic products. It aims to adjust the EU legislation to the current situation in the European organic market, which has quadrupled in size over the last 10 years or so. The situation may well change once Brexit (Britain withdraws from the EU) is implemented.

ANTIBIOTICS AND VACCINATION

Antibiotics are a major part of the conventional meat industry. And the drugs aren't just used to treat sick animals – they're also administered frequently to farmed animals. Growth promoters are banned; however, some antibiotics have a secondary effect of promoting growth.

In Britain, it is estimated that around 50 per cent of all antibiotics are used in animals (Davies, 2014). The use of antibiotics in the British pigs and poultry industry is now at least three and a half times higher per unit of livestock than it is in the Netherlands and at least four times higher than Denmark (Driver, 2016).

The Soil Association runs an 'Alliance to Save our Antibiotics' campaign to highlight the impact of large volumes of antibiotics used in intensive animal farming, and one of the focuses is the drug residues routinely found in human food (Soil Association website, 2016).



LAYING HENS: THE INSIDE STORY

Organically farmed animals are treated less frequently than those farmed intensively, and the routine preventative use of antibiotics is banned throughout the EU in organic systems, as well as the use of 'critically important' antibiotics except in individual, exceptional cases – mostly relating to the use of vaccines. There is a coccidiosis vaccine which can be used in certain circumstances (Berg, 2002); however, medications cannot be added to organic feeds to control the intestinal parasite infection, coccidiosis.

IMPACTS ON WELFARE

While the misuse of antibiotics is rampant in animal farming, antibiotics should be used to treat sick animals. The banning of antibiotics and vaccinations can therefore have a negative effect on birds living in sub-optimal conditions. In 2001, it was highlighted that most of the health and welfare problems found in conventional chicken systems for loose housed or free ranging birds can also be found on organic poultry farms (Berg, 2002). Hens can suffer for days, and often weeks, with painful illnesses that antibiotics would help on organic farms.

Organic farms, like other farms, have come under fire for housing animals in cramped conditions. Multi-tier aviary systems, where conveyor belts below the tiers remove the manure at regular intervals, are becoming

more common in organic egg production (Steenfeldt and Nielsen, 2015). Stocking densities on organic farms, under EU legislation, can be high (up to 2,500 birds per hectare) and the resultant constraints have a significant effect on hen welfare. A 2015 study has revealed that plumage condition, presence of breast redness and blisters, pecked tail feathers, and perch use are affected by high stocking density and simultaneous reduction in access to resources (Steenfeldt and Nielsen, 2015). Hens raised on organic farms also end up in the same slaughterhouses as hens raised in other farming systems, and are killed at a day-old if they are male.

New brands of organic eggs include Mac's Farm – launched in the south east of England by Noble Foods (The Mac's Farm website, 2016). The website of Mac's Farm features children cuddling hens, and their Facebook page claims opposition to intensive farming, and advocates its hen rehoming work (The Mac's Farm, 2016a). The farm has also been featured on Jamie Oliver's TV show (Clarke, 2015b). It carries out fundraising for charities in Africa and the UK and is involved in local community initiatives (The Mac's Farm website, 2016).

Noble Foods has also launched an organic version of the Happy Egg, which was presented with the Marketing Initiative of the Year Award by BFREPA in November 2014 (Ranger, 2015).



CASE STUDY: ORGANIC FARMS

MAC'S FARM, EAST SUSSEX

Mac's Farm received the Compassion in World Farming Good Egg Award in 2012 and were finalists in the 2013 Farmers Weekly Awards, Poultry Producer of the Year Category (Love Free-range Eggs website, 2016).

The company supplies supermarket Tesco (Clarke, 2014; Ditchling Village Association website, 2016) and Co-op, Neesa and Ocado (Love Free-range Eggs website, 2016). It falls under the 'RSPCA-Assured' and 'Organic Farmers and Growers' schemes, and is portrayed as a 'model' farm; yet, whilst the farm was undoubtedly better than most visited by Viva! during this investigation, similar problems were observed on individual hens with regards to feather loss and the overcrowding of sheds. There was also a hen with a severely deformed beak, and a dead hen lying on the filthy floor.

LAWN FARM, WILTSHIRE

Lawn Farm is a Soil Association and Stonegate, organic and free-range farm in Wiltshire that supplies eggs to supermarket Waitrose (Millett, 2016; Farming UK, 2014). The farm also has rearing sheds, partners with hatchery Joice & Hill Poultry, and sends young birds to other farms (Farming UK, 2014). In the two sheds – each housing around 2,000 hens – birds were observed with sore-looking, featherless patches on their backs and abdomens.



Hens at this Soil Association farm had red raw skin showing on abdomens and backs © Viva!



Is this the 'face' of high-welfare farming? © Viva!

FAIRBURN EGGS

LJ Fairburn & Son in Lincolnshire is RSPCA-approved, organic and free-range. The company supplies eggs to Costco (LJ Fairburn & Son website, 2015), and the supermarkets Sainsbury's (Twitter website, 2016) and Asda (Asda website, 2016). The company also has had contracts with ALDI and Iceland (LJ Fairburn & Son website, 2015) and Co-Op (Davies, 2014a). Viva! investigators observed hens in crowded conditions and perching near the rafters on wire, possibly to escape the crush below.

LJ Fairburn supply eggs to retailers from different farming systems – free-range, barn and enriched cages – which means that consumers may be unwittingly funding the cage systems when purchasing what they believe to be high-welfare eggs.



DEATH, INJURY AND DISEASE

The Welfare of Farmed Animals (England) Regulations 2007 and similar regulations in Scotland and Wales stipulate that, on the basis of their genotype or phenotype, animals must be housed without detrimental effects on their health or welfare. Despite this, alterations of the genetic material of hens have led to behaviours that have seriously impaired health and welfare, including osteoporosis (ie brittle bones, characterised by a progressive decrease in mineralised structural bone, Hester *et al.*, 2013). In broiler chickens genetic selection has led to serious impairment, such as lameness.

The farming industry claims that hens housed in cages within sheds are disease-free and safe (eg Davey, 2014), yet aside from the psychological suffering, hens suffer serious health problems as a direct result of living in this environment, including extensive injuries such as fractures. The restricted locomotor opportunities in the cage environment lead to physical impairments, such as poor skeletal strength and disuse osteoporosis.

Hens are also susceptible to disease such as fatty liver haemorrhagic syndrome (also referred to as fatty liver syndrome) which is the same disease that ducks and geese suffer in foie-gras production. Viva! has exposed production of this cruel 'luxury' product since 2007, and persuaded major chefs and retailers to stop selling it (Viva! website, 2016a). Excessive dietary energy intake due to a high level of egg production is believed to be the cause of fatty liver haemorrhagic syndrome in hens. Birds with this disease have large amounts of fat deposited in their liver and abdomen which can result in an enlarged liver that is easily damaged and prone to bleeding. In some cases the disease is fatal, usually as a result of blood loss from an internal haemorrhage. Haemorrhages often occur when a hen is straining to lay her egg. Fatty liver haemorrhagic syndrome is one the major causes of mortality in laying hens. Birds housed in cages are more likely to be affected as they are unable to exercise to burn off the extra dietary energy. A reduced housing density has been demonstrated to offer protection from hepatic damage in laying hens (Ma *et al.*, 2014).

Hens can also trap their body parts in cage housing and, in enriched cages, trapped birds who cannot extricate themselves from cage bars or doors may suffer from severe trauma or death.

CALCIUM DEFICIENCY AND SKELETAL FRACTURES

The incidence of weakened bones and fractures is affected by genetics and strain, nutrition, housing system and methods of depopulation, and it is exacerbated by the high egg output of modern hybrid strains (FAWC, 2010). Since the 1950s, the physical demands on hens and broiler chickens has increased remarkably (see Viva!'s report on Britain's intensive broiler industry, 'Life is Cheep'). There is an escalating demand for productivity and efficiency. On modern-day farms, hens are bred to produce large numbers of eggs which depletes their natural reserves of calcium and phosphorous.

Selective breeding, a restrictive environment, intense lighting and high protein feed on modern-day farms mean hens can now produce over 300 eggs a year. However, breeding companies worldwide are striving continuously to bring the production results of laying hens to a higher level. Some, such as Hendrix Genetics – who's motto is 'Eggs Earth Earnings' (ISA Poultry website, 2016), are already looking towards pushing hens to laying 500 eggs over 100 week cycles (Clarke, 2014a; Hendrix Genetics website, 2016). In November 2015, it was reported that flock performances were already at 500 eggs and it was stated that 'flock cycles of 100 weeks will be the new standard in 2020' (World Poultry website, 2015).

The company states: "Our mission is to contribute to profitable and sustainable egg production by improving the economic life of laying hens. This involves breeding hens that with each generation lay more eggs for a longer period of time... We own the largest gene pool of pedigreed pure lines in the world and collaborate closely with renowned academic and research institutes in numerous research projects in order to achieve our mission. The progress we are witnessing every year in our breeding program, and in production results obtained by egg producers, gives us great confidence that our breeding objective of 500 first quality eggs by 2020 is well within reach" (Hypor website, 2013).

The ability of hens to lay clutches of eggs has been utilised by the egg industry to develop the birds we

LAYING HENS: THE INSIDE STORY

have now, laying an egg a day without the need for fertilisation. In stark comparison, wild hens lay only 20 eggs in an entire year. Hens are not egg-laying machines – they are living, sentient creatures and their bodies can only ‘work’ up to a certain point.

This high productivity and fast growth can result in abnormal skeletal development or rickets in the growing chick, and fractures and osteoporosis in older birds. Newly hatched chicks require an immediate supply of dietary calcium for bone development, and an absence of calcium or vitamin D can lead to health problems. The daily calcium requirement for egg shell production is more than the diet can supply, or the bird can absorb, even though food is supplemented with granular calcium on farms. When the hen experiences calcium deficiency, she can mobilise skeletal calcium, which means the onset of osteoporosis.

Osteoporosis is a pathological condition, which is associated with progressive loss of structural bone throughout lay, thereby rendering bones fragile and susceptible to fracture. In severe cases, it can lead to collapse of spinal bone and paralysis. In 2013, FAWC stated that bone fractures are “a major cause of suffering afflicting approximately half of all laying hens in this country” (FAWC, 2013). Fractures are common but most are detected after slaughter, if at all. They are referred to as either ‘old’ fractures – those which occurred during the laying period – or ‘new’ fractures – those which occurred during depopulation, transport or slaughter. A considerable number of laying hens are subjected to pain as a result of bone fractures (FAWC, 2010).

Bone fractures are acutely and chronically painful in humans. In hens, bone marrow and growth plates are innervated and there are nociceptors (pain receptors) in the outer layer of the bone. It is likely to be extremely painful for these birds also. Acute pain is associated

“This is a sick bird. The poor quality photo angle means it is difficult to be sure, but she appears to have collapsed. If the eyes were persistently closed that also can be a sign of considerable illness”

Andrew Knight DipECAWBM (AWSEL), DACAW, PhD, MRCVS, SFHEA



Life on a wire floor causes pain, injury and frustration for millions of hens each year © Viva!



with the initial trauma and chronic pain arises from the increased sensitivity of nociceptors and the inflammation in surrounding tissues. These effects are worse and healing takes longer if the fracture site is mobile during repair. This will be a particular problem when a hen must move to reach food, water and a nest box, especially for those parts of the body, such as the legs, that cannot be held immobile.

Thirty six per cent of hens in 67 flocks housed in enriched cages have been demonstrated to be suffering fractures of the keel bone (DEFRA, 2004). Since 2010, similar evidence of a high prevalence of keel bone fractures has been demonstrated by researchers at University of Bristol (Nasr *et al.*, 2012a; Richards *et al.*, 2012). Deformation of the keel bone is the result of hens sitting on perches, particularly prior to ossification, and collisions with perches which can break keel and other bones.

Cage life also means living on sloping wire mesh, which causes painful foot injuries. The slope puts pressure on the hen's toes, causing damage to the foot, and the cage does not allow foraging by scratching and pecking at the ground which leads to hen's claws growing long or twisted, and be torn off. Claws can grow so long they twist around the wire mesh of the sloping cage floor.

Instead of a natural, varied diet of insects, seeds and fruits, a laying hen is fed a monotonous high protein diet. A natural diet may consist of small stones containing calcium carbonate and calcium silicate, which would be important for the digestive process in the hen's stomach as well as for the formation of the skeleton and the eggshell.

RED MITE (DERMANYSSUS GALLINAE)

Red mite (*Dermanyssus gallinae*) infestations, as observed in Viva!'s 2010 'Happy Egg' investigation (Viva! website, 2015a) and the visit to Bird Bros, are yet another brutal assault on hen welfare inside modern-day egg farms, and they adversely affect hen health and welfare around the globe. Both directly and through the mites' role as a disease vector (George *et al.*, 2015).

The red mites cause extreme irritation for already suffering hens. Compared with other poultry ectoparasites – such as fowl ticks, lice and flies, mites are considered to be the most destructive. Skin irritation, reduced plumage quality, dermatitis, feather

pecking and cannibalism, weight loss and anaemia and mortality in cases of extreme infestation are all consequences of red mite infestation. The nocturnal behaviour of the mites, which suck the birds' blood during periods of darkness and hide themselves in farm gaps and cracks during the daytime, means their complete eradication is difficult and an infestation can cause extreme restlessness and stress for the birds, particularly at night. Additionally, the mite is also able to survive long periods of time in its surroundings without being on the host bird and without even having a single meal of blood. This means that even after the removal of the birds, the unit can remain infested for a long time (Mozafar, 2014).

Studies have revealed that an intact beak is important for reducing ectoparasitic infestations, yet the overwhelming majority of hens are subjected to beak trimming (Vezolli *et al.*, 2015). For example, in a 2011 study, beak trimmed hens had far higher ectoparasite numbers relative to hens with intact beaks, and the authors concluded that beak trimming impairs host grooming and contributes greatly to the high ectoparasite populations observed in commercial flocks (Chen *et al.*, 2011; Mullens *et al.*, 2010).

LIGHTING

Caged hens are commonly housed in closed sheds with artificial lighting and fan-driven ventilation. Unnatural lighting is another means of controlling the behaviour of hens, even though it can be detrimental to their welfare. The lighting on farms is usually kept low to reduce the hen activity levels but is kept on during many of the hours of darkness in winter in order to keep the hens laying all year round. However, natural light is important for hens, as they are diurnal (in other words, active in the day) and capable of utilising sunlight for vitamin synthesis. Daylight controls and triggers many of the hen's physiological processes. It also stimulates their metabolism, plays an important part in the formation of red and white blood cells and of vitamin D, and promotes the secretion of hormones necessary for growth and reproduction.

BREEDING LINES (PARENT BIRDS)

In commercial layer breeding programmes, which are extremely costly, selection addresses egg production, 'quality' and size. More than 40 different traits are selected for robust heart, lungs and other organs

LAYING HENS: THE INSIDE STORY

(British Poultry Council website, 2016). Today, selective breeding of commercial laying hen strains is carried out by only a few specialist primary breeding companies which operate throughout the world (British Poultry Council website, 2016). In 2011, globally, there were just two companies owning the breeds that all commercial laying hens originate from – Hendrix and Lohmann (CIWF, 2012).

Large companies breed from 'elite' stock (also known as the 'great grandparents') of different pure lines who are crossed (chosen because they exhibit the genetic characteristics or traits most desirable in the generation eventually reared for egg laying) to produce parent stock day-old chicks. Breeding stock birds produce different lines of offspring with varying genetic advantages. As breed lines are developed, only the desired sex is reared, and the other is killed after hatching (CIWF, 2012). Parent birds in turn produce commercial layer hens. These are sold to commercial egg farmers, and the eggs sold to consumers.

Egg layer breeding companies include Novogen (www.novogen-layer.com), Lohmann Tierzucht (www.ltz.de), Hendrix Genetics (www.hendrix-genetics.com) (which owns the brands ISA, Shaver, Hisex, Dekalb, Bovans and Babcock) and Hy-Line (www.hyline.com).

These companies have counterparts overseas. One of the largest company breeding and supplying day-old egg layer chicks to the UK egg industry is Lohmann GB, which is a partner of Lohmann Tierzucht – a company that claims to be the largest layer breeder company in the world.

The Lohmann Brown is one of the main breeds of laying birds. In October 2014, a subsidiary of Lohmann Tierzucht, H&N International, announced that they were to launch yet another breed of hen to the UK market named H&N Brown (Clarke, 2014b).

Blue Barns Poultry Farm is one of the largest suppliers of chicks in northern Britain, and produces more than two million pullets a year (Joice & Hill Poultry website, 2014) for customers in Northumberland, Yorkshire and Durham.

Hendrix Genetics is a huge player in the egg industry. It is a global company, multi-species (eg egg layers, turkeys, pigs and salmon), animal genetics company which sells parent stock to around 300 distributors.

Another German company, Tom Barron, sells a new breed, Novogen, and the company boasts to have sold, as at June 2015, 4 million chicks just three years after establishing (Ranger, 2015b). Previously, the company sold 7 million Hendrix chicks a year (Ranger, 2015b).

BREEDING LAYER HENS

Fertilisation in commercial chickens is usually the result of natural mating. However, in some cases, artificial insemination is commonly practised. The turkey industry especially depends on artificial insemination since natural mating is virtually impossible as a result of intense genetic selection for conformation and body weight (The Poultry Site, 2009). In the typical breeder house with thousands of birds, the entire sequence of behaviors do not always occur, and the courtship dance is frequently left out of the sequence. Chickens are polygynous but certain males and females selectively mate regularly. Some females in the flock will show avoidance to specific males, and therefore are rarely mated by those males (The Poultry Site, 2009).

Breeding stock of chickens are valued highly and pedigree farms are often located in remote areas where the sea borders the site to reduce the risk from airborne pathogens (Webster, 2011). Breeding hens tend to be reared in a barn system (CIWF, 2012). Within the breeding stock there may be mutilations to the male birds including dubbing (the removal of the comb with a regular pair of scissors) and de-spurring. De-spurring is the removal of the spur bud on the back of the male chicken's leg, using a heated wire.

