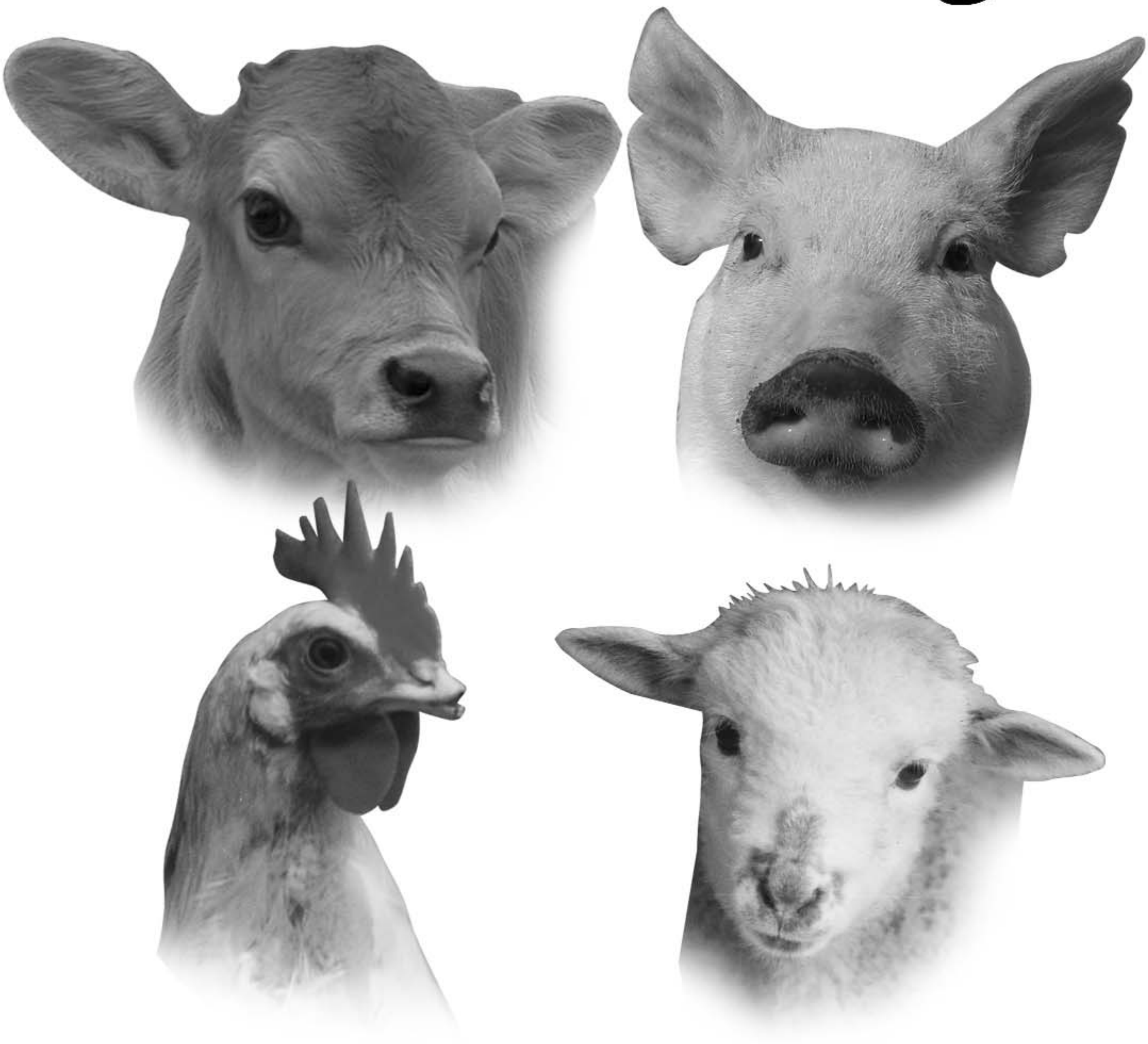
Sentient Beings



A Summary of the Scientific Evidence Establishing Sentience in Farmed Animals

A Farm Sanctuary Report

Establishing Sentience in Farmed Animals: A Summary of the Scientific Evidence A Farm Sanctuary Report

1. Introduction

Anyone who has spent much time in the company of animals is aware of their rich emotional lives. Most people have had the opportunity to observe the capacity of animals to feel, to interact socially with other beings, and to solve simple problems. Usually the animals being observed are our companion dogs and cats, but it follows that if these animals have such abilities, that others — including cows, pigs, sheep, goats, chickens and turkeys — do as well.

The renowned naturalist Charles Darwin was among the first scientists to study and document the existence of animal emotions. He believed that nonhuman animals experience feelings like pleasure and pain, happiness and misery, and asserted that the differences between humans and other animals are a matter of degree, not kind (Darwin, 1981). He describes the similarities of human and nonhuman animal minds in the following passage from The Descent of Man:

> *"All have the same senses, intuitions, and sensations — similar passions, affections, and emotions, even the more complex ones, such as jealousy, suspicion, emulation, gratitude, and magnanimity; they practice deceit and are revengeful; they are sometimes susceptible to ridicule, and even have a sense of humor; they feel wonder and curiosity; they possess the same faculties of imitation, attention, deliberation, choice, memory, imagination, the association of ideas, and reason ...."*
> (Darwin, 1981, p. 48-49)

Animal welfare scientist John Webster (1994) identifies a number of possible negative and positive feelings and moods experienced by animals. According to Webster, possible feelings include hunger, thirst, exhaustion, pain, malaise, fear, satiety, comfort, security, and delight; possible moods include anxiety, apathy, impotence, hopelessness, excitement, and curiosity. The existence of such a wide range of emotions in animals is also supported by animal behavior expert Marc Beckoff (2002). In his book Minding Animals, Beckoff notes that science is providing compelling evidence that at least some animals feel a variety of emotions traditionally only ascribed to humans, including fear, joy, happiness, shame, embarrassment, resentment, jealousy, rage, anger, love, pleasure, compassion, respect, relief, disgust, sadness, despair, and grief.

***"The question is not, can they reason? nor can they talk? but can they suffer?"* (Bentham, 1823)**

Beckoff (2002) also provides evidence that some animals are intelligent or "smart." He defines intelligence in animals as the ability to adapt behavior to novel and unpredictable situations and to anticipate and plan for the future.

> *"Animals are said to be smart if they perform such tasks as counting objects, forming concepts in which differences or similarities are recognized, avoiding cagey predators, locating hidden food, making and using tools, or using complex forms of communication."* (Beckoff, 2002, p. 89)

There is increasing evidence of the existence of some of these indicators of intelligence in farmed animals. However, psychologist Jeffrey Masson (2003) argues that whether other animals think as we do "is irrelevant to the question of whether they feel as we do." He asserts that memories and feelings are not thought-mediated and our recognition of their existence in another animal should not depend on proof that the animal has reasoning abilities similar to our own. Eighteenth-century British philosopher Jeremy Bentham first declared that the treatment of animals should be based on their ability to experience sensations like suffering:

> *"The question is not, can they reason? nor can they talk? but can they suffer?"* (Bentham, 1948)

While nearly everyone now acknowledges the occurrence of emotions in at least some animals, many people still deny them to farmed animals. In his book, *The Pig Who Sang to the Moon*, Masson (2003, p. 143) offers a poignant example derived from his discussion about cows with women who were tending animals at an agricultural show in New Zealand:

"'What about their feelings?' I asked. 'They don't have any,' they agreed.... 'They are so even tempered,' one woman told me. 'They are always the same, they feel nothing.' At that moment, we all heard a loud bellowing. I asked why the cows were making that noise. 'Oh, it's nothing,' the woman assured me, 'just cows calling their calves.' What did she mean, calling them? 'Well, they've been separated and the calves are afraid and are calling for their mothers, and their mothers are afraid for their calves and are calling them, probably trying to reassure them.' Here it was, from their own mouths, the same mouths that said these animals feel nothing, no fear, no pain at separation, no desire to comfort, no love for their child, no missing their mom."

In P*ortrait of a Burger as a Young Calf*, journalist Peter Lovenheim (2002) describes his surprise upon taking his daughter to a McDonald's in 1997 and finding the company giving away Beanie Babies toys that included a bright red bull named "Snort" and a black-and-white cow named "Daisy." Lovenheim (2002, p. xii) comments: "It struck me as odd that a company selling ground beef would offer toys in the shape of cattle. Were children really expected to hug and play with a toy cow while eating the grilled remains of a real one? It seemed to me the McDonald's Beanie Baby promotion revealed a deep disconnect between what we eat and where it comes from."

From early childhood, we are taught to deny feelings to the animals we eat. We dissociate picture-book scenes of cows and sheep grazing in a pasture from rows of plastic-wrapped cuts of meat lining grocer's shelves. We eat "pork" not pigs, "veal" not baby cows. According to psychologist Scott Plous (1993), Americans are socialized to both love and consume animals, and conflict between these two practices is avoided by deemphasizing the animals we eat as objects of affection. Plous (1993) conducted a survey in which he asked elementary school students whether various animals sometimes felt "unhappy." Only one-fourth of the children thought farmed animals were capable of unhappiness, compared to approximately one-half who thought companion animals or wild animals were sometimes unhappy.