Removing (parts of) the comb may have an effect on communication between birds. In red junglefowl, health, condition and social status affect comb size, a well-documented predictor of female choice (Parker and Ligon, 2002), and the comb is important for thermoregulation allowing for heat exchange during high temperatures (Hester *et al.* 2015). This dubbing is carried out on broiler breeds, for example the White Leghorns. Both male and female birds may also have their beaks trimmed, and the last joint on the medial and back toes cut off.

CATCHING AND DEPOPULATION

After around 72 weeks, regardless of the type of farm system she was raised in, the commercially-farmed hen's egg-laying ability starts to decline to the point where she is not considered profitable enough by farmers to keep alive. This is the time when egg production lessens before ceasing completely and moulting commences. In fact, once the hens have refreshed their plumage and the calcium in their bones is replenished, they return to almost peak egg production within a few weeks. This period can occur several times during a hen's natural lifetime, which can be over 10 years. Of course, in the egg industry, the hens are discarded in this period as they are considered of no economic value. In Britain, over 40 million so-called 'spent' hens are slaughtered each year (Humane Slaughter Association, 2014).

Chickens are highly susceptible to stress when they are captured and handled, and the depopulation of hens from cages has significant implications on their welfare. One study revealed that, during catching and crating, levels of the stress hormone corticosterone in caged hens were ten times higher than normal (Broom, 1990).

End-of-lay hens have low economic value and the skill level of workers is also low. Conditions are hot, humid, dusty and odorous for workers and there is huge

commercial pressure to 'process' the animals as quickly as possible. Catchers are organised into catching teams or 'gangs', typically consisting of four to six people (often more for end-of-lay hens), and they work under a catching Team Leader. It has been estimated that a typical rate of 5,000 hens are caught and loaded per hour per team of eight catchers (DEFRA, 2006).

During catching, hens panic, struggle and become injured. The last few birds in each cage have a greater space to evade capture, and their struggling often results significant damage to their legs, wings and (in particular) keel bones. Catchers chaotically thrust their hands into the cages, grabbing and pulling hens out one-by-one – by their legs, wings or heads. They are carried upside down to transport crates which can be the other side of the shed. Rough handling and complete disregard for the hens' welfare often leads to breaking bones in the process (Turner and Lymbery, 1999). Hens are calcium-depleted and fragile, which means individuals already suffering brittle bones are at an event greater risk of bone breakage from poor handling when being taken from cages (Webster, 2011). Spontaneous fractures occur in severely weakened bones, and the incidence of fractures is increased by trauma.



LAYING HENS: THE INSIDE STORY

Trauma during this period of the hens lives is caused by collisions with furniture or by poor handling (FAWC, 2010). Workers carry the hens, sometimes with more than three birds in each hand. They are swung around, bashed into other birds and structures such as doors, egg trolleys and crates. Their wings are often flapping, which can lead to broken wings and other injuries.

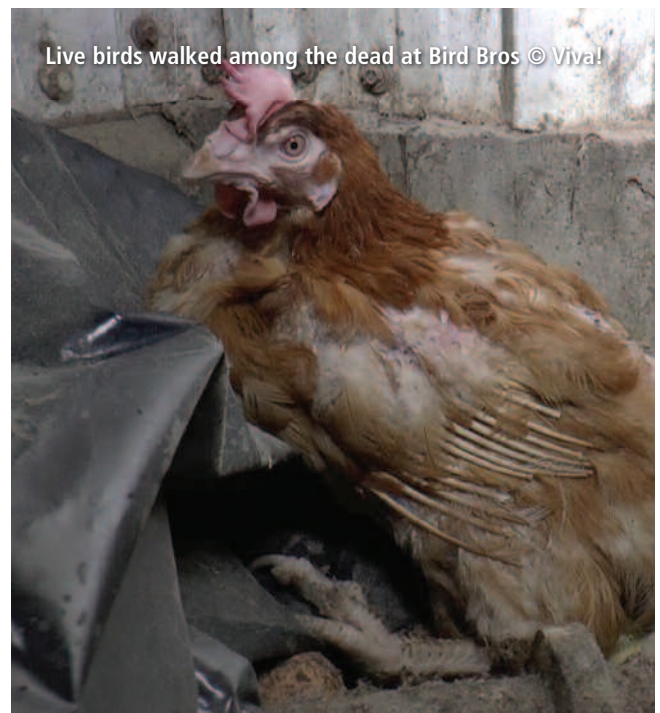
In 2009, FAWC stated: "FAWC has particular concerns about catching and handling of fracture-prone end-of-lay hens" (FAWC, 2009).

In 2006, two workers from the company Bernard Matthews were arrested and charged after being secretly filmed by undercover investigators from Hillside Animal Sanctuary 'playing baseball' with live turkeys (Hillside website, 2016). The RSPCA inspector who investigated the case stated that it was the 'worst case of animal cruelty' he had ever seen (Salisbury, 2011). The workers claimed that animal cruelty was institutionalised at the Norfolk facility. In 2007, Hillside Animal Sanctuary obtained further shocking footage of workers 'playing football' with turkeys (*Daily Mail*, 2007). Regardless of species, animal abuse is sadly inherent when there are large numbers of animals being handled by workers at high speeds.

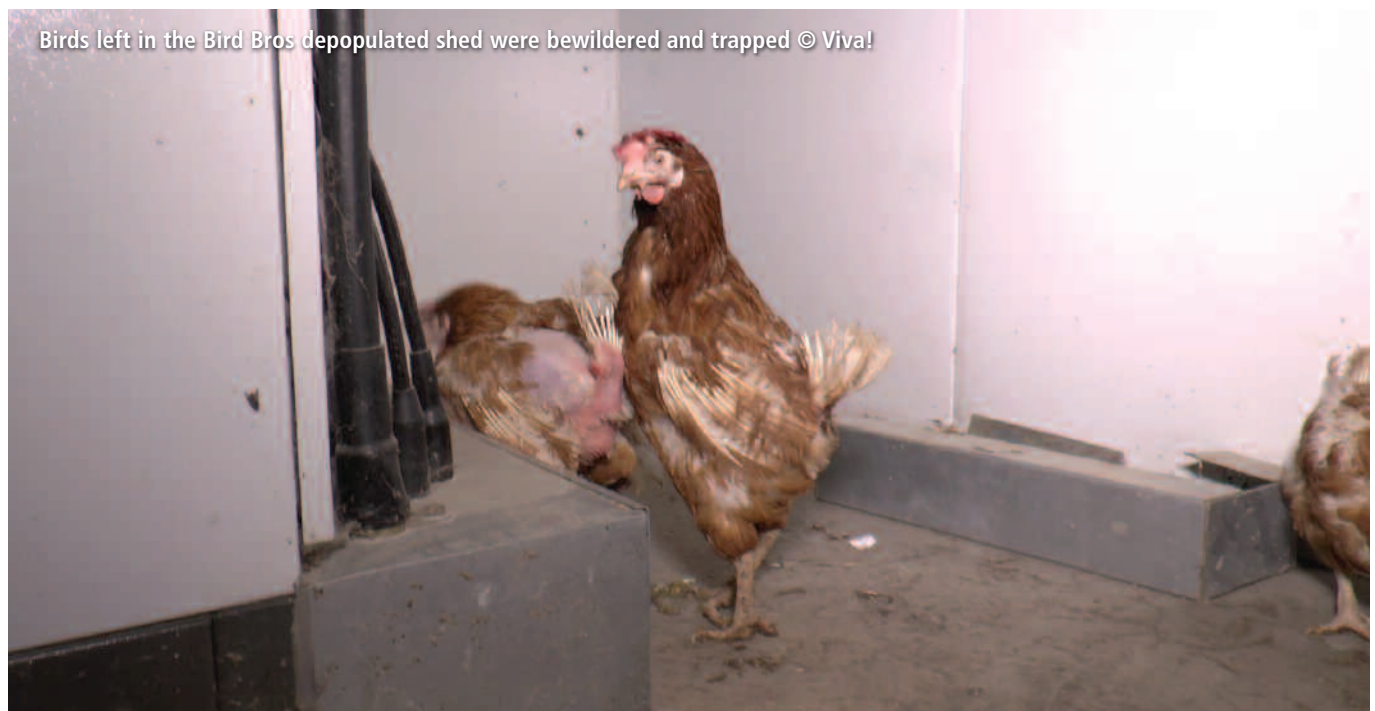
Prior to slaughter, hens are also starved for 12 hours so that their crops are not full at slaughter, as this could mean the carcass is 'contaminated'. Even 12 hours of food deprivation, when coupled with water deprivation, has been demonstrated to cause an

increase in plasma corticosterone concentration, as well as increased levels in the liver, an increase in the rate of gluconeogenesis and a decrease in the rate of glycogenesis (Ralph *et al.*, 2015). All of which indicate that the hens are suffering stress.

In March 2016, Viva! investigators made a return visit to Bird Bros and found cages empty as the farmer had depopulated the shed. They found dead and injured birds on the floor below the cages – those who were alive were hiding and appeared bewildered.



Live birds walked among the dead at Bird Bros © Viva!



Birds left in the Bird Bros depopulated shed were bewildered and trapped © Viva!



TRANSPORT

End-of-lay hens are considered a by-product of the egg industry. They are often treated appallingly during handling and slaughter, and there is now extensive evidence to demonstrate that this period of their lives is an incredibly traumatic experience for them.

The procedures used to handle and transport spent hens and broilers result in welfare problems for the birds which are often very severe. There is evidence for substantial emergency responses, such as adrenal cortex activity. There can also be birds dead on arrival at the slaughterhouse, bruising, and high incidences of bone breakage (Knowles and Broom, 1990).

Many hens loaded onto lorries destined for slaughter are lame and in pain. The Welfare of Animals (Transport) Order 2006 also requires that birds must be fit for a journey, yet FAWC has questioned whether hens with recent or new fractures should be transported at all (FAWC, 2010).

During transit, the birds are then exposed to a number of concurrent stressors – amongst them being thermal stress (either prolonged heat or cold stress), which constitutes a major threat to hen welfare (World Poultry website, 2013). Previous research into the microclimates of chicken transport systems has mainly focused on broilers, who suffer the highest dead-on-arrivals (DOAs) of all farmed animals.

Mitchell and Kettlewell, in 1998, examined the causes of thermal stress in poultry during transport, concluding that inadequate ventilation resulted in a heterogeneous distribution of temperature and humidity in vehicles, and that the existence of a thermal core in vehicles increased the risk of a heat stress (Mitchell and Kettlewell, 1998).

Aside from thermal stress, birds are negatively affected by rough driving, distance and length of transport,

unloading, and lairage time in slaughterhouses (Warriss *et al.*, 1992; Mitchell and Kettlewell, 1998; Nijdam *et al.*, 2004).

MacCaluim *et al.* (2003) studied the aversion of poultry to both thermal and vibrational stressors in a continuous free-choice procedure, and observed that birds significantly avoided the stressors (MacCaluim *et al.*, 2003).

Gregory and Austin (1992) examined the reasons for birds being DOA in a paper published in *The Veterinary Record*, concluding that over half the birds had died from heart failure and stating: “Presumably the physiological responses associated with the stress of catching, loading and transporting the birds had been too much for the cardiovascular system to cope with.” The second most common reason for mortality was found to be dislocation of the femur at the hip joint, which was associated with haemorrhaging. Other birds died from a crushed skull – a cause of death which occurred most frequently in transporters using plastic drawers. The researchers stated: “Insufficient care was taken to ensure that birds were crouching down when the drawers were being closed” (Gregory and Austin, 1992).

Prior to even reaching the slaughterhouse, hens endure the stress of catching, transportation and loading – procedures so stressful that they can cause birds to have heart attacks. After a nightmarish journey, bewildered hens are violently grabbed by workers, who then force their legs into shackles so that the birds are hanging upside-down. Many legs can be broken in the process and leg deformities and other existing injuries may exacerbate the pain for hens as their sensitive periosteum are pinched by the metal shackles.

Extreme crowding and rough handling during unloading and dumping in crates at the slaughterhouse leads to a relatively high number of birds recorded as DOA.



Plucked chickens on a rack in a slaughterhouse (PHOTO: Andy Hall/The Guardian)

SLAUGHTER

Over 40 million so-called 'spent' hens are slaughtered each year (Humane Slaughter Association, 2014). Many of these animals are killed by having their throats cut, and the vast majority are supposed to be stunned unconscious before this is done. Their bodies are processed into products such as chicken pies and soups (Humane Slaughter Association, 2014).

The overwhelming majority of hens are slaughtered in large, licensed chicken slaughterhouses. Annually, in the European Union, several billion birds are killed in slaughterhouses (European Commission website, 2008; The Poultry Site, 2013). In 2013, there were 69 poultry slaughterhouses in the UK (FSA, 2013), and here several thousand birds can be killed every hour in a factory-like, high-speed operation.

A 2013 survey carried out by Food Standards Agency (FSA) revealed that there has been a significant increase in the proportion of birds slaughtered using the gas killing method – this method has been claimed to have 'significant animal welfare improvements' over electrical water bath stunning (FSA, 2013). The gas method, in 2013, was used for 71 per cent of poultry slaughter in 16 different premises in Britain (FSA, 2013). The number of animals not stunned prior to slaughter (allowed in accordance with religious rites) accounted

for two per cent of cattle, 15 per cent of sheep and goats, and three per cent of poultry (FSA, 2013).

Around 29 per cent of birds in Britain continue to endure shackling and electrical stunning followed by neck-cutting (FSA, 2013), despite it being well acknowledged as being grossly inhumane. During the week of the 2013 FSA survey alone, a staggering 4,855,625 birds were shackled (FSA, 2013).

SHACKLING AND ELECTRICAL STUNNING

Shackling is both a physiologically and psychologically painful experience for birds.

During unloading and shackling, the terrified animals struggle to escape, often defecating and vomiting on the workers. An undercover investigator at a Perdue slaughterhouse in the United States has stated: "The screaming of the birds and the frenzied flapping of their wings was so loud that you had to yell to the worker next to you" (PETA website, 2005). Birds are hung upside down on a line of shackles moving so fast that it is impossible for workers to handle the birds humanely. Once in the shackles, the upside-down birds



Undercover investigation at Tyson Foods slaughterhouse, United States (PHOTO: PETA)

are dragged through an electrified water bath which, by law, should render the birds unconscious and insensible to pain.

To make matters even worse, many of the birds hung upside down on shackles will already be suffering from painful injuries. The idea behind slaughter welfare legislation is – supposedly – to ensure the ‘humane’ treatment of animals. In fact it legitimises horrific suffering for birds in the run up to slaughter. It is particularly barbaric to allow birds with chronic leg disorders to be hung upside down by their legs by shackles.

The law also states that ‘appropriate measures’ should be taken to ensure that shackled birds are ‘in a sufficiently relaxed state for stunning or killing to be carried out effectively and without undue delay’. A bird must not be shackled, ‘in such a manner as to cause it avoidable pain or suffering’. Yet the entire slaughter process causes severe pain and suffering – but exactly which elements are avoidable is not made clear (Viva! website, 2000).

STUNNING: THE WATER BATH

The conventional water bath method involves immersion of the head of a bird in an electrified water bath and a current then flows through the body of the bird whilst he/she is being hung upside down by the legs in moving shackles (Hindle *et al.*, 2010). Depending on the dimensions of the water bath, several birds are submerged (up to their shoulders) simultaneously in water.

The main welfare issues involved in the water bath stun method of slaughter are as follows:

Pre-stun shock: This is a painful and common occurrence for hens. Inversion is unnatural, stressful, and often elicits fear and escape responses, such as

wing flapping (FAWC, 2009). When entering the water bath, a bird’s wing may be hanging lower than the head, which means that the bird will suffer a painful electric shock. Inadequate stunning is a real problem within the chicken and egg industry.

Effectiveness of current: In conventional slaughter, tens of millions of chickens are inadequately stunned each year, and thousands inadequately stunned each hour. Because of the great variation amongst individuals, the effectiveness of the electrical settings also varies. When several birds are immersed in the bath, the current is divided between them, and those with a high electrical resistance may receive insufficient current to cause an adequate stun.

Each individual bird will have a different weight, fat content, age, number of feathers, level of cleanliness, brain resistance, and leg size – which means that it is nearly impossible to ensure proper stunning unless the settings are changed to accommodate each bird.

European and UK legislation requires that animals are rendered immediately unconscious and insensible to pain until blood loss occurs at slaughter. It is generally accepted that for poultry, unconsciousness and insensibility should occur immediately (within 1 second) after an electrical stun, and that a bird should remain in a state of unconsciousness for the sum of time taken to bleed out and die (Hindle *et al.*, 2010).

There is evidence to reveal that water baths deliver stuns that immobilise birds, but do not render them insensible to pain, particularly when the electric current is set at a low voltage. This means that birds are not able to display a pain reflex because of temporary paralysis (PETA, 2007). They are not only having their throats cut whilst fully conscious, they are also suffering the pain and literal shock of essentially useless stunning prior to this, compounding their suffering.

The aim of modern water bath systems is supposedly to induce a cardiac arrest in birds so that they die and have no chance of regaining consciousness. However, not all birds have a cardiac arrest. The RSPCA has stated that ‘the current flowing through the bird’s body may not be sufficient to ensure the bird is unconscious’ (RSPCA website, 2016). End-of-lay hens regain consciousness faster than broilers stunned with the same current (FAWC, 2009), and can recover consciousness after as little as 22 seconds (Gregory and Wotton, 1994). Birds retain their brain function during exsanguination (bleeding out) for longer than

LAYING HENS: THE INSIDE STORY

mammals. Chickens will regain consciousness before they lose brain responsiveness if they do not have a cardiac arrest when they enter the water bath.

Water bath avoidance: Hens may avoid the stun bath altogether by lifting their heads. Those who do can go on to have their throats slit by a mechanical blade whilst fully conscious. This is a particularly common problem with some species of birds known to 'swan neck' and avoid full immersion (Humane Slaughter Association website, 2016). A 'back-up killer' is supposed to check birds leaving the water bath are unconscious, but with such high speeds of birds going past on the slaughter line, it is extremely difficult to inspect each individual's awareness.

Birds inhale water: Chickens can inhale water pathogens (PETA website, 2016) thereby causing internal contamination with microbes (Mead, 2004).

Avoidance of mechanical blade: If birds are not insensible from the water bath, and are fully or even partially conscious, which can occur when birds lift their heads or there is a shackle rail failure, they may well struggle and miss the mechanical blade also, which is the killing part of the process. Manual killers are supposed to be positioned between the mechanical blade and the scalding tank, but with such fast-moving lines, often two or more rows deep, it is impossible to ensure that every bird is dead, let alone unconscious, before entering the scalding tank. Large slaughterhouses typically run lines at a rate of 185 to 195 birds a minute, or nearly 12,000 an hour (Lawrence *et al.*, 2014) and a poultry slaughter expert who advises the European Food Safety Authority has stated that "one of the greatest risks for inhumane treatment is line speed. You can't always stop the abuse at these speeds... it's so fast, you blink and the bird has moved away from you" (Kindy, 2013).

Consciousness in scalding tank: The more time that elapses after the point of the initial stun (for those who did not avoid the water bath), the closer the birds are to full recovery. Thus, those who avoid the mechanical blade have an increased probability of being conscious when they reach the manual killer or, in the event that they are missed by the manual killer as well, as they enter the scalding tank.

Council Regulation (EC) 1099/2009 on the Protection of Animals at the Time of Killing came into force across Europe on 1 January 2013. Most aspects of the regulation applied immediately. Under this regulation,

the responsibility for animal welfare and food safety in slaughterhouses rests with the business operator. This regulation stipulates that each operator has to know what they are doing through the use of a standard operating procedure. In theory, stunned animals should be regularly monitored to ensure that they do not regain consciousness before slaughter, and each slaughterhouse must appoint an Animal Welfare Officer to oversee the welfare of animals.

CONTROLLED ATMOSPHERIC SYSTEMS (GASSING)

It is widely acknowledged that the handling, shackling and immersion process is inhumane. In 2009, FAWC stated: "Current systems of pre-slaughter inversion and shackling for poultry should be phased out" (FAWC, 2009).

In the gassing process, hens are conveyed through a machine which maintains an atmosphere containing proportions of gases that cause the birds to become unconscious and then die. Gas mixtures can either be any mixture of argon, nitrogen or other inert gases with a maximum of 2 per cent total oxygen by volume (2 per cent total oxygen by volume is the proportion of oxygen in a 90 per cent inert gas, 10 per cent air mixture, as the amount of oxygen in air is 20.9 per cent) or carbon dioxide with any mixture of argon, nitrogen or other inert gases with a maximum of 2 per cent oxygen by volume, provided that the carbon dioxide does not exceed 30 per cent (European Food Safety Authority, 2004).

Some controlled atmosphere machines convey the birds through the gas in their transport containers so there is minimal handling; others unload the birds prior to entry to the machine.

Gassing has not, however, been developed for the small or medium size slaughterhouses, which represent a large proportion of the total slaughter capacity in Europe (The Poultry Site, 2013). There are also disadvantages to this method of killing. Carbon dioxide is well acknowledged to be aversive in high concentrations (due to dissolution in nasal and mouth fluids, producing acid), as well as a potent respiratory stimulant that can cause breathlessness (gaspings). The European Commission states: "The use of carbon dioxide will be still permitted in certain cases despite the scientists' opinion on its aversiveness for animals" (European Commission, 2008). Another disadvantage of

using gas is more moving parts in the system compared to electrical water bath stunners. There is therefore an increased chance of a system breakdown.

HALAL (ISLAMIC) AND KOSHER (JEWISH) SLAUGHTER OF BIRDS

There has been growing public and parliamentary focus on methods used for religious slaughter, welfare concerns about whether animals are stunned before slaughter, which retailers are serving halal meat, and whether all meat prepared by halal and shechita methods is being labelled as such.

The Welfare of Animals (Slaughter or Killing) Regulations 1995 sets out specific requirements for the slaughter of animals by the Jewish and Muslim methods. These Regulations implement EU Protection of Animals at Time of Slaughter of Killing Directive (1993). The Regulations state that, amongst other things:

- The animal's throat must be cut by one rapid, uninterrupted movement of the knife.
- Both carotid arteries and both jugular veins must be severed.
- The knife used to slaughter the animal must be inspected before each animal is slaughtered to make sure it is of sufficient size and sharpness to slaughter that animal.

UK LEGISLATION AND POSITION

UK and EU slaughter regulations set minimum welfare standards at slaughter and require all animals to be pre-stunned before slaughter to minimise their suffering. Member States can, however, and the majority do exempt slaughter in accordance with religious beliefs from the pre-stunning requirement and the UK implements this derogation.

The UK Government has stated that it would prefer all animals to be pre-stunned before slaughter on welfare grounds but it observes the rights of religious communities and the previous Prime Minister, David Cameron, has said he would never ban religious slaughter (Downing, 2015).

In November 2014, George Eustice reiterated the UK Government's long-standing position (over successive governments) on religious slaughter in answer to a House of Commons debate on the issue.

For animal slaughter to be lawful under Jewish law and Shariah (Islamic) law, Jewish (Shechita) and Muslim (Halal) conditions are required to be met before an animal is cut and bled. These conditions also dictate how, and whether, pre-stunning of animals is acceptable. Around 80 per cent of meat in Britain prepared by the Halal method is pre-stunned (Downing, 2015).

At present, there is a transition to new EU regulations in this area. EU Regulation 1099/2009 (September 2009) on the Protection of Animals at the Time of Killing came into effect on 1 January 2013 in all Member States. These regulations set out minimum standards for slaughter and Member States are able to maintain more stringent national slaughter standards and controls additionally.

Some countries have already laid down specific laws on this issue:

1. Denmark banned animals being killed without pre-stunning in 2014. Slaughter without prior stunning has also been banned in Norway (since 1930), Iceland, Switzerland and Sweden, while Finland and Austria require stunning immediately after the incision if the animal had not been stunned beforehand. The Netherlands passed a bill in 2011 banning the slaughter of livestock without pre-stunning.
2. Bans have been overturned in Poland and New Zealand (following a judicial review).

In the week of the 2013 FSA survey, 21,716 birds were slaughtered by the Jewish method (all un-stunned) at three establishments in Britain (FSA, 2013).

No hens killed for shechita slaughter will be stunned, but Halal slaughter is a mixture of stunning and non-stunning.

PRE-STUNNING

The Halal Food Authority (HFA) stipulates that pre-slaughter stunning is permitted to stun animals and not to be used to kill animals (Downing, 2015), whereas the Halal Monitoring Committee (HMC) – which certifies unstunned Islamic slaughterhouses, doesn't agree (Halal Monitoring Committee website, 2016).

In 2011, Viva! made the Government aware that effective stunning was not being employed in British slaughterhouses – in other words, animals may only have been stunned to immobilise, yet remained sensible to pain. This followed an investigation by Scotland for Animals revealing that in halal slaughter abattoirs,

LAYING HENS: THE INSIDE STORY

ineffective stunning methods were deliberately being employed (Scotland for Animals website, 2016).

An organic halal meat company based in the UK has stated: "Abraham Natural Produce would rather all animals were slaughtered without stunning" (Halal Focus website, 2010). A director at the Halal Monitoring Committee has also stated: "We believe that halal unstunned slaughter is the most humane method of killing" (Taher and Elliot, 2014).

'Simply Halal' in Banham, Norfolk is among a number of new slaughterhouses that have sprung up across the UK, providing a rising demand among Britain's 2.7 million Muslims for meat from animals unstunned during killing (Taher and Elliot, 2014).

CLOSED-CIRCUIT TELEVISION (CCTV)

The focus on religious slaughter methods has met with parallel debate concerning the installation of Closed Circuit Television (CCTV) in slaughterhouses as a result of undercover footage shot by the organisation Animal Aid which was released in 2015. The footage was taken at Bowood Yorkshire Lamb halal slaughterhouse (a trading arm of Bowood Farms Ltd) (Animal Aid website, 2015; FSA, 2015; Downing, 2015). The abhorrent treatment of animals which was filmed has caused the FSA to suspend the licences of the slaughtermen involved (Downing, 2015).

A survey by the FSA in 2013 showed that 55 per cent of white meat slaughterhouses had some form of Closed-Circuit Television (CCTV) in use for animal welfare purposes, which is an increase from the results of a FSA survey in 2011 (FSA, 2013). Whether or not workers monitor the footage, however, is another issue entirely.

POSITION OF UK GOVERNMENT AND MEAT SUPPLIERS

Compulsory CCTV at slaughterhouses was considered in 2013 as part of the implementation of EU Regulation 1099/2009 on the protection of animals at the time of killing in England (Downing, 2015). However, the UK Government was not convinced of the need for further legislation and has been keeping the need for CCTV under review in the context of the new monitoring requirements required under the Regulation (Downing, 2015). In November 2014, FAWC carried out an independent assessment of CCTV in slaughterhouses and released an opinion in February 2015 recommending that slaughterhouses install CCTV but not suggesting this should be mandatory (Downing, 2015; FAWC, 2015).

Supermarkets such as Asda, the Co-op, Iceland, Marks & Spencer, Morrisons, Sainsbury's, Tesco, Lidl and Waitrose now insist upon the use of CCTV in supply chain slaughterhouses (Downing, 2015).

The RSPCA also requires CCTV in slaughterhouses that are members of its accreditation scheme. Red Tractor however only 'recommends' it (Red Tractor, 2012).

QUALITY ASSURANCE SCHEMES: WHAT THEY REALLY MEAN

There are a number of so-called (voluntary) 'quality assurance' schemes in Britain which have been established to indicate that products meet a set of agreed standards of agricultural practice, for example minimum animal welfare standards. A quality assurance scheme may not actually offer any tangible benefits to the animals themselves. The best known British quality assurance schemes are Red Tractor, RSPCA Assured (previously Freedom Food), and Soil Association. The Soil Association scheme is considered to be the most trustworthy of all the schemes (Viva! website, 2016b).

RSPCA ASSURED

- Stocking density: up to nine laying hens per metre squared of useable area
- In barns flocks can be up to 32,000 birds and there can be 16,000 birds in a free-range flock
- Infrared beak trimming of day-old chicks is allowed
- Shackling is allowed at the slaughterhouse 'for a short a period'
- Cages (including enriched cages) are not allowed

BRITISH LION QUALITY

Approximately 85 per cent of UK eggs are currently produced to British Lion Quality standards (British Lion Quality website, 2016.). British Lion Quality – which was launched by the British Egg Industry Council (BEIC) – means only that eggs are produced to minimum legal food safety requirements. In other words, the baby chicks are vaccinated against salmonella.

SOIL ASSOCIATION

- Stocking density: up to six laying hens per square metre indoors and up to 2,000 birds
- Beak trimming is prohibited
- Each hen is allowed a minimum of 10 square metres of space outside

Soil Association's standards are difficult to apply on farms large enough to supply the major supermarkets, though most Waitrose stores stock Soil Association certified eggs, as do health food shops, farmers' markets, organic box schemes and some greengrocers.



THE GLOBAL EGG INDUSTRY

Around the world, there are more than 20 billion chickens alive on our planet at any one time (Lawler, 2015) and the global laying hen population has reached a volume of around 6.5 billion birds (Windhorst *et al*, 2013).

According to a 2013 report using data provided by the Food and Agriculture Organisation (FAO), which was presented at an economics workshop during an International Egg Commission (IEC) conference in April 2015, more than 90 per cent of all eggs outside of Europe are still produced in cages – mainly conventional cages (Windhorst, 2014). The report revealed that there was no free-range egg production whatsoever in Brazil, India, Iran, Mexico, Russia and Turkey, and concluded that, outside the EU, there is unlikely to be a switch from conventional cages anytime within the next 10 to 20 years.

A greater proportion of laying hens in Europe are housed in non-cage systems compared to the rest of the world (Janczak and Riber, 2015). The banning of conventional cages thoroughly changed the prevalence of housing systems (Windhorst *et al*, 2013). In some countries, such as Austria, Germany, the Netherlands and Sweden, the barn system reached the highest percentage. In the United Kingdom, Ireland and the Czech Republic free-range systems were favoured (Windhorst *et al*, 2013).

The report also revealed that within Europe, Lithuania, Portugal, Spain, Greece, Slovakia, Poland, Latvia, Croatia and the Czech Republic all house 70 per cent or more hens in enriched cages, and almost no free-range hens. In contrast, Luxembourg does not have any cages. Austria has almost 29 per cent of hens in free-range housing (Windhorst, 2014).

The leading egg producing country in 2011 was China with 24.1 million tonnes or 37.2 per cent of the global production volume. It was followed by the United States, India and Japan. In the United States, as of December 1 2015, the laying flock in the United States alone was over 288 million (UEP website, 2016). Data documents the globalisation of egg production which has shifted from Europe to Asia (Windhorst *et al*, 2013).

Egg consumption in the UK has been steadily growing over several years and, in 2015 alone, according to egg

industry data, around 10.02 billion eggs were produced in the UK (Egg Info website, 2016).

Imports have been steadily increasing and exports decreasing (DEFRA, 2016).

Around 12.2 billion eggs were eaten by consumers in Britain in 2015, which equates to 33 million eggs per day (Egg Info website, 2016). During recent years, there has also been significant growth in consumption of egg products, in other words, eggs which have been taken out of their shell (liquid/frozen yolk, albumen, egg blends, ready-made omelettes, etc).

The UK laying flock, in 2015, was estimated to be at 36 million (Egg Info website, 2016). Fifty one per cent of eggs laid in Britain in 2015 were from caged hens, 47 per cent from free-range birds (including an estimated two per cent organic) and 2 per cent were barn living birds (Egg Info website, 2016). Enriched cage egg production, since the ban on battery cages, has increased, whereas free-range egg production has decreased (see Figure 1; DEFRA 2016a).

The extent of the welfare problems of laying hens varies between countries as the type of housing system influences the risk of suffering. In the United States, as at May 2016, around 90 per cent of eggs came from caged hens, where animals are denied even the most basic needs, such as dustbathing and wing stretching (United Egg Producers website, 2016). In the United States, egg consumption is at its highest in 30 years (United Egg Producers website, 2016) and, as at May 2016, there existed 186 egg-producing companies with flocks of 75,000 hens or more. These companies represent around 99 per cent of all the egg layers in the country (UEP website, 2016).

In 2008, voters in California overwhelmingly passed 'Proposition 2' – a ballot measure requiring that, by 1 January 2015, egg-laying hens raised in California would be able to stand up, lie down, turn around, and fully extend their wings. The ballot was passed with 63 per cent of the votes in favour, and 37 per cent against. However, whilst Proposition 2 has so far succeeded in offering hens additional space, other behavioural needs such as nesting, foraging, and dustbathing are not met as hens can still be housed in cages.

The UK industry uses almost exclusively medium hybrid brown birds supplied by well-established hen breeding companies. In the 1960s, a marketing decision assumed that consumers preferred a brown-shelled egg from brown feathered birds on the basis that they appear more 'natural' than the white-shelled variety. In the United States, the reverse is the case, with white-shelled eggs being the standard (presumably on the basis that they appear more 'hygienic' than brown eggs) (Webster, 2011).

RETAILERS

The labelling on food is the information to the consumer from the manufacturer and it assists consumers making choices for dietary and other reasons. There is however a lack of clear information on the welfare standards for the animals used in the production.

Since 2004, the law has required all eggs and egg boxes to be labelled according to the method of production – either eggs from caged hens, barn, free-range or organic. All boxes of eggs sold in Britain now state the method of production on them using a code (0 = organic, 1 = free-range, 2 = barn and 3 = caged) and state the country of origin.

As Viva! has revealed during the 2016 investigations at laying hen farms, hens in enriched cages suffer similar assaults as hens in battery cages and so the labelling system fails consumers (and hens) looking for 'high welfare' products.

Some supermarkets, such as Tesco, Asda and Morrisons, state clearly when eggs are laid by caged hens, however misleading labelling is commonly used on egg boxes to dupe consumers into believing eggs, even those laid by caged hens, are 'high welfare' products.



Words such as 'quality' and 'freshness' are used on egg boxes



Tesco eggs state that eggs are laid by caged hens © Viva!

Some egg boxes feature illustrations of grass and meadows. Organic. Free-range. Barn. These terms may make consumers feel better, but the reality is harsh for the birds.

Egg boxes use images of grass along with words such as 'hand-selected' which leads consumers into believing the eggs are laid by hens outside, when they are actually incarcerated in barren wire cages.

One area where labelling is failing hens and consumers is liquid egg – a product used in processed food such as cakes and quiches. In the first quarter of 2016, liquid egg accounted for 67 per cent of total egg production in Britain (DEFRA, 2016a).

In 2015, after a rigorous campaign by Viva!, Trading Standards announced that Noble Foods would amend a misleading label on 'Big and Fresh' eggs from caged hens (Viva! website, 2015). Despite the victory, Viva! questions why it took Trading Standards eight months to bring about this change, and its ability to police large producers and ensure they do not mislead the public (Viva! website, 2015).

The contentious wording in this case is: "Lion Quality eggs are produced in the UK under the BEIC Code of Practice which ensures the highest standards of hygiene and animal welfare." Yet the box also states that the eggs are from caged hens.

CAGE EGG COMPANY SUPPLIERS

Grocery sales in Britain are dominated by only a handful of major supermarkets – Tesco, Sainsbury's, Asda and Morrisons. Three of these – Tesco, Asda and Morrisons – continue selling both their own 'Value' range of cage

LAYING HENS: THE INSIDE STORY

eggs despite receiving widespread criticism. Grocery discounters Aldi and Lidl also sell their own brand cage eggs and cage eggs from other brands.

Waitrose, Sainsbury's, the Co-op and Marks & Spencer, no longer sell eggs from caged birds, though each of these supermarkets sell non-own brand products which may use eggs from cage systems. Supermarkets have come under fire for selling cage eggs. In 2016, a petition was launched by 14-year old school girl, Lucy Gavaghan, which reached over 280,000 signatures (Gavaghan, 2016). The industry's response to this and other efforts was to urge farmers 'not to bow to pressure' (Davies, 2016). Tesco – which sells 1.4 billion eggs a year in Britain – however, did bow to pressure and, in July 2016, the company announced that it would be phasing out eggs from caged hens by 2025 (Tesco website, 2016a). Later that same month, both Iceland (Davies, 2016b), Morrisons (Farming UK, 2016), Lidl (Askew, 2016) and Asda (Farming UK, 2016a) made similar statements.