If we don't witness the emotions and thinking abilities of farmed animals it may be because we have never attempted to know them on their terms, or because we have placed them in situations where they are prevented from expressing feelings and mental abilities. Masson makes this point in *The Pig Who Sang to the Moon* (2003, p. 222):

"The more we learn about farm animals, the more profound they appear to be. The less we know, the less important their lives. It is impossible to know them and not to respect them, not to care about how their lives go for them. It is impossible to realize that their ancestors were capable of deep and complex emotions, such as nostalgia, compassion, love, joy, disappointment, and others, and not wonder whether the lives they live permit them to express such emotions."

Some would deny emotions and reasoning abilities to farmed and other nonhuman animals because the animals are unable to communicate their feelings and experiences to us. But the lack of a common language between humans and other animals does not prove their inferiority or that they don't share our feelings and thoughts, as observed by renowned scientist Carl Sagan and his collaborator Ann Druyan in Shadows of Forgotten Ancestors (1992, p. 387):

"To compare humans with other animals in regard to behavior amenable to observation is just; but unfavorable comparisons on the basis of first-person accounts emanating from within the animals themselves, their reports of their thoughts and insights, are unfair if no channel of communication into their internal lives has yet been opened. Absence of evidence is not evidence of absence."

Animal behavior expert Donald Griffin (1992) explains that our own feelings and mental experiences are important to us and that we should assume feelings in nonhuman animals are important to them. Griffin (1992) believes that the only way we can fully appreciate and understand other species is by learning about what they think and feel.

> ***"to deny animals' emotions is to deny a large part of who these beings are."***
>
> **Beckoff in *Minding Animals***

As noted by Beckoff in Minding Animals, "to deny animals' emotions is to deny a large part of who these beings are."

This report summarizes some of the scientific evidence of sentience in farmed animals and describes how research on feelings and cognitive abilities in farmed animals has been conducted. The report also details how current factory farming practices cause farmed animals to suffer negative emotions and prevent animals from performing their natural behaviors. Although some of the research findings presented in the report were obtained by invasive means, Farm Sanctuary is opposed to intrusive research conducted on animals and recommends that only observation and other non-invasive means of studying farmed animals be used, and that the research be conducted in as natural a setting as possible, and only when the intent of the research directly benefits the lives of farmed animals.

2. Documenting Sentience in Farmed Animals

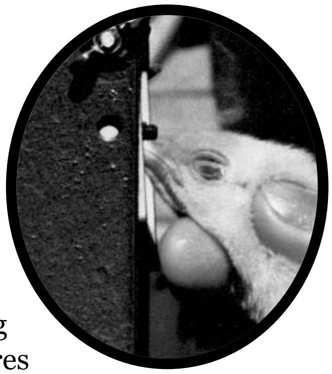
Traditionally, scientists who study animal behavior have had little to say about the feelings or thoughts of animals, especially farmed animals. One reason for this avoidance is a belief that mental experiences are private to the being experiencing them and cannot be verified by hard science (Griffin, 1992). Concepts such as "emotions," "thinking," and "awareness" are hard to define, and it is difficult to prove what any animal - including humans - think or feel. Beckoff (2000, p. 21) notes:

> *"Emotions still defy science's empirical method. They're subjective, fleeting, evanescent, elusive, and subject to the bias of the observer."*

Yet, according to Griffin (1992), scientists have a number of ways of learning about what goes on inside the minds of animals. Observation alone provides a wealth of information. The emotional states of many animals are easily recognizable on their faces and in their behavior. Beckoff (2002) suggests that changes in muscle tone, posture, gait, facial expression, eye size and gaze, vocalizations, and odors indicate emotional responses to situations that people even lacking scientific training can identify. Increasingly academic journals are publishing papers that describe the existence of thinking and feeling among farmed animals.

Many scientists still reject evidence about animal sentience not derived from controlled testing and replication. Beckoff (2002) urges that hard science be redefined to include traditional knowledge, common sense, and anecdotes. Anecdotal evidence is that which comes from observations and stories describing the existence of animal emotions. Darwin himself based some of his most important theories on observing animals and not on controlled experiments. Beckoff (2002, p. 10) believes "hard science, socially responsible science, compassion, heart, and love can be blended into a productive recipe for learning more about the fascinating lives of other animals and the world within which each of us lives."

3. Evidence of Feelings in Farmed Animals



3. 1. Pain and Discomfort

Generally, little consideration is given to the experience of pain in animals raised for food. Much of the treatment that farmed animals must endure - removal of horns and tails without anesthesia, crowding and confinement to cramped quarters, and transportation over long distances - is done without regard to the pain and discomfort these practices cause. Procedures routinely performed on farmed animals would be considered cruelty if the victims were humans or our companion dogs and cats. However, there is no justification for concluding that just because they are being raised for our use, farmed animals don't suffer pain. Whether we can recognize the agony of farmed animals by their cries, or whether they utter hardly a sound, Sagan and Druyan (1992, p. 371-72) argue that animals are indeed capable of suffering:

"Humans - who enslave, castrate, experiment on, and fillet other animals - have had an understandable penchant for pretending that animals do not feel pain.... The limbic system in the human brain, known to be responsible for much of the richness of our emotional life, is prominent throughout the mammals. The same drugs that alleviate suffering in humans mitigate the cries and other signs of pain in many other animals. It is unseemly of us, who often behave so unfeelingly toward other animals, to contend that only humans can suffer."

Pain generally has been defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage" (Otto & Short, 1998). A definition of pain in animals has been proposed by Zimmerman (cited in Gentle, 1992, p. 236):

> *"Pain in animals is an aversive sensory experience caused by actual or potential injury that elicits protective motor and vegetative reactions, results in learned avoidance, and may modify species specific behavior, including social behavior."*

These definitions of pain are limited in that they do not necessarily help in the determination of whether or not an animal is in pain (Sparrey & Kettlewell, 1994). The effects of pain can be measured by the occurrence of a mixture of behavioral and physiological findings (White et al., 1995). Webster (1994) identifies four approaches to the assessment of pain in animals: behavior, mood, pain thresholds, and pharmacology.

Behavioral reactions to pain include acute responses such as withdrawal reflexes, vocalization, aggression, self-mutilation, facial expressions, abnormal postures, and protective responses such as restricted movement, limping, escape attempts, and licking at the site of the lesion (Taylor et al., 2000; Molony et al., 1995; Webster, 1994). However, domestic cows and sheep are probably genetically inclined not to display some of these obvious signs of distress in order to avoid signaling weakness to predators (Webster, 1994). Mood reactions to pain include anxiety and depression (Webster, 1994). The lack of play behavior can also be interpreted as a behavioral sign of pain and/or stress in young animals (Herskin & Jensen, 2000). The occurrence of acute pain in animals can be shown by measuring the response of pain receptors in the skin to the application of mechanical (pressure) and thermal (heat or cold) stimuli (Gentle & Tilston, 2000; Webster, 1994). Researchers have also been able to demonstrate the existence of pain in farmed animal species by documenting the effects of various drugs, including steroids, analgesics, and antidepressants (Webster, 1994).

Physiological responses, such as sweating, panting or increased respiratory rate, increased heart rate, and the release of endorphins and pituitary-adrenal hormones (corticosteroids) into the blood stream, are also commonly used as indicators of pain (Webster, 1994). In addition, the development of inflammation and sepsis may be considered evidence of chronic pain (Molony et al., 1995). However, according to Webster (1994), these physiological reactions do not correlate well with the conscious perception of pain or with the response to analgesics in humans and, therefore, may not be good indicators of the intensity of pain in nonhuman animals.

Webster (1994) notes that horses, cattle, and sheep have pain thresholds similar to each other and to humans. According to Molony et al. (1995), the ability of farmed animals to suffer pain is based on an analogy with humans, and behavioral changes exhibited by animals should be equated with the level of pain experienced by humans with similar injuries. "Thus, if a lesion poses the same biological threat, then the pain suffered ... should occupy an equivalent place on [the animal's] pain scale, to that of a similar lesion on the human pain scale." (Molony et al., 1995, p. 44)

It could be argued that the perception of pain in animals is even more acute and stressful than in humans because animals lack the ability to put the experience of pain in perspective, to understand its cause and its likely duration, and to take steps to diminish it. Philosopher and bio-ethicist Bernard Rollin makes this point in The Unheeded Cry: Animal Consciousness, Animal Pain and Science (1989, p. 144):

> *"[I]f animals are indeed ... inexorably locked into what is happening in the here and now, we are all the more obliged to try to relieve their suffering, since they themselves cannot look forward to or anticipate its cessation, or even remember, however dimly, its absence. If they are in pain, their whole universe is pain; there is no horizon; they are their pain."*

The absence of behavioral indicators of pain should not be interpreted as evidence that an animal is not suffering. Learned helplessness is a behavioral pattern exhibited by animals who are subjected to a continuing aversive stimuli of which they are unable to stop or escape. For example, when a restrained hen has her feathers plucked one at a time for an extended period of time, she initially shows agitation by flapping her wings and vocalizing but eventually just crouches in the restraint with tail feathers and head lowered in an immobile state (Gentle & Hunter, 1991).

Pain and its effects have been investigated far more thoroughly in mammals than in birds and other non-mammals. However, there are no major differences in the anatomical, physiological, or behavioral responses to pain between mammals and birds. Gentle (1992, p. 235) argues that, *"with regard to animal welfare and pain in birds, it is clearly essential that the ethical considerations normally afforded to mammals should also be afforded to birds."*

Recent research by British scientists has added fish to the list of animals that perceive pain. In the 2003 Proceedings of the Royal Society, the UK's national academy of science, the researchers describe their finding of sites in the heads of rainbow trout that respond to noxious stimuli. They found that trout showed marked reactions to harmful substances and concluded that the behavioral and physiological changes to noxious stimuli by trout are comparable to those observed in higher mammals (Sneddon, et al., 2003).

Webster (1994, p. 252) draws the following conclusion regarding the experience of pain in nonhuman animals:

> *"Animals not only find pain aversive and try to avoid future exposure but also display anxiety if they anticipate that they will be unable to avoid pain or control the intensity of the stimulus. When pain becomes chronic, the intensity tends to increase rather than diminish with the passage of time. All these factors imply that sentient animals do not merely experience pain, they suffer from it."*

Following are some examples of the occurrence of pain and discomfort in farmed animals:

3.1.1. Cattle

Following castration without anesthetic or analgesia, calves exhibit changes in their behavior consistent with a pain response, including increased abnormal standing, increased licking of the site, slow movements of the tail, and alternate lifting of the hindlegs. Blood adrenal hormone (cortisol) levels are also elevated in calves after castration (Molony et al., 1995). (See also section 6.3.1.)

Calves undergoing hot iron branding vocalize more than calves handled in the same manner but not branded. Branded calves make louder calls and produce vocalizations that are different in measurable acoustic patterns than non-branded animals (Watts & Stookey, 1999). (See also section 6.3.3.)

3.1.2. Sheep

Sheep given a narcotic drug experience reduced sensitivity to a painful thermal stimulus for up to 3 ½ hours. Researchers report that the plasma levels of the drug indicate that it is rapidly distributed in a manner similar to that reported in humans (Nolan et al., 1987).

Lambs subjected to castration and the surgical removal of their tails exhibit signs they are experiencing pain by standing and walking abnormally and the occurrence of elevated blood adrenal hormone concentrations. Researchers acknowledge that castration and tail docking cause severe distress in sheep (Lester et al., 1996). (See also section 6.3.1.)

3.1.3. Goats

Goats undergoing castration and disbudding (placement of a hot iron over the horn bud for 15 to 20 seconds) exhibit symptoms of pain including elevated cortisol and endorphin levels. Behavioral signs of pain include vocalizing whimper-like sounds, shaking and twitching of the head or hind legs, and standing alone or walking with a stiff gait (Greenwood & Shutt, 1990). (See also section 6.3.1.)

3.1.4. Pigs

Piglets respond to being castrated without anesthesia by producing more high frequency calls than piglets who are restrained in the same manner but not castrated (Weary et al., 1998). Piglets castrated without anesthesia also have a higher heart rate than those given an anesthetic (White et al., 1995). (See also section 6.3.1.)

3.1.5. Chickens and Turkeys

Three types of pain receptors have been identified in chickens - mechanical, thermal, and mechanothermal (Gentle, 1992). Pain receptors have been identified at a total of 21 different sites on the scaly skin covering the lateral surface of the lower portion of a chicken's leg (the "shank" or tarsometatarsus). The receptive fields of the leg receptors are similar in size to those found on the beak, according to Gentle & Tilston (2000).

Behavior indicative of chronic pain is observed in chickens after they are subjected to partial amputation of their beak. For the first six weeks after debeaking, the birds eat and drink less. Other behaviors, such as reduced preening and pecking and increased sitting inactive and dozing, persist as long as 56 weeks after surgery (Gentle, 1992). (See also section 6.3.4.)

Scientists studying physiological and behavioral responses of hens to feather removal found that the birds' blood pressure always increased before a gradual return to normal levels. It was concluded that feather removal is painful to birds (Gentle & Hunter, 1991).

Lameness causes pain in broiler chickens. When tested on the time required to traverse an obstacle course, sound birds complete the course in 11 seconds, while lame birds take 34 seconds, and lame birds treated with an analgesic take 18 seconds. Researchers conclude that the analgesic increases the speed of lame birds, "providing evidence that birds with moderate lameness suffer pain when they walk" (McGeown et al., 1999, p. 668).

Turkeys suffering from degenerative hip disorders experience chronic pain, as evidenced by research showing that turkeys treated with steroids spend more time standing and walking than turkeys not receiving the drug. Turkeys receiving steroid treatments also drink more and show increased sexual interest and activity (Duncan et al., 1991).

3.2. Fear, Anxiety, and Frustration

Stress is a psychological state of an animal subjected to a noxious stimuli, such as heat, cold, hunger, thirst, crowding, isolation, light, darkness, noise, restraint, and surprise. Fearfulness and anxiety are common pre-pathological forms of stress that affect an animal's state of well-being and their ability to cope with their environment. Fear is seen as a reaction to a specific negative stimuli, while anxiety is more generalized (Davis, 1992). The fear response has been found to originate in the same area of the brain in both humans and nonhuman animals (Davis, 1992). The measures typically used to identify fear in animals and anxiety in humans are also very similar, as illustrated in the table below (Davis, 1992):

Measures of fear in animals	Psychiatric criteria for anxiety in humans
Increased heart rate	Heart pounding
Decreased salivation	Dry mouth
Stomach ulcers	Upset stomach
Respiration change	Increased respiration
Scanning and vigilance	Scanning and vigilance
Increased startle	Jumpiness, easy startle
Urination	Frequent urination
Defecation	Diarrhea
Grooming [excessive]	Fidgeting
Freezing	Apprehensive expectation

Fearfulness can be tested in several ways, including gauging an animal's reaction to physical restraint, the presence of predators, release into a novel environment, exposure to novel objects, or exposure to surprise or startling stimuli (Hansen et al., 1993). Responses to these situations may include physical reactions (increased heart rate, elevated adrenal hormone levels) and behavioral reactions (aggression, agitation, inactivity, hesitancy to enter or leave an area) (Weary et al., 1997).

Frustration, including frustration related to hunger, is another form of stress which may be either acute or chronic depending on the circumstances. Frustration is the state that occurs when an animal meets physical or psychological interference with a behavior that normally leads to receiving a goal (Curtis & Stricklin, 1991). For example, when something obstructs an animal on her way to the feeder, the animal is frustrated in her attempt to eat. Frustration is common in intensive animal confinement operations because of restricted movement, pressures on social relationships, and competition for food. If chronic, frustration resulting from loss of control over their environment may lead farmed animals to experience depression and a sense of helplessness (Curtis & Stricklin, 1991).

Scientists have studied frustration in farmed animals by teaching them to expect a reward, such as food, when they perform a certain task, such as pressing a level, and then observing the animal's response when completing the activity no longer results in the reward. A state of frustration in animals can be demonstrated by behavioral reactions, like pacing, pawing or scratching, and physical responses, including elevated levels of corticosteroids in the blood.

The quality and quantity of vocalizations are also indications of stress in farmed animals. However, while vocalizing may be an appropriate reaction to a frustrating situation, silence and freezing is a more adaptive response to a threatening situation, since vocalizing may attract predators (Ruiz-Miranda, 1992). The absence of vocalization, therefore, does not necessarily indicate that an animal is not fearful, anxious, or in pain.

Following are some examples of the occurrence of fear, anxiety, and frustration in farmed animals:

3.2.1. Cattle

Dairy cows who are repeatedly handled aversively, such as being shouted at, demonstrate fear of humans by taking more time to walk a course approaching people than cows not handled in a negative manner (Pajor et al., 2000).

Heifers exposed to novel environments and surprise effects react by becoming immobile and showing a hesitancy to enter or exit the area where the fearful situation is found (Boissy & Bouissou, 1995).

Calves show agitation, by lifting their heads or standing up, in response to unpleasant situations such as the presence of an umbrella in their pen, the presence of a dog, or being restrained (Boissy et al., 2001). The heart rate of a calf increases from a resting level of 90 beats per minute to 135 beats/min. when a person enters his/her pen and 145 beats/min. when restrained by a person (Stephens & Toner, 1975).

3.2.2. Sheep

Sheep respond to being exposed to stressful situations by showing an increase in their heart rate. Heart rates go up 30 beats/min. when sheep are introduced to a new flock, 50 beats/min. when approached by a human, and 84 beats/min. when approached by a human with a dog (Fraser & Broom, 1997).