Each of the major supermarkets specify on egg boxes whether eggs are from caged hens, as do other supermarkets such as Iceland (another large supermarket that continues to sell cage eggs). However, during visits to the supermarkets, Viva! discovered that many eggs on the shelves in Tesco, Morrisons and Asda are non-traceable to the consumer. When searching on the online Egg Tracker (Food Miles website, 2016), all cage eggs at Morrisons and some in Asda had an unidentifiable supplier. One untraceable egg code at both supermarkets, for example, was 3UK54321. In Morrisons, none of the own-brand eggs were traceable. At Tesco, RSPCA-approved eggs were also not traceable.

Many eggs at supermarkets visited by Viva! were untraceable (Food Miles website, 2016).



NOBLE FOODS

Noble Foods have sold, or continues to sell, cage eggs to Asda, Tesco and Morrisons. Noble Foods cage egg ranges sold at each of these supermarkets have included the 'Big & Fresh' and 'Chef Range'.

STONEGATE (NOW RIDGEWAY FOODS)

This company has sold, or continues to sell, cage eggs to Aldi and Asda. Asda has offered the 'Big and British' range.

SUPERMARKET POLICIES

Sainsbury's – In 2009, the supermarket banned own-brand eggs from battery cages and, in 2012, went cage-free in their ingredients (Sainsbury's website, 2012). So currently none of their own-brand products, irrespective of price, contain eggs from caged hens, from the basics range to the premium Taste the Difference lines. Other brands of whole shell eggs are also free-range or barn.

Marks & Spencer – The company has a 100 per cent free-range egg policy covering both whole egg (since 1997) and eggs used in ingredients (since 2002) (M&S website, 2015). However, products that aren't Marks & Spencer own-branded may use eggs from caged hens.

Waitrose – The supermarket claims: 'We are the only supermarket to guarantee that all our eggs are free-range' (Waitrose website, 2016). All of the supermarket's own brand whole egg, and egg ingredients are free-range. However, products that aren't Waitrose own-branded may use eggs from caged hens.

Co-op – In 2007 the supermarket started selling only free-range own-brand eggs and, since 2010, all the eggs used in their own-brand products have been free-range also (Co-operative website, 2016).

Morrisons – In 2012, Morrisons was stripped of the 'Good Egg Award' by CIWF as the supermarket started selling eggs from caged hens again under its 'M Savers' range (Glutz, 2012). In 2016, it committed to a phase out period of nine years.

Tesco – The supermarket continues to sell eggs from caged hens in the 'Everyday Value' range (Tesco website, 2016). In 2016, it committed to a phase out period of nine years (Tesco website, 2016).

Asda – Walmart, the parent company of supermarket Asda, has committed to ending the sale of eggs from caged hens by 2025 (Spary, 2016). In 2016, Asda committed to a phase out period of nine years.

Aldi – The supermarket continues to sell eggs from caged hens. In 2016, it committed to a phase out period of nine years (McDougal, 2016).

Lidl – In July 2016, it was reported in Poultry World that Lidl had no plans to follow Aldi with a cage-free commitment (McDougal, 2016a). Later in 2016, it committed to a phase out period of nine years.

INGREDIENTS

Egg products can come in the form of dried, frozen or liquid whole-egg, egg yolk or albumen and are either produced in Britain or imported (primarily from the EU).

Many of the pre-prepared cakes found in UK supermarkets are still made with eggs from battery hens kept outside the EU. This is because it is far cheaper for manufacturers to use those eggs over their barn, free-range or organic counterparts. If it doesn't specify, then it will almost certainly contain eggs from caged hens.

VEGAN LINES

EGG REPLACER

There is an increasing number of vegan 'egg' products for sale in Britain and around the world, including egg replacers and egg free mayonnaise.

Only last year, it was discovered that liquid from cooked chick peas can be whipped into foam and used to make a vegan meringue. This chick pea water was named 'aquafaba' and it has revolutionised the vegan cake making world (Valle, 2015; MacKenzie, 2015; Hartke, 2015). It has been used to make egg-free foods such as chocolate mousses, meringues, nougat, cakes, choux pastry, soufflés, royal icing, mayonnaise and macarons.


The Vegg is a 100 per cent plant-based egg yolk replacement product that is cholesterol free, fat free and a good source of iron and Vitamin A (The Vegg website, 2016). It is now widely available in major health stores and even some supermarkets. There is even a 'French Toast Mix' which can be used to make 'eggy' bread! The company Follow your Heart, as well as producing vegan mayonnaise, cheese, dips and spreads, has also produced the 'VeganEgg' product for scrambled 'egg' (Follow your Heart website, 2016).

There is a wide selection of egg-free mayonnaises in Britain and elsewhere. Supermarkets such as Sainsbury's and Tesco now stock their own-brand vegan mayonnaise. They also stock brands such as Plamil and Tiger Tiger mayo. In the United States, Just Mayo by Hampton Creek has gone mainstream and is stocked in supermarket giant Walmart. This brand of mayonnaise has become such a threat to UK-based 60 billion dollar multinational corporation, Unilever, which owns Hellman's mayonnaise, that they attempted to sue Hampton Creek to court in 2015 for "false advertising" (despite the fact that it clearly states on each tub that the product is egg-free) and that, by not containing eggs, their product failed to live up to the FDA's definition of mayonnaise, which must contain "egg yolk ingredients." (Simon, 2014). In 2016, Hellman's brought its own egg-free mayonnaise (Rainey, 2016).

With millions of egg-laying hens a year enduring hellish conditions on farms in Britain alone, these products are helping to alleviate unimaginable suffering.

VEGAN EGG REPLACERS

Viva!

What	How much	Best for	Available from	
Commercial egg replacer eg Ener-G Egg or Orgran	1½ tsp + 2 tbsp water – use as directed on the packet		Biscuits/cookies – items that are crispy	Health food shops, supermarket free from/speciality food shelves
Soya flour	4 tsp mixed with 2 tsp water to form a paste		Cakes, muffins, cookies and other squidgy things. Nut loaves, savoury burgers	Health food shops
Gram flour (also called chickpea or besan flour) with regular flour	2 tbsp gram flour for every 350g regular flour. Sieve well as it is prone to lumps		Pancakes, nut loaves and savoury bean or lentil burgers	Large supermarkets, ethnic grocers and health food shops
Ground flaxseed (also known as linseed)	1 tbsp ground to a powder and mixed with 3 tbsp warm water. Let it sit for a few minutes until it turns glutinous – often called a flax egg!		Pancakes, bran muffins, cakes, breads, oatmeal cookies, burgers or nut loaves. Best to use only 1 egg's worth in any recipe, otherwise the taste can be too strong	Ready-ground flaxseed eg Aldi, Sainsbury's, Holland & Barrett etc. Can also be sprinkled on cereal and smoothies for a nice omega boost! Store in the fridge
Silken tofu	55g/scant 4 tbsp/¼ cup mixed with ½ tsp baking powder		Cakes or other moist recipes – not biscuits or pancakes (makes them too heavy)	Large supermarkets, ethnic grocers and health food shops
Apple purée	60g/4 tbsp/¼ cup mixed with ½ tsp baking powder as a raising agent		Cakes, quick breads and brownies – moist items, not crispy	Health food shops or supermarkets
Banana	½ a medium-large banana, mashed thoroughly		Good in loaf or banana bread as well as quick breads, muffins, brownies, most cakes and pancakes	Everywhere!
Sweet potato	1 small sweet potato, peeled, cubed, steamed until soft then mashed to a purée		Use like apple purée or banana	Greengrocers and supermarkets etc
Soya yoghurt	4 tbsp – or 500ml if making our fantastic big sponge cake!		Makes things moist, so good in quick breads, cakes, muffins, ie not biscuits or anything crispy	Alpro or Provamel plain yoghurt from supermarkets and health food shops; Sojade or Sojasun from health food shops
Baking powder and vinegar	1 tsp baking powder & 1 tbsp cider vinegar – mix together and add to the cake mix immediately		Cakes, cupcakes, fruit cake and quick breads	Supermarkets and health food shops
Aquafaba (canned chickpea water, whisked)	Liquid from one can (salt-free works best)		Meringues, marshmallows, macarons, mayonnaise, mousse	Everywhere!

Eggs are used to do two jobs: bind a mixture together and make it rise. These replacers do the binding job (except the Aquafaba). To make cakes rise a bit more, use a little extra baking powder and/or bicarbonate of soda – anything from 1-4 tsp, depending on the type and size of cake and whether plain or self-raising flour is used. See our cake recipes at Viva!'s www.veganrecipeclub.org.uk for more specific guidance.

EGGS AND YOUR HEALTH

BY VERONIKA POWELL, MSC (BIOLOGY)

Eggs have never been an essential part of the human diet but a mere addition. There is no recommended egg intake simply because we don't need to consume any. Whilst they contain some nutrients, the health risks far outweigh any nutritional content.

HEART HEALTH

Some people, even healthcare professionals, let the egg industry confuse them and lead them to believe that consumption of eggs, saturated fat and cholesterol is harmless. However, there are good reasons for long-standing recommendations that dietary cholesterol and saturated fats should be limited. Eggs are a source of both and their consumption can contribute to an increased risk or progression of heart disease.

Professor David Spence, the director of Stroke Prevention & Atherosclerosis Research Centre in Ontario, Canada, warns that eating eggs can have a similar detrimental effect on blood vessels as smoking (Spence *et al.*, 2012). He and his team surveyed more than 1,200 patients and found that regular consumption of egg yolks contributed to an increased build-up of artery plaques (cholesterol deposits attached to artery walls) which is a serious risk factor for stroke and heart attack.

And it's not just cholesterol but also what happens to it during cooking – high temperatures lead to cholesterol oxidation products that are a risk factor for heart disease and may be toxic to the body's cells and cause DNA damage (Milićević *et al.*, 2014).

There's been much debate about the role of saturated fats in the diet and whether they're of concern, mostly spurred by sensationalist media articles. Despite this, scientific data point in one clear direction – a very recent study pooled together data from two long-term studies including over 126,000 people (Li *et al.*, 2015). The results showed that saturated fats (of which eggs are a rich source) are not healthful and replacing them with unsaturated fats and healthy carbohydrates from wholegrains has the potential to significantly reduce the risk of heart disease.

These results are in agreement with an earlier large study that showed the intake of eggs and high-fat dairy products to be associated with greater risk of heart failure (Nettleton *et al.*, 2008).

And there is another component in eggs that's linked to an increased heart disease risk – choline. It is an essential nutrient that is needed for cell membranes, nerve signal transmission and other metabolic functions; however, we can get plenty from plant foods. High intakes of choline have been shown to have negative health effects and eggs are by far the richest source. Regular egg consumption can result in very high choline intakes.

In a study of human metabolism, choline intake and heart disease, the research group found that a product of choline metabolism (a compound called trimethylamine-N-oxide – TMAO) is associated with plaque build-up in the arteries and thus with the progression of heart disease (Tang *et al.*, 2013). Higher levels of TMAO in study participants were linked to a higher risk of major adverse cardiovascular events.

DIABETES

Professor Spence had also authored a scientific paper published in the Canadian Journal of Cardiology that warns that the amount of cholesterol in just one egg (a single large egg yolk contains approximately 275 milligrams) exceeds the maximum recommended daily amount (Spence *et al.*, 2010). The amount is 200 milligrams for people at risk of cardiovascular disease but as the paper points out, cutting down on cholesterol only when health problems occur might be too late. The main finding of the study was that people who consumed as much as one egg a day had double the risk of developing diabetes type 2 compared to people consuming less than one egg a week.

According to another study of 57,000 adults in the US, people who ate eggs daily were between 58-77 per cent more likely than those who did not eat eggs to develop diabetes type 2 (Djoussé *et al.*, 2009). And a more recent study agrees – egg consumption is associated with impaired blood sugar metabolism and increases the risk of developing type 2 diabetes (Lee *et al.*, 2014). This effect is mostly attributed to the cholesterol content of eggs.

FOOD POISONING AND CONTAMINANTS

Salmonella food poisoning is one of the most common and widely distributed foodborne diseases, with tens of millions of human cases occurring across the world every year. Worldwide, eggs are the main source of salmonella bacteria that cause food poisoning with symptoms including diarrhoea, stomach cramps, nausea, vomiting and fever (Miranda *et al.*, 2015). Salmonella can be destroyed by cooking so the main risk are raw or undercooked eggs and egg products (such as meringues and mayonnaise).

Salmonella is a hardy bacteria that can survive several weeks in a dry environment and several months in water (WHO, 2013). The bacteria come in many (thousands) of strains and some are antibiotic-resistant. In most cases, people become ill and recover in several days but in extreme cases or in people whose health is compromised the infection can result in death. The severity of the disease depends on the health of the affected person and on the strain of salmonella. All strains can cause disease in humans (WHO, 2013).

Because of previous outbreaks, egg-laying hens on farms subscribing to the British Lion code of practice have to be vaccinated against salmonella. According to the British Lion Quality website, 85 percent of eggs in the UK are now produced under the mark (British Lion Quality website, 2016a). This means 15 per cent of UK eggs come from farms that might not vaccinate their chickens and also there's a significant amount of egg products imported to the UK every year. In addition, farms that have fewer than 350 hens don't have to comply with the Salmonella National Control Programme so are largely unregulated in terms of salmonella (DEFRA, 2012).

The vaccination programme significantly reduced the number of salmonella food poisonings in the UK but even vaccination doesn't guarantee salmonella-free eggs. Although the egg contents are rarely infected, the eggshell contamination is still considerable (O'Brien, 2013). In a study testing several vaccination programmes in the UK, eggshell contamination with salmonella was lower in vaccinated hens than non-vaccinated but the reduction was 15-60 per cent, which is still far from eliminating the infection threat as some recent headlines suggested (Arnold *et al.*, 2014).

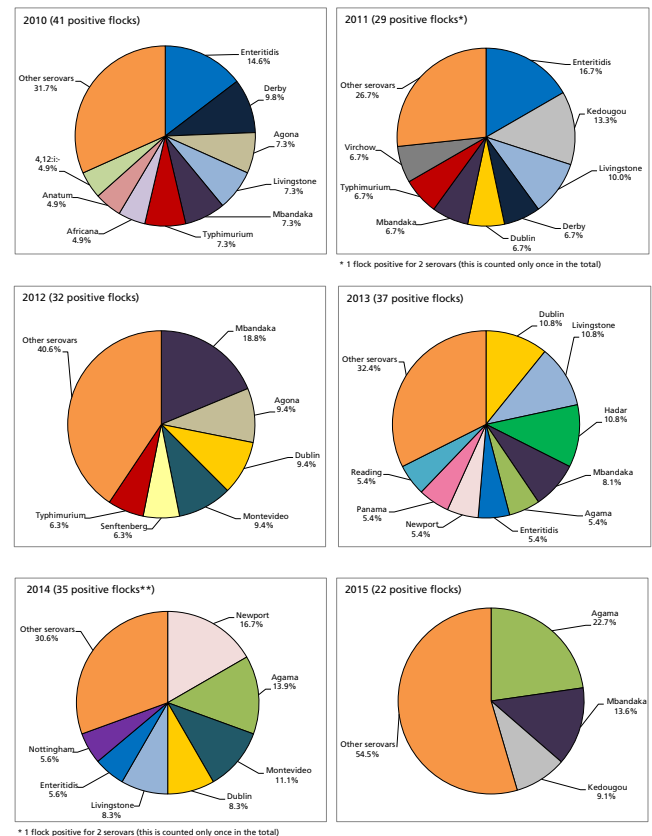
Under the UK regulations, class A eggs are not to be washed or cleaned, before or after grading with no

exceptions (DEFRA, 2016). This is because the egg's natural protective layer acts as a barrier to bacteria, lowering the risk of salmonella penetration into the egg. Nevertheless, this means that the eggshell can carry salmonella and consumers can still get infected when they are handling whole eggs.

A total of 721 salmonella cases were reported from chicken flocks in 2014 which is lower than in previous years but still a considerable number. In the same year, 34 different strains of salmonella were isolated from chicken flocks; however, there were 147 uncategorised Salmonella strains (Animal and Plant Health Agency, 2015). The number of chicken-related salmonella food poisoning cases in people was 6,505 in 2014 (Animal and Plant Health Agency, 2015).

At the moment there is a target set for a maximum of two per cent of laying hen flocks to be positive for the two main strains of salmonella that previously caused outbreaks (*S. enteritidis* and *S. typhimurium*) but this limit doesn't apply to other salmonella strains (Animal and Plant Health Agency, 2015). Forty laying hen flocks tested positive for Salmonella under the statutory testing programme in 2014 (Animal and Plant Health Agency, 2015). Out of these, only two flocks tested positive for the regulated strains.

The most common salmonella strains identified in adult laying hen flocks in the UK 2010 – 2014 (Animal and Plant Health Agency, 2015)



Commercially available and widely used vaccines are based on one or both of the two strains that cause epidemics and major outbreaks before – *S. enteritidis* and *S. typhimurium* (Arnold *et al.*, 2014). As these regulated strains are at a very low level now, other strains are increasing (Animal and Plant Health Agency, 2015):

The most common salmonella strains identified in adult laying hen flocks in the UK 2010 – 2014 (Animal and Plant Health Agency, 2015)

The latest report by the Advisory Committee on the Microbiological Safety of Food (ACMSF, 2016) suggested that eggs produced under the Lion code in the UK, or produced under equivalent comprehensive schemes, may be served raw or lightly cooked and are considered very low risk in terms of the two regulated salmonella strains. The report also suggested that for eggs not produced under the Lion code and non-UK hen shell eggs the existing advice should remain – that young children, the elderly, pregnant women and those who are already unwell should not consume these eggs raw or undercooked (ACMSF, 2016). The caution remains because salmonella can spread very quickly and antibiotic-resistant strains can cause serious health crises.

In the EU it was reported that in 2014, there were 88,715 confirmed cases of salmonella food poisoning (ACMSF, 2016). The total number of Salmonella outbreaks within the EU decreased by 44 per cent between 2008 (1,888 food-borne outbreaks) and 2014 (1,048 outbreaks). However, ‘eggs and egg products’ were still the most frequently identified food vehicles, associated with 44 per

cent of the reported Salmonella strong-evidence outbreaks.

In some European countries (Austria, Belgium, the Czech Republic, Germany, and Hungary) vaccination of laying flocks is compulsory, in others it is allowed and recommended (Bulgaria, Belgium, Cyprus, Estonia, France, Greece, Italy, Latvia, Lithuania, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, the UK) whilst in some others it is banned (Denmark, Finland, Sweden and Ireland) (Arnold *et al.*, 2014).

The number of human salmonella cases in England and Wales in 2015 as recorded by Public Health England (Public Health England, 2015-g) – eggs are mostly linked to Salmonella enteritidis but can also carry Salmonella typhimurium and other strains (strain PT4 caused serious outbreaks before and it’s strictly regulated now):

In recent years, there were three major salmonella outbreaks in the UK bringing the total number of salmonella poisoning definitely linked to eggs (either from the UK or imported eggs) to 548 cases in 2009, 324 in 2011 and 188 in 2014 (ACMSF, 2016). However, a paper by Inns *et al.* (2015) investigating the outbreak in 2014 states that there were 287 confirmed cases in the UK caused just by that particular strain responsible for the outbreak. And another paper documenting salmonella decline in the UK (Barrow *et al.*, 2012) stated that the main strain causing egg-related outbreaks in the UK was responsible for 459 human cases in 2010 whilst the official report (ACMF, 2016) only states 88 cases. This raises doubts about the credibility of the official figures and the reporting system.

Month 2015	Salmonella enteritidis PT4	Salmonella enteritidis (other PTs)	Salmonella typhimurium	Salmonella virchow	Other identified strains	Total salmonella
January	6	196	104	12	308	626
February	3	84	91	6	199	383
March	1	104	89	7	194	395
April	5	161	100	7	242	515
May	8	168	121	31	302	630
June	42	260	186	24	338	850
July	15	333	202	26	330	906
August	25	316	189	33	331	894
September	n/a					
October	16	309	201	17	323	877
November	0	164	142	13	249	578
December	n/a					
Total	121	2,095	1,425	176	2,816	6,654

LAYING HENS: THE INSIDE STORY

The ACMSF report warns about the issue of underreporting of salmonella food poisoning so many cases go undetected. It is estimated that in 2010 there were approximately 5.4 million true cases of human salmonellosis in the EU-27 (ACMSF, 2016), whilst only 99,020 salmonellosis cases in humans were reported (EFSA & ECDC, 2012). Of course, not all these cases are related to eggs or egg products but many are and it's a fact worth considering.

Eggs can also carry other dangerous bacteria such as *Listeria* or *Campylobacter* that have been known to cause serious illness in people although they are not the main sources (ACMSF, 2016).

Another important human-health issue linked to egg consumption is the potential presence of veterinary drug residues and environmental pollutants. Laying hens treated with drugs and/or given feed containing pesticides can produce contaminated eggs (Miranda *et al.*, 2015; Pirozzo *et al.*, 2002). Many of these potentially toxic pollutants are usually present even in free-range and organic eggs.

CANCER

Egg consumption has also been linked to cancer, especially to hormone-sensitive cancers. In a study of ovarian cancer patients and healthy women and their dietary habits, the researchers discovered there was a strong and significant relationship between cholesterol from eggs and risk of ovarian cancer (Pirozzo *et al.*, 2002). Interestingly, this link was only found between egg cholesterol but not other sources of cholesterol which suggests the culprit might be a different substance that's inherently linked to eggs and egg yolks in particular.

The results of a large study examining the link between the consumption of eggs, red meat, poultry and prostate cancer published in the journal *Cancer Prevention Research* revealed that by consuming 2.5 eggs per week, men increased their risk of prostate cancer by 81 per cent, compared with men who consumed less than half an egg per week (Richman *et al.*, 2011). These results were obtained from following the dietary habits of 27,607 men for 14 years. Eating poultry and processed red meat also increased the risk of death for men who already had prostate cancer. This was followed by another study looking specifically at the intake of choline and the risk of prostate cancer over the period of 22 years (Richman *et al.*, 2012). Whole eggs are the richest dietary source of choline and it was discovered that choline is highly concentrated in prostate cancer cells and higher blood concentrations of choline are

associated with an increased risk of prostate cancer. In this study, men with the highest choline intake had a 70 per cent increased risk of lethal prostate cancer. The study authors said the biological mechanism of exactly how choline is linked to prostate cancer isn't clear yet but highlighted that choline metabolism is clearly altered in prostate cancer, with greater concentrations of choline compounds in cancerous compared to normal cells.

A scientific team conducted an analysis of studies on the topic to explore the relationships between egg consumption and the risk of breast, prostate and ovarian cancer (Keum *et al.*, 2015). They found that the consumption of five or more eggs a week was linked to an increased risk of these hormone-sensitive cancers – with the risk of fatal prostate cancer being especially high. The authors suggested this can be due to several factors – cholesterol is the precursor for the synthesis of sex hormones such as testosterone and oestrogens that promote cell proliferation. Excessive amounts of sex hormones can contribute to cancerous growths in hormone-sensitive tissues such as breast, ovary or prostate. At the same time cholesterol and choline are both essential components of cell membranes and their plentiful supply might aid cancerous cells' high demand for these. And, as outlined above, choline has been implicated in the proliferation and progression of prostate cancer as higher than usual concentrations are found in prostate cancer cells.

HARD-BOILED FACTS

In a series of electronic correspondence between the USDA (United States Department of Agriculture) and the American Egg Board, it was made clear that eggs cannot be advertised as healthy and nutritious because of their cholesterol and fat content and cannot be marketed as protein-rich foods either, simply because they're not according to the criteria (Greger, 2014). Another claim that can't be made is that they are safe – because eggs are the main source of salmonella food poisoning and there's also the risk of bird flu infection (Greger, 2014).

It's best to steer clear from eggs, they're not essential to our health and can significantly harm it. Many recipes can be easily adapted so they are egg-free which is not only a healthy choice but also an ethical one. A wholesome vegan diet is the best possible for our health, animals and the environment.

For more information on vegan health and nutrition go to Viva!Health website: www.vivahealth.org.uk.

SANCTUARY STORIES

THE FARM ANIMAL SANCTUARY, WORCESTERSHIRE

www.thefarmanimalsanctuary.co.uk

Viva! runs an adoption scheme with The Farm Animal Sanctuary. Animals can be adopted for £25 a year which is split between caring for the animals at the sanctuary and Viva!. Visit www.adoptafarmanimal.org.uk for more information.

DAHLIA AND BRENDA

"Our first 60 ex-battery hens arrived looking a very sick and sorry little crowd. Few feathers, beaks badly trimmed, some trimmed so badly they had difficulty in eating.

It took several days for the bravest one to venture through the door and out onto the grass. She lifted her feet very slowly and gingerly, it was the first time she'd seen grass in the whole of her life.

Within days the others had followed her out. Within days they knew when it was feeding and treat time and would all crowd around the gate waiting for someone to appear with the buckets. They soon found out the best spots to find worms and insects, their natural instincts to forage, have a dust bath and stretch out in the sun that had been denied to them since hatching soon returned.

Two of them were slow growing back their feathers so were brought from the big poultry shed to live in smaller houses next to the sheep barns. One of them, who we named Dahlia, developed a passion for flowers. She would sneak through the gate into the yard by the house, jump into the nearest flowerpot and proceed to slowly remove all the petals, stopping only to have a little sleep before finishing the job. After that she would hop up onto the window ledge and stare at Rocky the parrot until she had to be forcibly removed.

Her friend Brenda had a different hobby. After breakfast she would fly over the gate into the sheep barn to spend a few hours sitting on Nana, her favourite sheep. Not only did this keep her feet warm but she could



Dahlia when she arrived at The Farm Animal Sanctuary, and after recovery from her ordeal on a farm



Brenda the hen with her friend, Nana the sheep at The Farm Animal Sanctuary

always find small treats of food in Nanas' fleece, bits of oats and barley that had been dropped by the other sheep. No other sheep would do as a cushion though, it had to be Nana!"

BROOK FARM SANCTUARY, NORTHAMPTONSHIRE

www.brook-farm.org.uk

PEGGY

"It is a special moment when a rescued battery hen realises she is free. Peggy was rescued by Brook Farm Animal Sanctuary. She had suffered much as a battery hen and when she came to stay with me she only had one leg. Her leg had been amputated just above the feather line as her leg had been so severely broken in the cage, it could not be saved. Peggy was a fine example of courage in the face of adversity and never let having only one leg interfere with her enjoyment of life. As she needed extra help such as climbing the ladder to the first storey hen house, she became very tame. It was a joy to see her blossom and become the hen she was meant to be, albeit with only one leg. She would spend many happy hours soaking up the warm sunshine or just pottering with her friends. She lived out her days in the hen run with her friends and showed me that there is always joy and pleasure in the simplest of things and whatever suffering she had seen as a battery hen was soon forgotten in her happiness of living a free life."

DAISY

"Daisy was 1 of 300 chickens who we rescued from an ex battery shed where thousands of chickens were destined for slaughter. The farm workers had no respect for the poor terrified featherless creatures who were handed to us by their feet. They were terrified every time we entered the stable. All the leghorns were featherless and their combs were floppy from lack of sunlight making it difficult for them to see. After a few hours of looking confused a few out of the group started to scratch the straw and peck at the ground, more followed her example and, by the next day, most had already started to dust bathe which was a wonderful sight."

"One amongst them who was discovered to be the lowest of the group and was severely bullied was taken out to our hospital where we found she had a severe respiratory infection and could not use her legs. Her prognosis looked grim but we all wanted to try and save this poor little girl and show her that life could be better than a dark, dirty tiny cage. We called her Daisy. Daisy was put onto antibiotics for her chest infection and pain killers for her legs. Every day we hand fed her and put her out in the sun to bathe. At first it was difficult to know whether she was improving, she was so terrified



when we approached her. She would just sit looking depressed and had to be moved by us every hour so that she didn't get sores. At night she wore little jumpers to cover her skinny featherless body from the cold and was kept on a heat pad. One morning Daisy was found standing on one leg without our support and, over the next few days, she went from strength to strength. She even realised that human hands brought lovely warm treats such as spaghetti for breakfast and other lovely foods.

It was a slow recovery for Daisy and it took her weeks to earn our trust. After months of being at the sanctuary she started to be able to hobble around on both legs and her feathers were starting to grow back. We soon found Daisy a suitable home where she could be slowly introduced to other hens. She now lives with a cockerel and another ex-battery chicken called Jenny. Her legs improve each week and our vet thinks she will make a full recovery. Daisy has now been shown that humans can give love and even runs up at breakfast time to make sure she is first in line for her warm spaghetti and layers pellets."

THE RETREAT, KENT

www.retreatanimalrescue.org.uk

BETTY BREATHE-EASY

"Betty Breathe-Easy is an ex-egg laying hen. She was seen falling from a large lorry sacked with hundreds of chickens. Betty sustained massive injuries – a broken wing, lung damage, bruised and battered – but she survived. There was no need for the lorry to stop because she was no longer of any value to the egg industry. Her life restarted in the treatment area of our sanctuary, where we watched a very brave little lady repair herself. It wasn't long before she found Mr. Right and the pair are now never apart."

CONCLUSION

Each year in the UK around a billion animals are killed for food. Modern factory farms exist to produce meat, dairy, and egg products as quickly and cheaply as possible. To keep production costs down, animals are literally given the bare minimum they need to survive.

For many hens on farms today, there is not even life outside of a barren cage. In our investigations, Viva! has exposed once again the reality of life for farmed animals – huge, dark, stinking sheds crammed full of sick and miserable beings who will never breathe fresh air nor see natural daylight. Sadly, consumers are being duped into believing the industry shaped up since the ban on battery cages, yet Viva! has exposed this to be a farce. The enriched cage offers no protection or comfort for laying hens, and neither do free-range or barn systems which result in a similar misery for hens.

VIVA! ADVOCATES A VEGAN, KIND LIFESTYLE

The egg industry is shrouded in abuses – from the killing of male chicks, painful mutilations, and a terrifying and brutal death at the slaughterhouse when the animals are no longer deemed of any use. Cruelty is normal when profit trumps compassion. If you want to help hens, Viva! advocates veganism to be the answer. Quite simply, as investigations reveal time and time again, there is no ‘humane’ way to consume animal products.



REFERENCES

- Advisory Committee on the Microbiological Safety of Food (ACMSF) - Ad Hoc Group on Eggs. 2016. An update on the microbiological risk from shell eggs and their products – draft.
- Andrews J. 2012. European Union Bans Battery Cages for Egg-Laying Hens. 19 January [online] Available from: www.foodsafetynews.com/2012/01/european-union-bans-battery-cages-for-egg-laying-hens/#.VjdTaitNuM8 [Accessed 22 June 2016].
- Animal Aid website. 2015. Undercover: Inside a UK non-stun slaughterhouse [online] Available from: www.animalaid.org.uk/h/n/NEWS/news_slaughter/ALL/3219/ [Accessed 05 July 2016].
- Animal and Plant Health Agency. 2015. Salmonella in livestock production in GB 2014. Chapter 6: Reports of salmonella in chickens.
- Appleby MC and Duncan IJH. 1989. Development of perching in hens. *Biological Behaviour*. 14 157-168.
- Appleby MC. 2003. The EU ban on battery cages: History and prospects. In: Salem DJ and Rowan AN (Eds.), *The state of the animals II: 2003*. Washington, DC: Humane Society Press [online] Available from: http://animalstudiesrepository.org/cgi/viewcontent.cgi?article=1008&context=sota_2003 [Accessed 22 June 2016].
- Ares E. 2014. Beak Trimming Ban Research Briefing. House of Commons Library [online] Available from: <http://researchbriefings.files.parliament.uk/documents/SN06931/SN06931.pdf> [Accessed 27 June 2016].
- Arnold ME, Gosling RJ, La Ragione RM, Davies RH and Martelli F. 2014. Estimation of the impact of vaccination on faecal shedding and organ and egg contamination for Salmonella Enteritidis, Salmonella Typhimurium and monophasic Salmonella Typhimurium. *Avian Pathology*. 43 (2) 155-163.
- Asda website. 2016. Fairburn large free-range eggs [online] Available from: <http://groceries.asda.com/product/free-range/fairburn-large-free-range-eggs/910001085682> [Accessed 29 June 2016].
- Askew K. 2016. Lidl next to make cage-free egg pledge in UK [online] Available from: www.just-food.com/news/lidl-next-to-make-cage-free-egg-pledge-in-uk_id133957.aspx [Accessed 19 October 2016]
- Barclay C. 2012. Battery Hens Parliamentary UK [online] Available from: <http://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN01367#fullreport> [Accessed 27 June 2016].
- Barrow PA, Jones MA, Smith AL and Wigley P. 2012. The long view: Salmonella - the last forty years. *Avian Pathology*. 41 (5) 413-420.
- BBC News website. 2012. UK battery farm breaks EU rules [online] Available from: www.bbc.co.uk/news/uk-16540769 [Accessed 23 June 2016].
- Berg C. 2002. Health and Welfare in Organic Poultry. *Acta Veterinaria Scandinavica*. 43 S37.
- Bird Bros website. 2016. Home page [online] Available from: www.birdbroseggs.co.uk [Accessed 22 June 2016].
- Bird Bros website. 2016a Higher welfare colony housing [online] Available from: www.birdbroseggs.co.uk/making-the-grade/subpage-for-making-the-grade [Accessed 29 June 2016].
- Blokhuis HJ and Arkes JG. 1984. Some observations on the development of feather pecking in poultry. *Applied Animal Behaviour Science*. 31 145-147.
- Brinker T, Bijma P, Visscher J, Rodenburg TB and Ellen ED. 2014. Plumage condition in laying hens: genetic parameters for direct and indirect effects in two purebred layer lines. *Genetics Selection Evolution*. 46 33.
- British Lion Quality website. 2016. British Lion Quality Code of Practice [online] Available from: www.lioneggfarms.co.uk/information/british-lion-quality [Accessed 21 July 2016].
- British Lion Quality website. 2016a. What does the British Lion Quality mark symbolise? [online] Available from: www.lioneggfarms.co.uk/information/british-lion-quality [Accessed online 8 February 2016].
- British Poultry Council website. 2016. Breeding. [online] Available from: www.britishpoultry.org.uk/how-the-sector-works/breeding [Accessed 29 June 2016].
- Broom D M, 1990. Effects of handling and transport on laying hens. *World's Poultry Science Journal* 46: 48-50.
- Broom DM. 2001. Assessing the welfare of hens and broilers. *Proceedings of the Australian Poultry Science Symposium*. 13 61-70 IN: Case against Cages RSPCA.[1]
- Campo J and Prieto M. 2009. Effects of moist litter, perches, and droppings pit on fluctuating asymmetry, tonic immobility duration, and heterophil-to-lymphocyte ratio of laying hens. *Poultry Science*. 88 708-713.
- Chen BL, Haith KL and Mullens BA. 2011. Beak condition drives abundance and grooming-mediated competitive asymmetry in a poultry ectoparasite community. *Parasitology*. 138 6 748-57.
- CIWF. 2007. Alternatives to the barren battery cage for the housing of laying hens in the European Union. *Compassion in World Farming*. [online] Available from: www.ciwf.org.uk/media/3818829/alternatives-to-the-barren-battery-cage-in-the-eu.pdf [Accessed 12 July 2016].
- CIWF. 2012. The Life of Laying Hens. [online] Available from: www.ciwf.org.uk/media/5235024/The-life-of-laying-hens.pdf [Accessed 29 June 2016].
- CIWF website. 2013. The life of: broiler chickens. [online] Available from: www.ciwf.org.uk/media/5235306/The-life-of-Broiler-chickens.pdf [Accessed 23 June 2016].
- CIWF website. 2016. Enriched cages may be legal but they aren't right [online] Available from: www.ciwf.org.uk/our-campaigns/investigations/enriched-cages-may-be-legal-but-they-arent-right [Accessed 27 June 2016].
- CIWF website. 2016a. End the cage age [online] Available from: <http://action.ciwf.org.uk/ea-action/action?ea.client.id=119&ea.campaign.id=32141> [Accessed 27 June 2016].
- Clarke P. 2014. Mac's Farm signs up by Tesco [online] Available from: www.fwi.co.uk/poultry/mac-s-farm-eggs-signed-up-by-tesco.htm [Accessed 29 June 2016].
- Clarke P. 2014a. Poultry breeder on target for 500 egg birds. *Farmer's Weekly*, 29 March [online] Available from: www.fwi.co.uk/poultry/poultry-breeder-on-target-for-500-egg-bird.htm [Accessed 6 July 2016].
- Clarke P. 2014b. New layer breed to hit UK market. *Farmer's Weekly*, 1 October [online] Available from: www.fwi.co.uk/poultry/new-layer-breed-to-hit-uk-market.htm [Accessed 29 June 2016].
- Clarke P. 2015. Young consumers put eggs firmly back on the menu. *Poultry World*. December 2015.
- Clarke P. 2015a. George Eustice says 'no' to beak trim ban. *Poultry World*. December 2015
- Clarke P. 2015b. Jamie Oliver and Jimmy Doherty film at egg farm. [online] Available from: www.fwi.co.uk/poultry/jamie-oliver-and-jimmy-doherty-film-at-egg-farm.htm [Accessed 29 June 2016].