3.2.3. Goats

Kids, or young goats, demonstrate stress when exposed to unfamiliar inanimate objects and humans by vocalizing, hesitancy to approach the object or person, and spending more time near their mothers (Ruiz-Miranda, 1992).

3.2.4. Pigs

Piglets demonstrate stress from early weaning by behavioral changes that include increased belly-nosing, increased escape behavior, and decreased feeding, exploratory behavior, and interactions with other pigs (Worobec et al., 1999). Early-weaned pigs also vocalize more than piglets weaned at a later age (Weary & Fraser, 1995). (See also section 6.1.4.)

Pigs demonstrate frustration when they don't receive a reward they've come to expect. Pigs who learn to press a panel with their snout to receive food have been shown to have an increased plasma corticosteroid level when pressing the panel no longer results in the reward. The animals become very restless, attempt to escape, rub their noses on the floor, and scratch the floor with their feet (Dantzer et al., 1980).

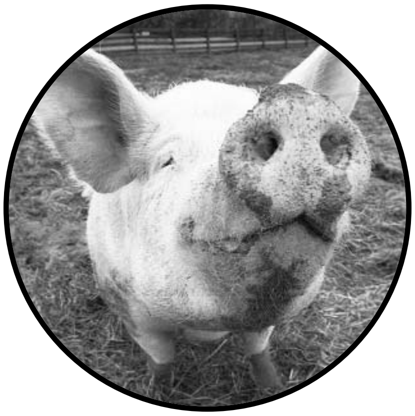
3.2.5. Chickens

Chickens react to frightening situations, such as the presence of a conspicuous object in their pen or food trough, by avoiding the object and remaining immobile and silent (Jones, 1987).

Chickens whose feed is restricted show signs of stress including higher plasma corticosteroid levels, body temperature, and heart rate. They also show an elevated ratio of heterophil to lymphocyte white blood cells in their blood, a reliable physiological indicator of stress in birds (Savory et al., 1993). When chronically hungry, chickens show hyperactivity, stereotyped pacing before feeding time, and pecking at non-food objects after feeding, signs that their urge to feed is frustrated (De Jong et al., 2002). (See also section 6.1.1.)

Laying hens express their frustration with being denied the opportunity to feed by giving a specific vocalization, the gakel-call. Hens also give significantly more gakel-calls when deprived of water, dust for bathing, and access to a nest than when they have access to these items (Zimmerman et al., 2000).

3.3. Pleasure, Play, and Curiosity



Positive feelings in animals, like joy and contentment, have been studied to a much lesser degree than negative ones. However, animal scientists acknowledge that the absence of pain and distress in animals does not necessarily indicate a state of well-being. When immediate physical needs are met, animals may choose to participate in certain activities, even when a significant amount of effort is required, because they result in a positive affective state, generally referred to by scientists as "pleasure" (Widowski & Duncan, 2000). Novelty, which in some circumstances is a source of stress, may be attractive to animals under other circumstances (Grandin, 1997).

According to Beckoff (2002), animals experience immense joy when they greet and groom one another, when they play, and perhaps when they watch others play. "Animals tell us they are happy by their behavior: they are relaxed, walk loosely as if their arms and legs are attached to their bodies by rubber bands, smile, and go with the flow. They also speak in their own tongues, purring, barking, or squealing in contentment." (Beckoff, 2002, p. 16)

Fraser and Broom (1997) cite numerous benefits to play behavior: play develops physical strength and endurance; play promotes development; play experience yields specific information; play develops cognitive skills; play is useful in competition with other animals; and play establishes social bonds within a group. Beckoff (2002) also suggests that social play in animals can be a serious matter, representing a "foundation of fairness" that teaches animals what is and is not acceptable during social interactions. "During play, animals assess themselves and others, fine-tune ongoing interactions, and attempt to negotiate agreements so play can continue" (Beckoff, 2002, p. xx). Webster (1994, p. 124) notes that while play performs an educational role for a young animal, "it requires a very strange and stern mind to conclude that puppies, kittens or lambs at play are not having fun."

Following are some examples of the experience of pleasure in farmed animals:

3.3.1. Cattle

Playful activities engaged in by cattle include prancing, kicking, snorting, cantering and galloping with the tail elevated, bucking, kicking one hind foot, head-butting, and pawing loose soil or bedding. These behaviors are typically observed in young calves, although adult cattle occasionally indulge (Fraser & Broom, 1997).

Cattle seem to experience joy or satisfaction in their accomplishments. Researchers observing the behavior of heifers who had learned to press a panel in order to open a gate found that the heifers were 14 times more likely than control animals to exhibit signs of excitement, such as increased heart rates and locomotion, on days when their learning performance increased. The researchers concluded "cattle can react emotionally both to the anticipation of a new achievement and to their own learning improvement" (Hagen & Broom, 2001).

3.3.2. Sheep

Lambs have a reputation for vigorous play. Play behavior in lambs has been observed as early as 2 or 3 days of age and involves butting, mounting, and sudden bouts of running back and forth in unison at high speed. Lambs also participate in gamboling, a stiff-legged jumping motion during which the body and head are twisted repeatedly and where the height of the jumps may exceed their lengths. Lambs like to play when their dams are preoccupied feeding (Orgeur & Signoret, 1984; Sachs & Harris, 1978).

3.3.3. Goats

Kids participate in group play, in which many kids or even an entire herd run and caper together. Kid play also includes running or galloping in circles, making high, arching jumps, running and jumping games, and little dances (Fraser & Broom, 1997). Fraser and Broom describe kid play as "elaborate and antic." "They may jump on and off their mothers' backs, and race or bound. They make sudden stops, toss and shake their heads and whirl on their own axis, sometimes falling." (Fraser & Broom, 1997, p. 252)

3.3.4. Pigs

Play in young pigs is a very important component of their total behavior. The most prominent form of piglet play is play fighting; chasing and cheek-to-cheek nipping at the other's face, neck, and shoulders is standard practice (Fraser & Broom, 1997).

Piglets provided with large, straw-bedded pens spend time exploring their area and objects in it and performing playful behaviors, including scampering (running across the pen), frisking (short, rapid turning movements), and lying on their backs and rolling about in the straw (Beattie et al., 1995).

3.3.5. Chickens

Chickens are curious and like novelty and complexity. In one experiment, adult hens looked through spyholes in order to view novel objects. In another experiment, chicks were exposed over time to one of two screensavers - "Flying Toasters" and "Fish." When allowed to choose between the screensaver they had been exposed to and the other novel screensaver, the chicks spent more time viewing the unfamiliar one (Jones et al., 1996).

Hens derive pleasure from dustbathing. Hens living in a cage have been taught to push to open a door for access to dustbathing materials. Although hens are willing to push more weight to open the door when they are deprived of dustbathing, they are also motivated to open the door when they are not deprived, suggesting that dustbathing, when the opportunity presents itself, gives chickens a sense of pleasure (Widowski & Duncan, 2000).

4. Evidence of Social Relationships and Communication in Farmed Animals

4.1. Social Relationships

In nature, farmed animals live in social groups. Webster (1994) offers five reasons why an animal may need the company of other animals - for sexual intercourse, for security, for cooperation in obtaining food or shelter, for education, and for pleasure. Regarding pleasure, Webster suggests that some animals form and sustain social relationships simply because they enjoy each other's company, a phenomenon humans refer to as "friendship" (Webster, 1994).

Social interactions among farmed animals are determined by kinship and social rank (Manteca & Deag, 1993). As in human societies, coexistence in animal communities depends upon the functioning of a social hierarchy. Social rank has a discernible effect on individual animals including their success at feeding and reproduction (Barroso et al., 2000). Social situations within animal groups are governed by the relationships among the individual animals, as well as group size and composition, the familiarity of the environment, and the nature of environmental events affecting the group (Lyons et al., 1988). Social roles within farmed animal groups have been studied by the observation of herd movements, grazing partnerships, and licking and other grooming behaviors.

Following are some examples of social relationships among farmed animals:

4.1.1. Cattle

Leadership in cattle may be dependent on affiliative relationships, so that if one animal moves the other in the pair will immediately follow. In one observation, when a leader cow was prevented from leaving an enclosure, the herd did not move. Eventually, two cows walked forward and backwards until the herd followed them, but when the leader cow was released, she resumed leadership (Manteca & Deag, 1993). Leaders make the decision when to start moving away from one location and in which direction to head (Reinhardt, 1983). There is even a consistent order in which cattle in a herd stand up at dawn (Benham, 1983).

During their "kindergarten time" - the first four months of life - calves develop strong personal bonds that are very stable, lasting five years or more (Reinhardt & Reinhardt, 1983).

Research on calf weaning has shown that the mere sight of a mother cow can reduce the distress at weaning for a calf. This suggests that stress associated with weaning has to do with breaking the bond between the cow and calf, and not with disruption of feeding. When separated, cows and calves search for their own specific partners and gain little comfort from other familiar or unfamiliar cows (Stookey & Haley, 2001).
(See also section 6.1.4.)