- Coalition for Sustainable Animal Agriculture. 2015. Beak Treatment: It's (Best) for the Birds [online] Available from: www.youtube.com/watch?v=fA4eoHOTfqo [Accessed 27 June 2016].
- Compassion Over Killing website. 2016. [online] Available at: http://cok.net/wp-content/uploads/2013/02/02_4cff05cu3.jpg [Accessed 8 June 2016].
- Co-operative website. 2016 Animal Welfare [online] Available from: www.co-operativefood.co.uk/food-matters/farming-food/animal-welfare [Accessed 5 July 2016].
- Council Directive 1999/74/EC. 1999. Laying down minimum standards for the protection of laying hens. Official Journal of the European Communities. [online] Available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:203:0053:0057:EN:PDF> [Accessed 20 July 2016].
- Cumbers P. 2016. Killing male chicks – another welfare challenge. February 2016. Poultry World.
- Daigle CL, Banerjee D, Montgomery RA, Biswas S and Siegford JM. 2014. Moving GIS research indoors: spatiotemporal analysis of agricultural animals. *PLoS One*. 9 (8) e104002.
- Daily Mail. 2007. Bernard Matthews worker caught playing football with turkeys. 19 June [online] Available from: www.dailymail.co.uk/news/article-462909/Bernard-Matthews-worker-caught-playing-football-turkeys.html [Accessed 30 June 2016].
- Davey M. 2014. Inside the battery hen shed: the farmer who wants to prove cages aren't always cruel. *The Guardian*, 18 September [online] Available from: www.theguardian.com/world/2014/sep/19/sp-inside-the-battery-hen-shed [Accessed 29 February 2016].
- Davies S. 2014. Antimicrobial resistance – why the irresponsible use of antibiotics in agriculture must stop – a briefing from the Alliance to save our antibiotics. Soil Association. [online] Available from: www.ciwf.org.uk/media/7247793/antibiotics-alliance-40pp-report-2015.pdf [Accessed 29 June 2016].
- Davies J. 2014a. Egg packer Fairburn wins Co-op supply deal. [online] Available at: www.fwi.co.uk/poultry/egg-packer-fairburn-wins-co-op-supply-deal.htm [Accessed 29 June 2016].
- Davies J. 2015. Animal rights group films chick maceration in French hatchery. *Farmer's Weekly*, 12 August [online] www.fwi.co.uk/poultry/animal-rights-group-films-chick-maceration-in-french-hatchery.htm [Accessed 237 June 2016].
- Davies J. 2016. 6 messages from the NFU poultry break out session. 24 February [online] Available from: www.fwi.co.uk/poultry/6-messages-from-the-nfu-poultry-breakout-session.htm [Accessed 23 June 2016].
- Davies J. 2016a. Stonegate owners sell free-range and organic business. 13 April 2016. [online] Available from: www.fwi.co.uk/poultry/stonegate-owners-sell-free-range-and-organic-business.htm [Accessed 28 June 2016].
- Davies J. 2016b. Iceland and Sodexo both commit to cage-free eggs. 25 July 2016. [online] Available from: www.fwi.co.uk/poultry/iceland-and-sodexo-both-commit-to-cage-free-eggs.htm [Accessed 26 July 2016].
- Davis GS, Anderson KE and Jones DR. 2004. The effects of different beak trimming techniques on plasma corticosterone and performance criteria in single comb white leghorn chickens. *Poultry Science*. 83 1624-1628.
- Dawkins R. 1968. The ontogeny of a pecking preference in domestic chicks. *Zeitschrift für Tierpsycholo*. 25 170-186.
- Dawkins MS and Hardie S. 1989. Space needs of laying hens. *British Poultry Science*. 30 413-416.
- Dawkins MS, Cook PA, Whittingham MJ, Mansell KA and Harper AE. 2003. What makes free-range broiler chickens range? In situ measurement of habitat preference. *Animal Behaviour*. 66 (1) 151-160.
- Decuyper E, Tona K, Bruggeman V and Bamelis F. 2001. The day-old chick: a crucial hinge between breeders and broilers. *World's Poultry Science Journal*. 57 127-38.
- DEFRA. 2004. Defra Research Project AW0226 – Effects of stocking density, cage height on health, behaviour, physiology and production of laying hens in furnished cages. 2000-2004. Department for Environment, Food and Rural Affairs [online] Available from: <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=9859> [Accessed 28 June 2016].
- DEFRA. 2005. Explanatory Leaflet on the Production Methods for Free-range and Barn Eggs marketed under the Egg Marketing Regulations. Department for Environment, Food and Rural Affairs.
- DEFRA. 2006. Review of the poultry catching industry in England and Wales. London: Department for Environment, Food and Rural Affairs [online] Available from: <http://www.food.gov.uk/sites/default/files/multimedia/pdfs/poultrycatchreview.pdf> [Accessed 30 June 2016].
- DEFRA. 2007. The Welfare of Poultry at Slaughter or Killing (WASK) [online] Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/69473/pb13539-welfare-poultry-slaughter.pdf [Accessed 21 July 2015].
- DEFRA. 2010. The Mutilations (Permitted Procedures) (England) (Amendment) Regulations 2010. Department for Environment, Food and Rural Affairs [online] Available from: <http://legislation.data.gov.uk/ukdsi/2010/9780111503553/data.htm?wrap=true> [Accessed 20 July 2016].
- DEFRA. 2011. Welfare of Animals During Transport: Advice for Transporters of Poultry. London: Department for Environment, Food and Rural Affairs [online] Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/69378/pb12544e-poultry-080711.pdf [Accessed 27 June 2016].
- DEFRA. 2012. Eggs: trade regulations. Salmonella control [online] Available from: www.gov.uk/guidance/eggs-trade-regulations#salmonella-control [Accessed 9 February 2016].
- DEFRA. 2016. Agriculture in the UK. London: Department for Environment, Food and Rural Affairs [online] Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/525886/AUK-2015-26may16.pdf [Accessed 22 June 2016].
- DEFRA. 2016a. United Kingdom Egg Statistics – Quarter 1, 2016 [online] Available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/520971/eggs-statsnotice-05may2016.pdf [Accessed 5 July 2016].
- de Haas EN, Bolhuis IC de Jong, Kemp B, Janczak AM and Rodenburg TB. 2014. Parents and early life environment affect behavioural development of laying hen chickens. *Plos One*. 9 (3) e90577.
- Dennis RL and Cheng HW. 2012. Effects of different infrared beak treatment protocols on chicken welfare and physiology. *Poultry Science*. 91 1499-1505.
- Derbyshire D. 2013. Up to 16,000 hens crammed into a shed, and many never see daylight. But believe it or not, these are free-range chickens. Mail online. 16 November 2013 [Accessed 22 June 2016].
- Ditchling Village Association website. 2016. Mac's Farm News – Temporary Opening Hours [online] Available at: www.ditchling.com/news/400 [Accessed 29 June 2016].
- Djoussé L, Gaziano JM, Buring JE and Lee IM. 2009. Egg consumption and risk of type 2 diabetes in men and women. *Diabetes Care*. 32 (2) 295-300.
- Downing E. 2015. Religious Slaughter of Animals. House of Commons Library [online] Available from: <http://researchbriefings.files.parliament.uk/documents/SN07108/SN07108.pdf> [Accessed 4 July 2016].
- Drake KA, Donnelly CA and Dawkins MS. 2010. Influence of rearing and lay risk factors on propensity for feather damage in laying hens. *British Poultry Science*. 88 38-43.
- Driver A. 2016. Kerry McCarthy calls for formal targets to cut farm antibiotic use. [online] Available from: www.fginsight.com/news/kerry-mccarthy-calls-for-formal-targets-to-cut-farm-antibiotic-use-11507 [Accessed 29 June 2016].

LAYING HENS: THE INSIDE STORY

- Duncan IJH and Wood-Gush D. 1972. Thwarting of feeding behaviour in the domestic fowl. *Animal Behaviour*. 20 444–451.
- Edgar J L, Lowe JC, Paul ES and Nicol CJ. 2011. Avian maternal response to chick distress Proceedings of the Royal Society B: *Biological Sciences* 278 (1721) 3129–3134.
- Egg Info website. 2016. Industry Data. [online] Available from: www.egginfo.co.uk/egg-facts-and-figures/industry-information/data [Accessed 29 June 2016].
- European Commission. 2008. Questions and Answers on the proposal for the protection of animals at the time of killing Memo/08/574. European Union.
- European Egg Packers and Traders Association website. 2016. EU cage ban imminent [online] Available from: www.eepta.eu/News/Detail.aspx?nwqd=6651e140-4032-4834-a02a-43c6db5733ea [Accessed 23 June 2016].
- European Food Safety Authority. 2004. Welfare aspects of animal stunning and killing methods. AHAW/04-027 [online] Available from: www.efsa.europa.eu/sites/default/files/scientific_output/files/main_documents/45.pdf [Accessed 4 July 2016].
- European Food Safety Authority. 2005. Opinion of the Scientific Panel on Animal Health and Welfare (AHAW) on a request from the Commission related to the welfare aspects of various systems of keeping laying hens. AHAW [online] Available from: www.efsa.europa.eu/sites/default/files/scientific_output/files/main_documents/197.pdf [Accessed 27 June 2016]
- European Food Safety Authority and European Centre for Disease Prevention and Control, 2012. The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2010. *EFSA Journal*. 10 (3) 2597.
- European Society of Dog and Animal Welfare. 2016. ESDAW - European Society of Dog and Animal Welfare [online] Available from: www.esdaw.eu/battery-cage.html [Accessed 22 June 2016].
- Farming UK. 2014. Tending to the flock – Organic best practice [online] Available from: www.farminguk.com/news/Tending-to-the-flock-Organic-best-practice_29916.html [Accessed 29 June 2016].
- Farming UK. 2015. 9 out of 10 eggs outside the EU are still produced in cages. *Farming UK*, 27 April [online] Available from: www.farminguk.com/News/9-out-of-10-eggs-outside-the-EU-are-still-produced-in-cages_35513.html [Accessed 22 June 2016].
- Farming UK. 2015a. Securing a future in egg packing [online] Available from: www.farminguk.com/content/DigitalIssue/145/files/assets/common/downloads/publication.pdf [Accessed 29 June 2016].
- Farming UK. 2016. Morrisons becomes latest in string of retailers to go cage-free by 2025 [online] Available from: www.farminguk.com/News/Morrisons-becomes-latest-in-string-of-retailers-to-go-cage-free-by-2025_42613.html [Accessed 26 July 2016].
- Farming UK. 2016a. Asda joins Lidl and Morrisons in ditching caged eggs in favour of more ethical options [online] Available from: www.farminguk.com/News/Asda-joins-Lidl-and-Morrisons-in-ditching-caged-eggs-in-favour-of-more-ethical-options_42677.html [Accessed 19 October 2016].
- FAWC. 2007. Code of Recommendations for the Welfare of Livestock: Laying Hens. Farm Animal Welfare Council.
- FAWC. 2007a. Opinion on beak trimming of laying hens. Farm Animal Welfare Council. [online] Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/325161/FAWC_opinion_on_beak_trimming_of_laying_hens.pdf [Accessed 27 June 2016].
- FAWC. 2007b. Opinion on enriched cages for laying hens. Farm Animal Welfare Council. [online] Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/325142/FAWC_opinion_on_enriched_cages_for_laying_hens.pdf [Accessed 27 June 2016].
- FAWC. 2009. Report on the Welfare of Farmed Animals at Slaughter or Killing – Part Two: White Meat Animals. Farm Animal Welfare Council. [online] Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/325045/FAWC_report_on_the_welfare_of_farmed_animals_at_slaughter_or_killing_part_two_white_meat_species.pdf [Accessed 4 July 2016].
- FAWC. 2010. Opinion on Osteoporosis and bone fractures in laying hens. Farm Animal Welfare Council. [online] Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/325043/FAWC_opinion_on_osteoporosis_and_bone_fractures_in_laying_hens.pdf [Accessed 29 June 2016].
- FAWC. 2013. Letter from Peter Jinman, Chairman, FAWC to DEFRA, Welsh Government and Scottish Government. Farm Animal Welfare Council. [online] Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/324505/FAWC_advice_on_keel_bone_fractures_in_laying_hens.pdf [Accessed 29 June 2016].
- FAWC. 2015. Opinion on CCTV in slaughterhouses Farm Animal Welfare Council. [online] Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/400796/Opinion_on_CCTV_in_slaughterhouses.pdf [Accessed 6 July 2016].
- Fernandez O. 2015. Vital role of chick transport in overall flock performance, Cobb-Vantress technical service [online] Available from: www.cobb-vantress.com/academy/articles/article/academy/2015/04/04/vital-role-of-chick-transport-in-overall-flock-performance [Accessed 27 June 2016].
- Fleming RC, Whitehead D, Alvey N, Gregory and Wilkins L. 1994. Bone structure and breaking strength in laying hens housed in different housing systems. *British Poultry Science*. 35 651–662.
- Follow your Heart website. 2016. Home page [online] Available at: <http://followyourheart.com> [Accessed 14 July 2016].
- Food Miles. 2016. Food Miles Calculator [online] Available from: www.foodmiles.com [Accessed 5 July 2016].
- FSA. 2013. Results of the 2013 animal welfare survey in Great Britain. Food Standards Agency. [online] Available from: www.food.gov.uk/sites/default/files/2013-animal-welfare-survey.pdf [Accessed 4 July 2016].
- FSA. 2015. FSA statement on abattoir footage released by Animals Aid. 3 February [online] www.food.gov.uk/news-updates/news/2015/13519/fsa-statement-on-footage-released-by-animal-aid [Accessed 5 July 2016].
- Gavaghan L. 2016. End the sale of eggs from caged hens and barn kept hens in Tesco [online] Available at: www.change.org/p/tesco-ban-the-sales-of-eggs-from-caged-and-barn-kept-hens [Accessed 19 October 2016].
- George DR, Finn RD, Graham KM, Mul MF, Maurer V, Moro V and Sparagano OA. 2015. Should the poultry red mite *Dermanyssus gallinae* be of wider concern for veterinary and medical science? *Parasit Vectors*. 25 (8)178.
- Gilani AM, Knowles, TG and Nicol CJ. 2013. The effect of rearing environment on feather pecking on commercial farms. *Applied Animal Behaviour Science*. 148 54–63.
- Glutz J. 2012. Morrisons stripped of 'Good Egg' welfare award. *The Grocer*, 4 September [online] Available from: www.thegrocer.co.uk/channels/supermarkets/morrisons/morrisons-stripped-of-good-egg-welfare-award/232230.article [Accessed 5 July 2016].
- Greger M. 2014 Who Says Eggs Aren't Healthy or Safe? [online] Available from: www.nutritionfacts.org/video/who-says-eggs-arent-healthy-or-safe [Accessed 10 February 2016].
- Gregory NG and Austin SD. 1992. Causes of trauma in broilers arriving dead at poultry processing plants. *Veterinary Record*. 31 501–503.

- Gregory NG and Wotton SB. 1994. Effect of electrical stunning current on the duration of insensibility in hens. *British Poultry Science*. 35 463-465.
- Halal Focus website. 2010. Is stunning animals used for meat haram? [online] Available from: <http://halalfocus.net/is-stunning-animals-used-for-meat-haram> [Accessed 4 July 2016].
- Halal Monitoring Committee website. 2016. Issues of Mechanical Slaughter and Stunning [online] Available from: www.halalhmc.org/IssueOfMSandStunning.htm [Accessed 4 July 2016].
- Han E. 2016. Egg industry wants to stop grinding and gassing millions of male chicks to death [online] Available from: www.smh.com.au/business/consumer-affairs/egg-industry-wants-to-stop-grinding-and-gassing-millions-of-male-chicks-to-death-20160611-gpgy5s.html [Accessed 27 June 2016].
- Happy Egg. 2016. Five-star accommodation [online] Available from: <https://thehappyegg.co.uk/our-girls/free-range-hen-welfare/> [Accessed 10 February 2016].
- Hartke K. 2015. Trust us. You can use the liquid form from a can of beans to make dessert. *The Washington Post*, 5 October [online] Available from: www.washingtonpost.com/lifestyle/food/trust-us-you-can-use-the-liquid-from-a-can-of-beans-to-make-dessert/2015/10/05/508ccb42-6852-11e5-9223-70cb36460919_story.html [Accessed 5 July 2016].
- Hegelund L, Sørensen JT and Kjær JB. 2005. Use of the range area in organic egg production systems: effect of climatic factors, flock size, age and artificial cover. *British Poultry Science*. 46 1-8.
- Hegelund L, Sørensen JT and Hermansen JE. 2006. Welfare and productivity of laying hens in commercial organic egg production systems in Denmark. *NJAS* 54 (2): 147-155.
- Hendrix Genetics website. 2016. Breeding for resource use efficiency [online] Available from: www.hendrix-genetics.com/en/brighter_life/sustainability/resource-use-efficiency [Accessed 21 July 2016].
- Hess EH. 1959. Imprinting – an effect of early experience, imprinting determines later social behaviour in animals. *Science*. 130 133-141.
- Hess EH. 1964. Imprinting in birds – research has borne out concept of imprinting as a type of learning different from association learning. *Science*. 146 1128-1139.
- Hester PY, Enneking SA, Haley BK, Cheng HW, Einstein ME and Rubin DA. 2013. The effect of perch availability during pullet rearing and egg laying on musculoskeletal health of caged White Leghorn hens. *Poultry Science*. 92 (8) 1972-80.
- Hester PY, Al-Ramamneh DS, Makagon MM and Cheng HW. 2015. Effect of partial comb and wattle trim on pullet behaviour and thermoregulation. *Poultry Science*. 94 (5): 860-866.
- Hillside. 2016. [online] Available from: www.hillside.org.uk/bmpage.htm [Accessed 30 June 2016].
- Hindle VA, Lambooj E, Reimert HG, Workel LD and Gerritzen MA. 2010. Animal welfare concerns during the use of the water bath for stunning broilers, hens, and ducks. *Poultry Science*. 89 (3) 401-41 2.
- Honaker CF and Ruzsler PL. 2004. The effect of claw and beak reduction on growth parameters. *Poultry Science*. 83 873-881.
- Huber-Eicher B and Wechsler B. 1997. Feather pecking domestic chicks: Its relation to dustbathing and foraging. *Animal Behaviour*. 54 757-768.
- Humane Slaughter Association. 2005. Technical Notes: Instantaneous Mechanical Destruction (IMD). Humane Slaughter Association [online] Available from: www.hsa.org.uk/downloads/technical-notes/TN9-mechanical-destruction.pdf [Accessed 27 June 2016].
- Humane Slaughter Association. 2006. Technical Notes: Gas Killing of Chicks in Hatcheries. Humane Slaughter Association [online] Available from: www.hsa.org.uk/downloads/technical-notes/TN14-gas-killing-of-chicks-in-hatcheries.pdf [Accessed 23 June 2016].
- Humane Slaughter Association. 2014. A Fowl End? Humane Slaughter Association [online] Available from: www.hsa.org.uk/downloads/related-items/poultry-slaughter.pdf [Accessed 4 July 2016].
- Humane Slaughter Association. 2016. The live electrode-water-bird interface. Humane Slaughter Association [online] Available from: www.hsa.org.uk/operating-an-electrical-waterbath/the-live-electrode-water-bird-interface [Accessed 3 November 2016].
- Humane Society of the United States. 2008. Welfare Issues with Transport of Day-Old Chicks. Humane Society of United States [online] Available from: www.humanesociety.org/assets/pdfs/farm/welfiss_chick_transport.pdf [Accessed 27 June 2016].
- Humane Society of the United States. 2010. An HSUS report: welfare issues with furnished cages for egg-laying hens [online] Available from: www.humanesociety.org/assets/pdfs/farm/welfare_issues_furnished_cages.pdf [Accessed 12 July 2016].
- Humane Society of the United States. 2015. Scientists and Experts on Battery Cages and Laying Hen Welfare [online] Available from: www.humanesociety.org/assets/pdfs/farm/HSUS-Synopsis-of-Expert-Opinions-on-Battery-Cages-and-Hen-Welfare.pdf [Accessed 22 June 2016].
- Hypor website. 2013. New SNP chip to speed up ISA's 500 eggs mission [online] Available from: www.hypor.com/en/isapoultry/news/new-snp-chip [Accessed 29 June 2016].
- Inns T, Lane C, Peters T, Dallman T, Chatt C, McFarland N, Crook P, Bishop T, Edge J, Hawker J, Elson R, Neal K, Adak GK, Cleary P and Outbreak Control Team. 2015. A multi-country Salmonella Enteritidis phage type 14b outbreak associated with eggs from a German producer: 'near real-time' application of whole genome sequencing and food chain investigations, United Kingdom, May to September 2014. *Euro Surveillance*. 20 (16).
- ISA Poultry website, 2016. Eggs Earth Earnings. [online] Available at: www.isapoultry.com/~media/Files/ISA/isa_brochure.pdf [Accessed 29 June 2016].
- Jacob J. 2015. Feather Pecking and Cannibalism in Small and Backyard Poultry Flocks 5 May [online] Available from: www.extension.org/pages/66088/feather-pecking-and-cannibalism-in-small-and-backyard-poultry-flocks#.VeWf5Pnq6M8 [Accessed 27 June 2016].
- Janczak AM and Riber AB. 2015. Review of rearing-related factors affecting the welfare of laying hens. *Poultry Science*. 94 (7) 1454-1469.
- Jeory T and Forster K. 2016. Exposed: The shocking and filthy conditions endured by supermarket hens in 'enriched cages'. Independent. [online] Available at: www.independent.co.uk/news/uk/home-news/enriched-caged-hens-chickens-video-footage-eggs-viva-tesco-asda-morrisons-one-stop-lidl-oaklands-a7374281.html [Accessed 3 November 2016].
- Joice & Hill Poultry. 2014. Blue Barns celebrate record sales [online] Available from: www.joiceandhill.co.uk/en/news/blue-barns-celebrate-record-sales [Accessed 27 June 2016].
- K Fresh. 2010. K Fresh Colony [online] Available from: www.youtube.com/watch?v=WyoPY5i0Kw [Accessed 22 June 2016].
- K Fresh website. 2016. Homepage [online] Available from: www.kfresh.co.uk [Accessed 22 June 2016].
- K Fresh website. 2016a. Consumers [online] Available from: www.kfresh.co.uk/consumers.html [Accessed 22 June 2015].
- Keppler C and Fölsch DW. 2000. Locomotive behaviour of hens and cocks (*Gallus gallus f. domesticus*) Implications for housing systems. *Archiv für Tierzucht*. 43 184-188.
- Keppler C, Schnurrenberger-Bölter U and Fölsch DW. 1997. Activity and social relationships of chickens (*Gallus gallus f. domesticus*) in aviary systems – methods and preliminary results. In: Koene P and Blockhuis, HJ (ed) 5th Symposium on Poultry Welfare University of Wageningen, Netherlands: World's Poultry Science Association.

LAYING HENS: THE INSIDE STORY

- Keum N, Lee DH, Marchand N, Oh H, Liu H, Aune D, Greenwood DC and Giovannucci EL. 2015. Egg intake and cancers of the breast, ovary and prostate: a dose-response meta-analysis of prospective observational studies. *British Journal of Nutrition*. 21 1-9.
- Kindy K. 2013. USDA plan to speed up poultry-processing lines could increase risk of bird abuse. *The Washington Post*, 29 October [online] Available from: www.washingtonpost.com/politics/usda-plan-to-speed-up-poultry-processing-lines-could-increase-risk-of-bird-abuse/2013/10/29/aeeffe1e-3b2e-11e3-b6a9-da62c264f40e_story.html [Accessed 4 July 2016].
- Knowles TG and Broom DM. 1990. The handling and transport of broilers and spent hens. *Applied Animal Behaviour Science*. 28 75-91.
- Kuhne A, Adler S and Sauerbrey AF. 2011. Redirected behavior in learning tasks: the commercial laying hen (*Gallus gallus domesticus*) as model. *Poultry Science*. 90 (9) 1859-66.
- Lawler A. 2015. Why did the chicken cross the world? The epic saga of the bird that powers civilisation. London: Duckworth Overlook.
- Lawrence F, Wasley A and Ciorniciuc. 2014. Revealed: the dirty secret of the UK's poultry industry. *The Guardian*, 23 July [online] Available from: www.theguardian.com/world/2014/jul/23/sp-revealed-dirty-secret-uk-poultry-industry-chicken-campylobacter [Accessed 4 July 2016].
- Lee CT, Liese AD, Lorenzo C, Wagenknecht LE, Haffner SM, Rewers MJ and Hanley AJ. 2014. Egg consumption and insulin metabolism in the Insulin Resistance Atherosclerosis Study (IRAS). *Public Health Nutrition* 17 (7) 1595-1602.
- Li Y, Hruby A, Bernstein AM, Ley SH, Wang DD, Chiuve SE, Sampson L, Rexrode KM, Rimm EB, Willett WC, Hu FB. 2015. Saturated Fats Compared With Unsaturated Fats and Sources of Carbohydrates in Relation to Risk of Coronary Heart Disease. *Journal of the American College of Cardiology*. 66 (14) 1538-1548.
- LJ Fairburn & Son website. 2015. Fairburn announce a new line with Costco [online] Available at: <http://ljfairburnpoultry.co.uk/fairburns-announce-a-new-line-with-costco> [Accessed 29 June 2016].
- Love Free-range Eggs website. 2016. Mac's Farm – at one with welfare [online] Available at: www.lovetofreerangeeggs.co.uk/Socialmedia/Mac-s-Farm-At-One-With-Welfare_12.html [Accessed 29 June 2016].
- Lundberg AS and Keeling LJ. 2003. Social effects on dustbathing behaviour in laying hens: Using video images to investigate effect of rank. *Applied Animal Behavioural Science*. 81 43-57.
- Ma Z, Zhang J, Ma H, Dai B, Zheng L, Miao J and Zhang Y. 2014. The influence of dietary taurine and reduced housing density on hepatic functions in laying hens. *Poultry Science*. 93 (7) 1724-1736.
- MacCaluim JM, Abeyesinghe SM, White RP and Wathes CM. 2003. A continuous-choice assessment of the domestic fowl's aversion to concurrent transport stressors. *Animal Welfare*. 12 95-10.
- MacKenzie S. 2015. The best vegan egg replacer. 10 January [online] Available from: www.huffingtonpost.com/food-52/the-best-vegan-egg-replac_b_8226826.html [Accessed 5 July 2016].
- Marchant-Forde RM, Fahey AG and Cheng HW. 2008. Comparative effects of infrared and one-third hot-blade trimming on beak topography, behavior, and growth. *Poultry Science*. 87 1474-1483.
- M&S website. 2015. Our standards – Free-range Eggs [online] Available at: <http://corporate.marksandspencer.com/documents/plan-a-2015/eggs.pdf> [Accessed 5 July 2016].
- Matthews D. 2016. This is the best news for America's animals in decades. It's about baby chicks [online] Available from: www.vox.com/2016/6/9/11896096/eggs-chick-culling-ended [Accessed 27 June 2016].
- McDougal T. 2016. Aldi to phase out sale of colony eggs in stores [online] Available from: www.fwi.co.uk/poultry/aldi-to-phase-out-sale-of-colony-eggs-in-stores.htm [Accessed 5 July 2016].
- McDougal T. 2016a. Lidl has no plans to follow Aldi with a cage-free commitment. July 2016. *Poultry World*.
- Mead GC. 2004. Poultry meat processing and quality. Woodhead Publishing Limited. Cambridge: UK [online] Available from: http://197.14.51.10:81/pmb/AGROALIMENTAIRE/Poultry_Meat_Processing_and_Quality.pdf [Accessed 4 July 2016].
- Meepmeepcreative. 2010. K Fresh Colony [online] Available from: www.youtube.com/watch?v=PP5j4AnWRCA [Accessed 29 June 2016].
- Mench JA and Blatchford RA. 2014. Determination of space use by laying hens using kinematic analysis. *Poultry Science* 93: 794-798.
- Merical Animal Health website. 2012. BirdBros [online] Available from: www.youtube.com/watch?v=ruE7URMIQ18 [Accessed 22 February 2016].
- Michael S. 2015. So much for free-range: The horror farms where chickens are NEVER allowed outside - but you're still charged more to feel better about your eggs. *Daily Mail*, 21
- May [online] Available from: www.dailymail.co.uk/news/article-3090407/So-free-range-horror-farms-chickens-NEVER-allowed-outside-charged-feel-better-eggs.html#ixzz3qL2dRoAp [Accessed 29 June 2016].
- Miličević D, Vranić D, Mašić Z, Parunović N, Trbović D, Nedeljković-Trailović J and Petrović Z. 2014. The role of total fats, saturated/unsaturated fatty acids and cholesterol content in chicken meat as cardiovascular risk factors. *Lipids in Health and Disease*. 13, 42.
- Millett T. 2016. As it says on the Waitrose TV commercial – these Waitrose-free eggs come from a Marlborough farm. *Marlborough News Online* [online] Available from: www.marlboroughnewsonline.co.uk/features/general/5542-as-it-says-on-the-tv-commercial-these-waitrose-free-range-eggs-come-from-a-marlborough-farm [Accessed 29 June 2016].
- Miranda JM, Anton X, Redondo-Valbuena C, Roca-Saavedra P, Rodriguez JA, Lamas A, Franco CM and Cepeda A. 2015. Egg and egg-derived foods: effects on human health and use as functional foods. *Nutrients* 7 (1) 706-729.
- Mitchell MA and Kettlewell PJ. 1998. Physiological stress and welfare of broiler chickens in transit: Solutions not problems! *Poultry Science*. 77 1803-1814.
- Mitchell MA and Kettlewell PJ. 2004. Transport of chicks, pullets and spent hens. In: Perry GC. (ed) *Welfare of the Laying Hen*. Oxfordshire, UK: CABI Publishing. 361-372.
- Mozafar F. 2014. Tackling red mite in laying hens remains a challenge. [online] Available from: www.worldpoultry.net/Health/Articles/2014/7/Tackling-red-mite-in-laying-hens-remains-a-challenge-1438417W [Accessed 29 June 2016].
- Mullens BA, Chen BL and Owen JP. 2010. Beak condition and cage density determine abundance and spatial distribution of northern fowl mites, *Ornithonyssus sylviarum*, and chicken body lice, *Menacanthus stramineus*, on caged laying hens. *Poultry Science* 89: 2565-2572.
- Nasr MAF, Nicol CJ and Murrell J. 2012. Do hens with keel fractures experience pain? *PLoSOne*. 7 (8) e42420.
- Nasr MAF, Murrell J, Wilkins LJ and Nicol CJ. 2012a. The effect of keel fractures on egg-production parameters, mobility and behaviour in individual laying hens. *Animal Welfare*. 21: 127-135.
- Nettleton JA, Steffen LM, Loehr LR, Rosamond WD and Folsom AR. 2008. Incident heart failure is associated with lower whole-grain intake and greater high-fat dairy and egg intake in the Atherosclerosis Risk in Communities (ARIC) study. *Journal of the American Dietetic Association*. 108 (11) 1881-1887.
- Newberry R, Estevez I and Keeling L. 2001. Group size and perching behaviour in young domestic fowl. *Applied Animal Behaviour Science*. 73: 117-129.
- Nicol CJ. 1989. Social influences on the comfort behaviour of laying hens. *Applied Animal Behaviour Science*. 22 75-81.
- Nicol CJ, Poetzsch C, Lewis K and Green LE. 2003. Matched concurrent case-control study of risk factors for feather pecking in hens on free-range commercial farms in the UK. *British Poultry Science*. 44 515-523.