Heifers react less strongly to fear-inducing situations and are able to learn new tasks more quickly when they are in the presence of other heifers than when they must face the situations alone (Boissy & LeNeindre, 1990).

Calves kept in isolation react more to startling situations, such as water being thrown, than calves housed with others (Veissier et al., 1997). Calves who are chronically stressed by being repeatedly re-housed with different pen mates react more strongly to fear-inducing situations than calves kept with the same pen mates (Boissy et al., 2001).

4.1.2. Sheep

Lambs quickly develop the ability to recognize their own mother and can discriminate between a number of familiar and unfamiliar individuals. This recognition persists despite the lack of direct contact for several days, suggesting that the social relationships of lambs living in large groups may be quite complex (Ligout et al., 2002).

To determine whether sheep bond with their shepherds, scientists have studied the parts of a sheep's brain that control face recognition and found that sheep normally categorize unfamiliar humans in the same way as they do dogs but differently from other sheep, perhaps because humans, like dogs, represent a potential threat. However, the faces of humans who tend sheep are categorized in the same way as a very familiar member of the flock (Kendrick, 2004). "Friendly humans effectively become honorary sheep" (Kendrick, 2004, p. 48).

Sheep who are isolated demonstrate stress by reduced water intake and increased plasma adrenal hormone levels. Some sheep refuse to drink altogether when deprived of their peers' company (Parrott et al., 1987). The stress of isolation causes a decrease in the ability of sheep to digest food, and isolated sheep also exhibit rest less behavior - repeated bleating and standing up and lying down - that causes increased heat production (van Adrichem & Yogt, 1993).

4.1.3. Goats

A herd of goats exhibits a well-defined hierarchy based on dominance-subordination, and once established these relationships remain stable over time. In one herd, of 364 relationships studied, 335 (or 92 percent) were consistent with the social hierarchy. An individual goat's rank is associated with aggressiveness, presence of horns, age, and size (Barroso et al., 2000).

The amount of fear experienced by kid goats when exposed to humans depends on the behavior of other goats who accompany the kid. When timid kids are accompanied by an adult goat who behaves as if he/she is fearful of the person, their stress hormone levels are elevated (Lyons et al., 1988). The presence of a kid's mother reduces fearful reactions to people and inanimate objects (Ruiz-Miranda, 1992; Lyons et al., 1988).

4.1.4. Pigs

Although much is made of the aggressiveness of sows, or adult female pigs, kept under factory farming conditions, in feral and free-ranging domestic pigs agonistic behavior among sows is quite rare. Older sows lead group movements around the home range, and members of the group are fairly tolerant of the integration of new members. Activities performed by one group member, such as root digging, is observed and mimicked by others (Mendl, 1996).

Separating pigs from their groupmates causes fear. Isolated pigs react to novel situations by avoiding the novel environment and playing, walking, and vocalizing less than group-housed pigs faced with the same situations (Herskin & Jensen, 2000).

Pigs show less frustration after being denied an expected reward if they are in the presence of another pig with whom they have a social bond. But if they're with an unacquainted pig, a frustrating situation results in aggressive behavior (Arnone & Dantzer, 1980).

Isolation and barren environments affect the ability of pigs to learn. Pigs raised in straw-bedded pens with their dams are able to learn tasks, like pushing a panel for a reward or completing a maze to receive a reward, more rapidly than pigs raised alone in barren environments (Sneddon et al., 2000).

4.1.5. Chickens

Chickens are highly social animals. Being in the company of their peers may be even more important to chickens than food. When researchers placed chicks at the start of a long runway they approached a video of other chicks much faster than they approached a video of a box of food (Clarke & Jones, 2001).

4.2. Communication

Animals convey conscious thoughts and subjective feelings to one another through communicative gestures and vocalizations. Vocalizations and other signals provide an opportunity to study and gauge the mental experiences of animals, a sort of "window" on animal minds (Griffin, 1992). Communications have been interpreted as expressions of emotions, conveyed to their companions, rivals, and sometimes members of other species (Griffin, 1992). According to Griffin (1992), these communications are verifiable evidence of the mental experiences and abilities of animals. In fact, Griffin notes that communicative behavior provides the strongest evidence of conscious thinking by nonhuman animals.

Animal behavior scientists differentiate between signals that are informative only, when the receiver is told of something of which it was not formerly aware, and communicative, when the sender has the specific intention of making the receiver aware of something (Marler et al., 1986b). Intentionality is an indication, not only of communication skills, but of advanced cognitive abilities. In communicative signaling, which features intentionality, the call or gesture differs depending upon who the receiver is. Research suggests that some farmed animals may in fact demonstrate communicative behavior.

Communication between animals has been studied primarily through the evaluation of vocalizations. Researchers have assessed various aspects of the quality and quantity of calls, including their frequency, interval, length, volume, pitch, and speed.

Following are some examples of communication abilities in farmed animals:

4.2.1. Cattle

Calling is important between cows and their calves, allowing mothers and their offspring to locate one another and maintain contact. Calves bawl when separated from their mothers and when hungry to signal to their mothers that it's time to eat. Researchers analyzing the vocalizations of cows have identified a number of different calls including those made when hungry, when being milked, when having their hooves trimmed, and when in estrus (Jahns et al., 1998).

4.2.2. Sheep

It has been thought that sheep, unlike cattle and pigs, do not vocalize stress. However, recent analyses of the entire acoustic spectrum of bleats, rather than just the basic pitch and number of bleats, has shown distinctive and consistent markers within waveforms that correlate with stressful conditions, such as weaning or being isolated from flockmates. This suggests sheep are capable of signaling stress by modifying the overall quality of sounds, and, in this regard, sheep are more similar to humans than most other animals (Feinstein, 2003).

4.2.3. Goats

Ewes, or adult female goats, bellow and bleat during estrus, presumably to attract and maintain the presence of males. It is thought that the vocalizations of males plays a role in ewes going into heat (Fraser & Broom, 1997).

4.2.4. Pigs

Piglets separated from their mothers vocalize frequently, and calls from "needy" piglets (those who are smaller, kept in a cooler enclosure and have missed a feeding) are of a higher rate, higher in frequency, and longer than calls from less needy piglets (Weary et al., 1997; Weary et al., 1996; Weary & Fraser, 1995).

Sows respond to the calls of piglets by calling back and approaching the piglet. Sows are also able to differentiate between calls from their own piglets and other pigs and between calls from needy and less needy piglets (Weary et al., 1996).

4.2.5. Chickens

Roosters send information through their calls to female chickens about the quality of a particular food. The rate and number of calls a male chicken makes varies with the preference for the food. Males make many rapid calls to a favored food, like peas or mealworms, and fewer slower calls to less preferred foods, like peanuts or inedible nutshells. Hens are more likely to approach a male who is calling to a highly preferred food than to a low-preference food (Marler et al., 1986a).

Roosters also sometimes give food calls when no food is present. Food-type calls given by roosters in the absence of food are acoustically the same as calls given with food. Also, a rooster is more likely to give a food-type call without food when the hen is far from him than when she is close by. This suggests that when a hen has strayed too far away, the rooster attempts to deceive the hen into believing he has food in order to bring the female back into close proximity (Marler et al., 1991).

Roosters make different alarm calls depending on whether they are presented with an aerial predator, such as a hawk, or a ground predator, such as a fox (Gyger, et al., 1987). The roosters give fewer alarm calls when alone than when their mate or another female is nearby (Marler et al., 1991).

5. Evidence of Cognitive Abilities in Farmed Animals

5.1. Recognition and Memory

Ungulates are hoofed, mostly herbivorous mammals including cattle, sheep, goats and swine. Ungulates have a wide visual field due to the position of their eyes on the sides of their head (Blakeman & Friend, 1986). There is solid scientific evidence that ungulates make use of this visual sense to recognize members of their herd as well as individuals of other species (Kendrick et al., 1995). In addition to recognizing different individuals by facial characteristics, it is likely that ungulates are able to use visual cues from body shape, posture, and movement to distinguish individuals at a distance (Kendrick et al., 1995). This ability to form mental images of other individuals in their absence, and to use visual cues from the face to recognize another individual, are possible indicators of an animal's conscious awareness (Kendrick et al., 2001). Scientists have used projected images of the faces of familiar and unfamiliar individuals to test these recognition powers in farmed animals.

Memory is also an important mental ability in farmed animals as it allows them to remember grazing locations and the resources found there. This ability prevents animals from wasting effort by returning to areas with low resources (Bailey et al., 1989). Researchers have tested spatial memory in farmed animals by exposing them to various maze situations where the animals' ability to locate food in arms of the maze has been observed.

Following are some examples of recognition and memory in farmed animals:

5.1.1. Cattle

Heifers and steers perform very well in maze exercises, where they are released individually into a maze and allowed to find food placed at the end of each arm of the maze. In tests with eight-arm mazes, cattle are able to remember in which arms they previously found food, so that they don't re-enter a previously entered arm, for periods of up to eight hours. They make few errors, choosing correctly between six to eight times out of eight tries (Bailey et al., 1989).