- Nicol CJ. 2015. *The Behavioural Biology of Chickens*. Oxfordshire, UK: CABI Publishing.
- Nijdam E, Arens P, Lambooj E, Decuypere E and Stegeman JA. 2004. Factors influencing bruises and mortality of broilers during catching, transport and lairage. *Poultry Science*. 83: 1610-1615.
- Noble Foods. 2016. Home page [online] Available from: www.noblefoods.co.uk [Accessed 29 June 2016].
- Noble Foods. 2016a. Bringing eggs to life [online] Available from: www.noblefoods.co.uk/corporate-social-responsibility/animal-welfare [Accessed 29 June 2016].
- Nordquist RE, Zeinstra EC, Rodenburg TB and van der Staay FJ. 2013. Effects of maternal care and selection for low mortality on tyrosine hydroxylase concentrations and cell soma size in hippocampus and nidopallium caudolaterale in adult laying hen. *Journal of Animal Science*. 91 (1) 137-46.
- O'Brien SJ. 2013. The "decline and fall" of nontyphoidal salmonella in the United Kingdom. *Clinical Infectious Diseases*. 56 (5) 705-710.
- O'Brien J. 2006. Aspects of poultry behaviour: How free-range is free-range? *Elm Farm Research Centre Bulletin*. Elm Farm Research Centre. [2]
- O'Connor A, Dzikamunhenga RS, Totton S, Wolfe D, Sargeant J, Glanville J and Wood H. 2015. Systematic review of the effect of perch height on keel bone fractures, deformation and injuries, bone strength, foot lesions and perching behaviour. EFSA supporting publication EN-841.
- Olsson IAS and Keeling LJ. 2002 The push-door for measuring motivation in hens: Laying hens are motivated to perch at night. *Animal Welfare*. 11 11-19.
- Organic Research Centre. 2015. Developing more sustainable food and farming based on organic/agroecological principles [online] Available from: [www.organicresearchcentre.com/?go=organic-research-centre&page=What is ORC?](http://www.organicresearchcentre.com/?go=organic-research-centre&page=What%20is%20ORC) [Accessed 29 June 2016].
- PackagingBR. 2015. Bird Bros installs Endoline case sealing system to increase efficiency. 23 March 2015 [online] Available from: <http://machineryandequipment.packaging-business-review.com/news/bird-bros-installs-endoline-case-sealing-system-to-increase-efficiency-230315-4537485> [Accessed 29 June 2016].
- Parker TH and Ligon DJ. 2002. Dominant male red junglefowl (*Gallus gallus*) test the dominance status of other males. *Behavioural Ecology and Sociobiology*. 53 (1): 20-24.
- Parker C, Brunswick C and Kotey J. 2013. The happy hen on your supermarket shelf: what choice does industrial strength free-range represent for consumers? *Journal of Bioethical Inquiry*. 2 165-86.
- PETA website. 2005. Chicken transport and slaughter [online] Available from: www.peta.org/issues/animals-used-for-food/factory-farming/chickens/chicken-transport-slaughter [Accessed 4 July 2016].
- PETA. 2007. Controlled-atmosphere killing vs. electric immobilization: A comparative analysis of poultry slaughter systems from animal welfare, worker safety, and economic perspectives. [online] Available from: www.mediapeta.com/peta/PDF/CAKreport.pdf [Accessed 4 July 2016].
- PETA website. 2016. The case for controlled-atmosphere killing [online] Available from: www.peta.org/features/case-controlled-atmosphere-killing [Accessed 4 July 2016].
- Phillips RE and Siegel PB. 1966. Development of fear in chicks of two closely related genetic lines. *Animal Behaviour Science*. 14 84-88.
- Pickett. 2008. Controlling feather pecking & cannibalism in laying hens without beak trimming. *Compassion in World Farming*. [online] Available from: www.ciwf.org.uk/includes/documents/cm_docs/2008/c/controlling_feather_pecking_and_cannibalism_in_laying_hens.pdf [Accessed 5 July 2016].
- Pirozzo S, Purdie D, Kuiper-Linley M, Webb P, Harvey P, Green A. and Bain C. 2002. Ovarian cancer, cholesterol, and eggs: a case-control analysis. *Cancer Epidemiology, Biomarkers and Prevention*. 11 (1) 1112-1114.
- Poulter S. 2016. EXCLUSIVE: Shocking pictures show distressed and dying chickens kept in horrific conditions in 'enriched British Lion' cages that are 'worse than battery farms'. Mail Online [online] Available from: www.dailymail.co.uk/news/article-3508503/Shocking-pictures-distressed-dying-chickens-kept-horrific-conditions-called-enriched-cages-worse-battery-farms.html [Accessed 21 July 2016].
- Poultry World. 2016. Embryo sexing could end male chick culling. Poultry World. May 2016.
- Public Health England. 2015. Salmonella infections (faecal specimens) England and Wales, laboratory reports (PHE salmonella data set): January 2015. [online] Available from: www.gov.uk/government/publications/salmonella-infections-faecal-specimens-in-england-and-wales-laboratory-reports-2015/salmonella-infections-faecal-specimens-england-and-wales-laboratory-reports-phe-salmonella-data-set-january-2015 [Accessed 9 February 2016].
- Public Health England, 2015a. Salmonella infections (faecal specimens) England and Wales, laboratory reports (PHE salmonella data set): February 2015. [online] Available from: www.gov.uk/government/publications/salmonella-infections-faecal-specimens-in-england-and-wales-laboratory-reports-2015/salmonella-infections-faecal-specimens-england-and-wales-laboratory-reports-phe-salmonella-data-set-february-2015 [Accessed 9 February 2016].
- Public Health England, 2015b. Salmonella infections (faecal specimens) England and Wales, laboratory reports (PHE salmonella data set): March 2015. [online] Available from: www.gov.uk/government/publications/salmonella-infections-faecal-specimens-in-england-and-wales-laboratory-reports-2015/salmonella-infections-faecal-specimens-england-and-wales-laboratory-reports-phe-salmonella-data-set-march-2015 [Accessed 9 February 2016].
- Public Health England, 2015c. Salmonella infections (faecal specimens) England and Wales, laboratory reports (PHE salmonella data set): April 2015. [online] Available from: www.gov.uk/government/publications/salmonella-infections-faecal-specimens-in-england-and-wales-laboratory-reports-2015/salmonella-infections-faecal-specimens-england-and-wales-laboratory-reports-phe-salmonella-data-set-april-2015 [Accessed 9 February 2016].
- Public Health England, 2015d. Salmonella infections (faecal specimens) England and Wales, laboratory reports (PHE salmonella data set): May 2015. [online] Available from: www.gov.uk/government/publications/salmonella-infections-faecal-specimens-in-england-and-wales-laboratory-reports-2015/salmonella-infections-faecal-specimens-england-and-wales-laboratory-reports-phe-salmonella-data-set-may-2015 [Accessed 9 February 2016].
- Public Health England, 2015e. Salmonella infections (faecal specimens) England and Wales, laboratory reports (PHE salmonella data set): June 2015. [online] Available from: www.gov.uk/government/publications/salmonella-infections-faecal-specimens-in-england-and-wales-laboratory-reports-2015/salmonella-infections-faecal-specimens-england-and-wales-laboratory-reports-phe-salmonella-data-set-june-2015 [Accessed 9 February 2016].
- Public Health England, 2015f. Salmonella infections (faecal specimens) England and Wales, laboratory reports (PHE salmonella data set): July 2015. [online] Available from: www.gov.uk/government/publications/salmonella-infections-faecal-specimens-in-england-and-wales-laboratory-reports-2015/salmonella-infections-faecal-specimens-england-and-wales-laboratory-reports-phe-salmonella-data-set-july-2015 [Accessed 9 February 2016].
- Public Health England, 2015g. Salmonella infections (faecal specimens) England and Wales, laboratory reports (PHE salmonella data set): August 2015. [online] Available from: www.gov.uk/government/publications/salmonella-infections-faecal-specimens-in-england-and-wales-laboratory-reports-2015/salmonella-infections-faecal-specimens-in-england-and-wales-laboratory-reports-2015/salmonella-august-2015 [Accessed 9 February 2016].
- Qureshi AA. 1991. Losses due to dehydrated broiler chicks. *Misset World Poultry*. 7 (4) 75-9.

LAYING HENS: THE INSIDE STORY

- Rainey C. 2016. Hellman's just launched its own vegan mayo. The Huffington Post, 5 February [online] Available from: www.huffingtonpost.com/grub-street/hellmanns-just-launched-i_b_9163780.html [Accessed 3 November 2016].
- Ralph CR, Hemsworth PH, Leury BJ and Tilbrook AJ. 2015. Relationship between plasma and tissue corticosterone in laying hens (*Gallus gallus domesticus*): implications for stress physiology and animal welfare. *Domest Anim Endocrinol.* 50 72-82.
- Ranger. 2015. Soil Association confirms increase in organic sales. 12 April [online] Available from: www.theranger.co.uk/News/Soil-Association-confirms-increase-in-organic-sales_25170.html [Accessed 23 June 2016].
- Ranger. 2015a. Chairman's Comment February 2015. 16 February [online] Available from: www.theranger.co.uk/News/Chairman-s-Comment-February-2015_25129.html [Accessed 29 June 2016].
- Ranger. 2015b. Four million chicks and counting [online] Available from: www.theranger.co.uk/News/Four-million-chicks-and-counting_25172.html [Accessed 29 June 2016].
- Red Tractor. 2012. Assurance for Meat: Meat Processing Standards [online] Available from: <http://assurance.redtractor.org.uk/contentfiles/Farmers-6370.pdf> [Accessed 5 July 2016].
- Riber AB, Wichman Braastad BO and Forkman B. 2007. Effects of broody hens on perch use, ground pecking, feather pecking and cannibalism in domestic fowl (*Gallus gallus domesticus*). *Applied Animal Behaviour Science.* 108: 276-287.
- Richards GJ, Wilkins LJ, Knowles TG, Booth F, Toscano MJ, Nicol CJ and Brown SN. 2012. Pop hole use by hens with different keel fracture status monitored throughout the laying period. *Veterinary Record.* 170 494-498.
- Richman EL, Kenfield SA, Stampfer MJ, Giovannucci EL and Chan JM. 2011. Egg, red meat, and poultry intake and risk of lethal prostate cancer in the prostate specific antigen-era: incidence and survival. *Cancer Prevention Research.* 4 (12) 2110-2121.
- Richman EL, Kenfield SA, Stampfer MJ, Giovannucci EL, Zeisel SH, Willett WC and Chan JM. 2012. Choline intake and risk of lethal prostate cancer: incidence and survival. *American Journal of Clinical Nutrition.* 96 (4) 855-863.
- RSPCA. 2005. The Case Against Cages. Royal Society for the Prevention of Cruelty to Animals.
- RSPCA. 2011. Welfare Standards for Hatcheries – Chicks, poults and ducklings. Royal Society for the Prevention of Cruelty to Animals.
- RSPCA. 2013. Welfare Standards for Laying Hens. Royal Society for the Prevention of Cruelty to Animals.
- RSPCA website. 2016. Key Welfare Issues. Royal Society for the Prevention of Cruelty to Animals. [online] www.rspca.org.uk/adviceandwelfare/farm/slaughter/keyissues [Accessed 4 July 2016].
- Sainsbury's website. 2012. Press release: Sainsbury's goes the egg-straight mile for happy hens [online] Available from: www.j-sainsbury.co.uk/media/latest-stories/2012/20120213-sainsburys-goes-the-egg-straight-mile-for-happy-hens [Accessed 5 July 2016].
- Salahi A, Moosanezhad M, Pakdel A, Baghbanzadeh A. 2011. Effects of cold stress during transportation on hatchability and chick quality of broiler breeder eggs. *Turkish Journal of Veterinary and Animal Sciences* 36 (2): 159-167.
- Salisbury P. 2011. What's the real cost of Bernard Matthews Christmas turkey? *The Ecologist*, 20 December [online] Available from: www.theecologist.org/green_green_living/behind_the_label/1171257/whats_the_real_cost_of_bernard_matthews_christmas_turkey.html [Accessed 30 June 2016].
- Saul H. 2015. Hatched, discarded, gassed: What happens to male chicks in the UK. 5 March [online] Available from: www.independent.co.uk/life-style/food-and-drink/hatched-discarded-gassed-what-happens-to-male-chicks-in-the-uk-10088509.html [Accessed 27 June 2016].
- Savory JC, Jack MC and Sandilands V. 2005. Behavioural responses of hens in pens to different floor space allowances. *Animal Science Papers and Reports.* 23 (1) 135-41.
- Scholz B, Kjaer JB, Petow S and Schrader L. 2014. Dustbathing in food particles does not remove feather lipids. *Poultry Science.* 93 (8) 1877-1882.
- Schrader L and Muller B. 2009. Night-time roosting in the domestic fowl: The height matters. *Applied Animal Behaviour Science.* 121 179-183.
- Scotland for Animals website. 2016. Not racist! – just against unstunned slaughter [online] Available from: <http://scotlandforanimals.org/unstunned.html> [Accessed 4 July 2016].
- Shelling A. 2015. [online] Here's how Germany will stop the senseless killing of 45 million chickens [online] Available from: www.thedodo.com/germany-stop-culling-male-chicks-1068701850.html [Accessed 27 June 2016].
- Shimmura T, Maruyama Y, Fujino S, Kamimura E, Uetake K and Tanaka T. 2015. Persistent effect of broody hens on behaviour of chickens. *Animal Science Journal.* 86 (2) 214-20.
- Simon M. 2014. Big mayo files frivolous lawsuit against eggless competitor, Eat Drink Politics. 9 November [online] Available from: www.eatdrinkpolitics.com/2014/11/09/big-mayo-files-frivolous-lawsuit-against-eggless-competitor [Accessed 5 July 2016].
- Smith CK and Zielinski SL. 2014. Brainy Bird. *Scientific American* 310 (2) 60-65.
- Soil Association. 2014. Organic Standards: Farming and Growing. Soil Association.
- Soil Association website. 2016. Save our Antibiotics. [online] Available from: www.soilassociation.org/better-food/our-campaigns/save-our-antibiotics [Accessed 29 June 2016].
- Spary S. 2016. Walmart will stop selling eggs from caged hens, but Asda won't commit [online] Available from: www.buzzfeed.com/saraspary/walmart-will-stop-selling-eggs-from-caged-hens-but-asda-wont?utm_term=.dm068PeVL#.li0a1XkZ2Z [Accessed 5 July 2016].
- Spence JD, Jenkins DJ and Davignon J. 2010. Dietary cholesterol and egg yolks: not for patients at risk of vascular disease. *Canadian Journal of Cardiology.* 26 (9) e336-339.
- Spence JD, Jenkins DJ and Davignon J. 2012. Egg yolk consumption and carotid plaque. *Atherosclerosis.* 224 (2) 469-473.
- Steenfeldt S and Nielsen BL. 2015. Welfare of organic laying hens kept at different indoor stocking densities in a multi-tier aviary system. II: live weight, health measures and perching. *Animal.* 20: 1-11.
- Stonegate website. 2016. Product Range [online] Available from: www.stonegate.co.uk/productRange.aspx [Accessed 28 June 2016].
- Stonegate. 2016a. Home page [online] Available from: www.stonegate.co.uk [Accessed 28 June 2016].
- Stonegate. 2016b. Our Farms [online] Available from: www.stonegate.co.uk/compFarms.aspx [Accessed 28 June 2016].
- Taher A and Elliot V. 2014. Horror at halal slaughterhouse: Shocking undercover film shows the 'needless suffering' of livestock that are butchered without being stunned first. *Daily Mail*, 12 April [online] Available from: www.dailymail.co.uk/news/article-2603360/Horror-halal-slaughterhouse-Shocking-undercover-film-shows-needless-suffering-livestock-butchered-without-stunned-first.html [Accessed 4 July 2016].
- Tang WH, Wang Z, Levison BS, Koeth RA, Britt EB, Fu X, Wu Y and Hazen SL. 2013. Intestinal microbial metabolism of phosphatidylcholine and cardiovascular risk. *New England Journal of Medicine.* 368 (17) 1575-1584.
- Tesco website. 2016. Groceries [online] Available from: www.tesco.com/groceries/product/details/?id=252114301 [Accessed at 5 July 2016].

- Tesco website. 2016a. News release: Tesco to stop selling caged eggs by 2025. Tesco PLC. [online] Available from: www.tescopl.com/news/news-releases/2016/tesco-to-stop-selling-caged-eggs [Accessed 13 July 2016].
- The Mac's Farm. 2016. Home page [online] Available from: <http://themacsfarm.co.uk> [Accessed 29 June 2016].
- The Mac's Farm. 2016a. Facebook page [online] Available from: www.facebook.com/The-Macs-Farm-164019983621793 [Accessed 29 June 2016].
- The Poultry Site. 2009. Natural mating and breeding. 27 February [online] Available at: www.thepoultrysite.com/articles/1330/natural-mating-and-breeding [Accessed 29 June 2016].
- The Poultry Site. 2013. EU Regulation Changes View on Stunning at Slaughter. 3 July [online] Available from: www.thepoultrysite.com/articles/2867/eu-regulation-changes-view-on-stunning-at-slaughter [Accessed 21 July 2015].
- The Poultry Site. 2015. UK Government Rejects 2016 Beak Trimming Ban. 26 November [online] Available from: www.thepoultrysite.com/poultrynews/36221/uk-government-rejects-2016-beak-trimming-ban [Accessed 4 July 2016].
- The Vegg website. 2016. Home page [online] Available: <https://thevegg.com/> [Accessed 14 July 2016].
- Tom Barron. 2016. [online] www.tombarron.co.uk [Accessed 27 June 2016].
- Turner J and Lymbery PJ. 1999. Brittle Bones: Osteoporosis and the Battery Cage. *Compassion in World Farming*: Petersfield.
- Twitter website. 2016. Fairburns Eggs [online] https://twitter.com/FairburnsEggs?ref_src=twsrc^tfw [Accessed 29 June 2016].
- United Egg Producers. 2016. General US stats [online] Available from: www.unitedegg.org/GeneralStats/default.cfm [Accessed at 5 July 2016].
- Valle M. 2015. Aquafaba: chickpea brine is a surprisingly egg-cellent baking substitute. *The Guardian*, 29 September [online] Available from: www.theguardian.com/lifeandstyle/2015/sep/29/aquafaba-chickpea-liquid-baking-egg-white-substitute [Accessed 5 July 2016].
- Vezolli G, Mullens BA and Mench JA. 2015. Relationships between beak condition, preening behavior and ectoparasite infestation levels in laying hens. *Poultry Science*. 94 (9) 1997-2007.
- Viva! website. 2000. Sentenced to Death. Part Seven: Poultry Slaughter [online] Available from: www.viva.org.uk/sentenced-death/part-seven-poultry-slaughter [Accessed 4 July 2016].
- Viva! website. 2010. Hatchery investigation [online] Available from: www.viva.org.uk/resources/video-library/hatchery-investigation [Accessed at 4 July 2016].
- Viva! website. 2015. Viva! victory: egg supplier forced to drop welfare claims [online] Available from: www.viva.org.uk/what-we-do/about-us/media-centre/media-releases/viva-victory-egg-supplier-forced-drop-welfare-claims [Accessed at 5 July 2016].
- Viva! website. 2015a. Happy egg investigation [online] www.viva.org.uk/resources/video-library/happy-egg-company-undercover-investigation [Accessed at 21 July 2015].
- Viva! website. 2016. Chickens – Meat [online] Available from: www.viva.org.uk/lifeischeep [Accessed 22 June 2016].
- Viva! website. 2016a. Foie-gras [online] Available from: www.viva.org.uk/what-we-do/our-work/foie-gras [Accessed 29 June 2016].
- Viva! website. 2016b. A-Z of hidden nasties fact sheet [online] Available from: www.viva.org.uk/z-hidden-nasties-fact-sheet [Accessed 21 July 2016].
- Waitrose website. 2016. About our Food [online] Available at: www.waitrose.com/home/inspiration/about_waitrose/about_our_food/eggs.html [Accessed 5 July 2016].
- Warriss PD, Bevis EA, Brown SN and Edwards JE. 1992. Longer journeys to processing plants are associated with higher mortality in broiler-chickens. *British Poultry Science*. 33: 201-206.
- Webster J. 2011. Management and welfare of farm animals. UFAW Animal Welfare Series. Chichester: Wiley-Blackwell.
- Widowski TM and Duncan IJ. 2000. Working for a dustbath: are hens increasing pleasure rather than reducing suffering? *Applied Animal Behaviour* 68 (1): 39-53.
- Wilkins L, McKinstry J, Avery N, Knowles T, Brown S, Tarlton J and Nicol C. 2011. Influence of housing system and design on bone strength and keel bone fractures in laying hens *Veterinary Record*. 169 414.
- Windhorst H, Grabkowsky B and Wilke A. 2013. Atlas of the Global Egg Industry. [online] Available from: www.internationalegg.com/wp-content/uploads/2015/08/atlas_2013_web.pdf [Accessed 5 July 2016].
- Windhorst H. 2014. Patterns of European egg production and egg trade after the banning of conventional cages in the EU. *Zootecnica International* 36 (9) 24-31.
- World Health Organisation. 2013. Salmonella (non-typhoidal). Fact sheet N°139 [online] Available from: www.who.int/mediacentre/factsheets/fs139/en [Accessed 7 July 2016].
- World Poultry. 2013. Transporting end-of-lay hens to slaughter. 26 March [online] Available from: www.worldpoultry.net/Layers/Health/2013/3/Transporting-end-of-lay-hens-to-slaughter-1207806W [Accessed 27 June 2016].
- World Poultry. 2015. 500 eggs in 100 weeks [online] Available at: www.worldpoultry.net/Layers/Eggs/2015/11/500-eggs-in-100-weeks-2721812W [Accessed 29 June 2016].





Viva!

*Laying Hens:
The Inside Story*
© Viva! 2017
£5

ISBN 978-0-9571874-7-4



9 780957 187474