5.1.2. Sheep

Some sheep can accurately distinguish between the faces of sheep, humans, and dogs, and between the faces of male and female members of the same breed. Sheep can recognize the faces of at least 50 different individual sheep and 10 humans and remember them for more than two years. They have also been shown to be able to identify profile views of the faces of both familiar and unfamiliar animals initially presented to them in only a frontal view (Kendrick, 2004; Kendrick et al., 2001; Kendrick et al., 1995).

To compare sheep recognition skills with those of humans, researchers use a computer morphing program that gradually merges two different sheep or human faces to the point where they look identical. Sheep and humans alike can discriminate accurately between the two images when they differ by only five percent (Kendrick, 2004). Scientists conclude these findings suggest "a level of mental and social sophistication way beyond what they are usually credited with" (Kendrick, 2004).

5.1.3. Goats

Goats have demonstrated that they are able to discriminate between symbols. In one exercise, goats were able to learn to press one panel when a large white "X" was projected on a black background and another panel when a large "O" was projected, in order to receive a food reward. The goats enjoyed the learning experience, running ahead of the researcher to the testing area and having to be led away from the area when the test was completed (Blakeman & Friend, 1986).

5.1.4. Pigs

Pigs can remember areas where they have found food in the past. In a test situation, pigs were allowed to locate and eat food and were then removed from the area and, after a period of time ranging from ten minutes to two hours, were allowed back in. The pigs were able to find the food using fewer area visits than expected by chance,
indicating they could remember the locations (Mendl et al., 1997).

5.1.5. Chickens

Hens are able to recognize, and respond to, feeding errors made by their chicks. When hens observe their chicks eating food of a color that the hen associates with unpalatability, the hens respond by performing intense displays to attract the chicks' attention, such as pecking and scratching at the ground. When chicks are provided with two palatable foods they will eat the one being eaten by the hen (Nicol & Pope, 1996).

5.2. Learning and Problem Solving

Complex learning, particularly when it involves applying rules to novel problems, is another indicator of consciousness in farmed animals (Kendrick et al., 2001). Nicol (1996) suggests that some forms of learning in animals may provide the basis for higher mental abilities such as "reasoning." Nicol (1996) identifies three possible indicators of reasoning abilities in animals: the ability to solve novel problems on the first attempt, the ability to master a maze, and the ability to imitate novel motor behavior exhibited by another animal.

One way in which farmed animals demonstrate reasoning is by their ability to graze efficiently. Grazing may involve not just the ability to recognize foods and remember previous food locations, as described in the previous section, but the capacity to associate cues with the value of different foods prior to grazing them (Edwards et al., 1997; Griffin, 1992). Animals have also demonstrated social learning, the ability to associate a desired outcome, such as locating a preferred food item, with the behavior of a familiar or unfamiliar companion. Farmed animals are able to monitor and evaluate the behavior, knowledge, and competitive abilities of other animals and to adjust their own behavior accordingly (Held et al., 2000). One approach to the study of reasoning and social learning in farmed animals has been by releasing animals, individually or in groups, into mazes where food rewards are located.

Following are some examples of learning and problem solving abilities in farmed animals:

5.2.1. Cattle

Cattle can learn feeding site locations from other animals. In one situation, 81 percent of heifers who followed "leader" heifers to food locations in a maze were later able to relocate the food on their own (Bailey et al., 2000).

Steers can learn about and use visual cues (such as a traffic barricade or cone) to locate and consume foods more efficiently than steers not provided cues. The animals are able to use cues to find food in both fixed locations and locations that change (Howery et al., 2000).

5.2.2. Sheep

Lambs are able to learn to eat novel foods by observing and interacting with other sheep who are consuming the unfamiliar foods. Lambs also learn to avoid eating a harmful food by observing their mother's behavior in regards to the food (Thorshallsdottir et al., 1990), and lambs offered foods differing in energy content can learn over time to select the food possessing the higher energy concentration (Villalba & Provenza, 2000).

Sheep are able to form associations between cues (plastic bowls containing either preferred or non-preferred food pellets) and food rewards (patches of clover or ryegrass) when the cues and the rewards are physically separated. They are able to successfully choose the appropriate cue to receive the preferred food reward even when the position of the cue is randomly changed at the start of each day. By the fifth trial, the sheep are able to make correct choices more than 80 percent of the time (Edwards et al., 1997).

5.2.3. Goats

Goats can learn to avoid an unfamiliar food that is associated with ill effects post-ingestion when the food is offered simultaneously with other foods the animals has already learned to be safe (Zahorik et al., 1990). In grazing situations where a number of plants may be toxic, goats tend to select a mixed diet, thereby reducing their risk of exposure to toxicity (Duncan & Young, 2002).

5.2.4. Pigs

Young pigs can learn the location of potential feeding sites after watching a demonstration by a sibling or another unrelated pig (Nicol & Pope, 1994a). In two test situations, pigs who lacked knowledge about the location of food were able to exploit the knowledge of a pig they were paired with by following the informed pig to the food source (Held et al., 2001; Held et al., 2000).

5.2.5. Chickens

Chickens learn from other chickens. Hens allowed to watch other hens pecking a key for a food reward are able to learn the behavior with greater success than hens not able to watch a demonstration. The birds perform better after watching another chicken who has successfully learned the behavior than another untrained bird (Nicol & Pope, 1994b).

Chickens have been shown to be able to detect the metabolic and nutritional consequences of eating different feeds and to select a diet that meets their individual needs. Broilers and hens given a choice between one food containing a higher concentration of protein than required and another containing a lower concentration will eat amounts of the two that provide an optimum protein content (Forbes & Shariatmadari, 1994). Broiler chickens given colored feed that is either supplemented or not supplemented with ascorbic acid increase their intake of supplemented feed when exposed to hot temperatures, which increases the need for ascorbic acid in chickens (Kutlu & Forbes, 1993). When drugged and undrugged feed is offered to both lame and non-lame chickens, the lame chickens choose to eat more drugged feed, which helps relieve pain, while non-lame birds prefer undrugged feed (Danbury et al., 2000).

6. Impact of Factory Farming on Animals

Animal agriculture in the U.S. has been taken over by large corporations, turning family farms into factory farms. Industrialization has allowed agribusiness to reap great profits by raising a large number of animals more quickly and for less money. Factory farms operate on the principle that it is more cost effective to accept some loss in inventory than to spend money on treating animals humanely.

Factory farms commonly warehouse hundreds or thousands of animals indoors under one roof. Social species, like sows and calves, are housed individually in small crates that cause discomfort and deny the animals the opportunity to interact with their peers. Other animals, like young pigs and chickens, are packed together in cages and pens so tightly that aggression and fighting result.

The Farm Animal Welfare Council, a government advisory organization in the United Kingdom, has proclaimed that the welfare of an animal raised for agriculture - whether on the farm, in transit, at market, or at a place of slaughter - should be considered in terms of the animal's right to "Five Freedoms." These Freedoms are based on scientific and empirical evidence, examples of which have been described above, that farmed animals are sentient beings.

The 5 Freedoms:

Freedom from hunger and thirst - by ready access to fresh water and a diet to maintain full health and vigor

Freedom from discomfort - by providing an appropriate environment including shelter and a comfortable resting area

Freedom from pain, injury, and disease - by prevention or rapid diagnosis and treatment

Freedom to express normal behavior - by providing sufficient space, proper facilities, and company of the animal's own kind

Freedom from fear and distress - by ensuring conditions and treatment which avoid mental suffering

Factory farming practices routinely violate the Five Freedoms by causing farmed animals to experience pain, discomfort, and various forms of stress including hunger and thirst, frustration, boredom, helplessness, and anxiety and fear. Farmed animals raised under factory-farming conditions are also denied the freedom to perform natural behaviors including communicating, interacting with others, exploration and foraging, and problem solving and learning new skills.

Webster (1994) has suggested a sixth freedom, the freedom for animals to exert personal control over the quality of their own lives and to escape suffering as well as the possibility of living in limbo. According to Webster (1994), suffering specifically occurs when an unpleasant sensation becomes intense, lasts a long time, or when the animal is unable to take action to relieve it. Farmed animals denied the ability to control their environment develop repetitive behavior patterns, known as stereotypies, that have no obvious goal or purpose (Webster, 1994). Most stereotypies can be linked to environmental deprivation, such as the type found in intensive confinement settings.

In recent years, the animal agriculture industry has made some minor improvements in animal handling practices, such as providing 25 percent more space for laying hens crammed six or more at a time into small battery cages. However, avian researcher Lesley Rogers (1995) notes that these improvements in housing and handling practices are minimal concessions for the industry to make. "In no way can these living conditions meet the demands of a complex nervous system designed to form a multitude of memories and to make complex decisions" (Rogers, 1995, p. 218). In order to acknowledge and accommodate their multiple emotional, social, and cognitive abilities, major changes must be made in the way farmed animals are treated.

Examples of some common factory farming practices and how they affect the sentience of farmed animals are described below:

6.1. Food and Water Restriction

6.1.1. Restricting Feed of Breeding Chickens

Broiler chickens used for breeding are genetically selected for rapid growth rates which leads to an increase in appetite and obesity. To control weight gain, producers limit the amount of feed breeder chickens can consume starting as early as 1 week of age. Breeder birds receive 60-80 percent less feed than a bird would normally choose to eat during rearing and 25-50 percent less during the laying period. Breeding chickens whose feed is restricted eat only a quarter to a half as much as they would if given free access to food, and are highly motivated to eat at all times (Savory et al, 1993). As a result, breeder birds live in a constant state of hunger and exhibit behavioral signs of boredom and frustration (Mench, 2002).

6.1.2. Restricting Feed and Water of Hens

Laying hens are often subjected to a process known as forced molting that involves withholding or reducing their food for up to 14 days and water for up to three days. Forced molting is performed to inhibit ovulation and stimulate feather growth in order to start a new laying cycle. Normally hens go through a natural rest period of about four months before a new laying cycle, but since this is not cost-effective, egg producers force a feather molt that results in a down-time of only one or two months. Forced molting is traumatic for birds and violates an animal's right to freedom from hunger and thirst. Limiting food and water is considered so detrimental to hen welfare that artificial manipulation of the egg cycle by forced molting has been banned in Great Britain since 1987.

6.1.3. Restricting Feed of Sows

Breeding pigs are typically fed a measured ration of feed aimed at maintaining the animals' reproduction. The amount provided is kept lower than what the animals would choose to eat in order to prevent reproductive problems, reduce costs, and facilitate waste disposal. Sows eat the limited feed, which is the same every day, very quickly and are left in a constant state of hunger and frustration (Young et al., 1994). In the wild, sows are preoccupied with food, and restricted feeding does not offer the exercise, stimulation, or variety that foraging provides. This food restriction has been shown to result in the development of stereotypies (Terlouw & Lawrence, 1993). Access to straw and/or roughage reduces the incidence of stereotypies in food-restricted sows (Whittaker et al., 1998).

6.1.4. Early Weaning of Pigs

In the wild, weaning in pigs is a gradual process, with piglets decreasing their intake of milk and increasing their intake of solid food over a period of 3 or more months. In industrial hog operations, however, natural weaning is not allowed to occur, and piglets are separated from their sows at an increasingly younger age. In early weaning systems, piglets are removed as early as seven days after birth. Research has demonstrated that piglets weaned at seven and fourteen days exhibit more signs of distress than piglets weaned later. Researchers conclude that weaning on or before 14 days may result in "the development of behaviour patterns that either cause, or are indicators of, reduced welfare" (Worobec et al., 1999).

6.2. Intensive Confinement

6.2.1. Crates for Pregnant Pigs

To save on labor and feed, factory farms in the U.S. confine breeding sows to gestation crates for most of their productive lives, three to five years. The typical gestation crate, which is approximately two feet wide by six to seven feet long, not only does not allow a sow to turn around but prevents her from lying down and standing up without touching the sides of the crate. Scientific research has shown that this form of intensive confinement causes a host of physical and psychological problems for sows. Crate-housed sows cannot exercise and are deprived of the basic necessity of living space. As a result, they are weak, suffer leg and joint problems, and experience difficulty carrying out simple movements. The barren gestation crate does not meet the sow's social and cognitive needs and fails to allow for fulfillment of her natural instincts, and makes the animal depressed and frustrated to the point that she performs repetitive actions for mental stimulation. (For more information, see Farm Sanctuary's report, The Welfare of Sows in Gestation Crates: A Summary of the Scientific Evidence).

6.2.2. Crates for Veal Calves

Veal is a light colored meat which comes from young calves who are fed an all-liquid milk substitute which is deficient in iron and fiber. In addition, veal calves are tethered or confined in crates that are just two feet wide, and they are unable to walk or exercise throughout their entire lives. Confining calves in crates and preventing them from consuming a natural diet results in significant behavioral and psychological disorders including frustration of play and grooming instincts, sensory and social deprivation, chronic stress, and abnormal coping behaviors. Calves, like other animals, need wholesome food, exercise, and interaction with other animals to achieve optimal health. When calves raised for veal are denied these basic needs, they suffer from various physical maladies including digestive problems, physical discomfort, impaired locomotion, a greater susceptibility to disease, and anemia. (For more information, see Farm Sanctuary's report, The Welfare of Calves in Veal Production: A Summary of the Scientific Evidence).

6.2.3. Cages for Laying Hens

Hens used for egg production are housed at the highest density of all farmed animal species. In the U.S., hens are typically kept in groups of five to nine birds in small cages stacked in tiers in warehouse-like buildings. Each hen may have as little as 48 square inches of space, not nearly enough to allow the birds to flap their wings. Hens housed in this manner experience chronic discomfort, frustration, and anxiety. Confinement to a small barren cage for the entirety of their life inhibits the performance of virtually all aspects of normal hen behavior, including dustbathing, searching for food, and nest building. (For more information, see Farm Sanctuary's report, The Welfare of Hens in Battery Cages: A Summary of the Scientific Evidence).

6.3. Surgical Manipulations

Bath (1998) identifies a total of 24 potentially painful procedures performed on farmed animals by farmers and ranchers. Of the procedures cited, 21 are performed on sheep and goats, 19 on cattle, and 16 on pigs. The procedures include a variety of surgical mutilations, such as castration, dehorning, tail-docking, ear-notching, toe-clipping, teeth-clipping, tattooing, and branding. These procedures are done in order to facilitate intensive confinement and to make the raising of animals more convenient. Producers choose to perform surgical procedures to physically change farmed animals, rather than modifying their own production practices to accommodate the animals' physical needs. These manipulations are regularly carried out without providing the animals with anesthesia or analgesia, and are often performed by laypersons with little or no training (Bath, 1998).

6.3.1. Castration of Cattle, Sheep, Goats, and Pigs

Livestock are routinely castrated to improve the tenderness of meat and to make the animals easier to handle. The procedure may be performed any time from shortly after birth up to eight or nine months of age. Castration is done by three devices: knife, the emasculator (plier-like device that crushes the spermatic cord and blood vessels to the testicles), and the elastrator (a rubber ring over the testes that causes necrosis and eventual sloughing off of the testicles). In assessing the effects of the different methods of castration, Molony et al., (1995) found that all three approaches caused immediate pain and distress and that use of the rubber ring method of castration was associated with chronic pain lasting for at least 42 days.

6.3.2. Tail-docking, Ear-notching, Teeth-clipping of Pigs

For many years, the animal agriculture industry has claimed that surgical procedures are not painful to very young animals because their nervous systems are not fully developed. Piglets are regularly subjected to having their tails removed, their teeth clipped, and their ears notched without pain relief. However, we now know that the anatomical structures needed to perceive pain are formed before an animal is born (Noonan et al., 1994). Newborn piglets undergoing surgical manipulations without the benefit of analgesia exhibit behavioral signs of pain and distress: tail docking results in grunting and increased tail jamming and wagging; ear notching causes increased head shaking; and teeth clipping causes more teeth clamping (Noonan, et al., 1994). Piglets subjected to all of these procedures vocalize and struggle as soon as they are picked up, suggesting that restraint itself is also stressful (Noonan et al, 1994).

6.3.3. Branding of Cattle

Many cattle are still branded with a hot iron despite the availability of more humane methods of identification. Branding causes a third-degree burn that is painful to the animals (Watts & Stookey, 1999). Discomfort from branding can also cause loss of appetite and subsequent weight loss. When animals are sold, re-branding may result. In a 1999 audit conducted at U.S. slaughter plants, 46 percent of cattle had brands, and 21 percent had multiple brands (Roeber et al., 2001).

6.3.4. Debeaking of Chickens and Turkeys

Confinement in battery cages prevents laying hens from establishing normal social relationships and prevents escape from more aggressive animals. The cannibalism that results can lead to high rates of mortality. Instead of providing more space to reduce cannibalism, producers subject hens to "debeaking," a procedure whereby the hen's sensitive upper beak is sliced off with a hot blade. The egg industry has tried to convince the public that debeaking is as painless to chickens as nail clipping is to humans. However, researchers have reported that debeaked hens exhibit behavior providing both anatomical and physiological evidence that the birds are suffering long-term chronic pain (Gentle, 1992; Duncan et al., 1989). Turkeys are also frequently subjected to debeaking.

6.4. Handling and Transport

Farmed animals suffer fear, anxiety, and physical pain and discomfort from being handled and transported. Livestock are moved by a number of methods that are aversive to the animals, such as roping, shouting, hitting, tail twisting, and shooting with an electrical prod (Pajor et al., 2000). Use of these techniques causes significant stress, pain, and injury to the animals.

Farmed animals are also often restrained for the performance of various procedures, including the surgical manipulations described above. In a study of Jersey dairy calves, simple restraint and immobilization for drawing blood caused an elevation in the animals' heart rate from below 100 beats per minutes to more than 140 beats/min., and an

increase in blood adrenal hormone (cortisol) level from 7.7 ng/ml to 28.8 ng/ml (Stephens & Toner, 1975). Cortisol levels in sheep undergoing various treatments range from 40 ng/ml for slaughter in a quiet research abattoir, to 61 ng/ml for slaughter in a noisy commercial plant, to 73 ng/ml for shearing, and up to 100 ng/ml for prolonged restraint and isolation for 2 hours (research cited in Grandin, 1997).

Many farmed animals raised in intensive confinement settings have limited contact with humans and are unaccustomed to being handled when they are removed from their cages or pens for shipment to slaughter. For example, at about eight weeks of age, broiler chickens are caught by hand, carried upside down by one leg and stuffed into transport crates. Research conducted by Duncan et al. (1986) showed that the heart rate of chickens caught by hand increased from a baseline of about 320 beats/min. to about 410 beats/min. right after being caught. In addition, after catching, chickens remained immobile (an indication of fearfulness) for up to seven minutes (Duncan et al., 1986). Between 10 and 30 percent of broiler chickens are injured during this catching and crating process (Gerrits et al., 1985).

Battery laying hens are also frequently injured during removal from their cages for transport to slaughter. Hen-catching crews work rapidly, forcibly pulling multiple hens by their legs backward out of the cages (Newberry et al., 1999). Hens may be carried seven at a time, three in one hand and four in the other. Wing flapping, impact against hard surfaces, and struggling in the hands of the catcher cause bruises, joint dislocation, and broken bones (Newberry et al., 1999). In one British study of more than 3,000 hens, Gregory and Wilkins (1989) reported an average of 24 percent suffered broken bones during this type of commercial removal from layer barns. When birds were removed from cages individually, the incidence of broken bones dropped to 14 percent (Gregory & Wilkins, 1989).

Transportation - between the farm and feedlot, and the feedlot and slaughterhouse - is a significant animal welfare issue. The loading and unloading process is often as stressful as the ride itself, with cattle and other animals being shoved, shot with electric prods, and shouted at. The ride is generally rough with animals subjected to loss of balance, stress, and fear. Animals must stand or lie in excrement, and animals on the lower level of double-deck trucks are often defecated and urinated on by those on the upper level. Other sources of stress during transport include noise, wind sway, dust, exhaust, and temperature extremes.

Sheep respond to vehicular motion while being towed in a trailer by showing an increase in salivary cortisol level and heart rate (Hall et al., 1998). During long journeys, sheep also stand with their head below the level of the shoulders, a posture exhibited by sheep during other unpleasant experiences, such as exposure to driving rain (Hall et al., 1998). Research by Smith and Dobson (2001) on sheep subjected to just two hours of transport showed the animals had significantly increased adrenal hormone concentrations during the transport period. Goats have also been found to suffer from physiological stress, as evidenced by elevated blood cortisol, glucose, urea nitrogen, and leukocyte counts, during and after truck transportation (Kannan, et al., 2000).

Another study by Cole et al. (1988) documented that transport is stressful to calves, as evidenced by changes in blood chemistry levels. In studying the impact of transportation and handling on non-ambulatory, disabled ("downer") cows at slaughter, Stull (1996) found blood stress hormones levels in downers two to three times the upper "normal" limit established for cattle. She concluded that the cows had "experienced severe stress, probably due to their non-ambulatory condition."

Grandin (1997; 1994) and Fraser and Broom (1997) review results from several additional studies that document elevated stress levels during restraint, handling, and slaughter in cattle, sheep, and pigs. Grandin (1997) observes that farmed animals do not necessarily habituate to aversive handling practices and procedures. She cites three studies where animals subjected to repeated procedures - truck trips during which cattle fell down, sham shearing of sheep, and restraint of sheep with their legs tied - did not become accustomed to the treatment.

6.5. Slaughter

6.5.1. Shackling of Chickens

Unlike other animals, birds at slaughter are hung upside down by their legs on a conveyor belt while still conscious and aware. This causes the birds to struggle vigorously, flap their wings, and vocalize as they attempt to right themselves. Hanging upside down on the shackle line is a physiologically abnormal posture for birds which causes them to suffer fear and anxiety. To attach the bird to the conveyor line, his or her lower leg or "shank" is manually inserted into a metal shackle. If the bird's leg is too large for the shackle, which is common with male broiler chickens, the leg is forcibly compressed to fit into the shackle.

Researchers have calculated the amount of pressure required to compress legs of various sizes into different-sized shackles (Sparrey, 1994 cited in Gentle & Tilston, 2000). Scientists have also studied the presence of pain receptors in the skin over the surface of a chicken's leg (Gentle & Tilston, 2000). After assessing the pain threshold of the nerve fibers found on the leg, Gentle and Tilston concluded that "shackling is likely to be a very painful procedure." In a study of 3,115 laying hens, Gregory and Wilkins (1989) found that while 31 percent of the birds had at least one broken bone upon arrival at the slaughter plant, 45 percent had broken bones after removal from transport crates and shackling, an increase of 44 percent. The corresponding number of broken bones per hen increased 64 percent, from 0.55 to 0.90, during the removal and shackling process (Gregory & Wilkins, 1989).

6.5.2. Electrical Stunning of Chickens

Chickens are stunned on the conveyor line when their heads are run through a trough containing an electrified water solution. This method of rendering birds unconscious for slaughter is associated with several major animal welfare problems (Gade et al., 2001; Raj & Tserveni-Gousi, 2000):

> Pain is experienced by some conscious birds who receive an electric shock before being stunned. This can result from wing flapping or, in larger birds, from their wings hanging lower than their heads which causes the wings to make contact first with the electrified water.
>
> Pain and distress is experienced by some birds who miss being stunned adequately and have their necks cut while still conscious. Inadequate stunning can result when the birds receive too little current because the volt age is too low or because the birds are flapping their wings at the entrance to the stunning bath.
>
> Pain and distress is experienced by birds who regain consciousness during bleeding because either the neck-cutting or the stunning was inadequate.

6.5.3. Ritual Slaughter of Livestock

In the U.S. and other countries, laws that require farmed animals be rendered insensible to pain prior to slaughter exempt animals killed by religious or ritual practices. Some religions - including the Muslim and Jewish faiths - forbid stunning of animals prior to cutting. In these cases, animals may be shackled and hoisted while still conscious. Cattle and sheep killed under humane slaughter laws typically are stunned prior to shackling by use of a device known as a captive bolt gun that renders a concussive blow to the cranium and damages tissue by driving a bolt into the brain. Research has been conducted comparing the effects on brain functioning of captive bolt stunning and religious slaughter which features bleeding animals without prior stunning. In one study, brain functioning continued for as long as 113 seconds when animals were bled without prior stunning (Daly et al., 1988). The animals suffer significant distress between the time they are cut and when they eventually lose consciousness.

7. Conclusion

Animals raised for food experience a wide variety of feelings and moods, including pain, discomfort, fear, anxiety, frustration, pleasure, excitement, and curiosity. They are able to establish and maintain social relationships and to communicate information, as well as their feelings and needs to others. Evidence of their ability to communicate, recognize individuals of their own and other species, solve novel problems, and learn new information and tasks from others, all suggests that farmed animals are capable of reasoning or "thinking."

American neuroscientist Bernard Baars (2001, p. S39) offers the following conclusion regarding the differences in consciousness between humans and other mammals:

"After more than seven decades of cumulative discoveries about waking and sensory consciousness, we have not yet found any fundamental differences between humans and other mammals.... In humans, we invariably infer subjective experiences from objective behavioral and brain evidence; but that evidence is essentially identical in other mammals. On the weight of the objective evidence, therefore, subjective experience would seem to be equally plausible in humans and other mammals. Either we deny it to other humans (which is rarely done) or, to be consistent, we must also attribute it to animals that meet the same objective standards. It seems that the burden of proof for the absence of subjectivity in mammals should be placed on the skeptics."

Most people would agree that causing suffering to conscious, feeling beings is morally wrong, and very few honestly believe that animals have no feelings. Yet, most people also accept agricultural practices that subject animals to pain and other negative feelings, either because they are unaware of the suffering involved or because they have been convinced the suffering is somehow necessary and unavoidable.

As members of a civilized society, however, we have an obligation to know what happens to animals when they are raised for food, and how this treatment affects their physical, psychological, and behavioral well-being. We are all obliged to make value judgments about what activities related to animals are permissible, and our decisions should be informed by the degree to which we believe the animals suffer consciously. Given strong evidence that farmed animals are beings with rich emotional lives, a number of common agricultural practices must end. Minor modifications in current practices will not be enough. We must stop feed restriction, intensive confinement, surgical manipulations, stressful handling and transportation, and inhumane slaughter practices. Everyone can help contribute to this effort by making ethical choices in the products we buy, in what we wear and eat, and in the kinds of entertainment we patronize.

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