

## **Animal Welfare during Pre-Slaughter**



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### **Introduction**

In 2008 U.S. industry produced 34.2 million cattle, 9 billion chickens, 2.7 million sheep and 271 million turkeys. The United States is the third largest beef exporter worldwide. The meat industry in the U.S. and other countries is a prior basis on agriculture.

In times of mass production the danger of neglecting the welfare of animals increases, therefore it is important that slaughterhouses and meat plants are regularly audited, to ensure that animals do not suffer. Simple methods, in which facilities work with and not against an animal's instinct, can be used to maintain the wellbeing of the animal. After all, the first step to quality and efficiency in the livestock industry is to establish a high standard of animal welfare.

The following essay deals with methods of animal handling in meat plants, in order to reduce fear and pain in animals.

### **Dr. Temple Grandin**

Dr. Temple Grandin is a leading designer of livestock handling facilities and professor of Animal Science at Colorado State University. She developed a scoring system for assessing the handling of cattle and pigs in meat plants, which is used by many companies to improve animal welfare (Grandin 2009).

Grandin attained her B.A. at Franklin Pierce College and her M.S. in Animal Science at Arizona State University. In 1989 she received her Ph.D. in Animal Science from the University of Illinois. Apart from teaching courses on livestock behaviour and facility design at Colorado State University she works together with the meat industry regarding animal welfare. Dr. Grandin is the author of 'Thinking in Pictures' (1996), and the two books 'Animals in Translation' (2005) and 'Animals Make us Human' (2009) both on New York's best seller list (Grandin 2009).

She was born in 1947 and didn't start to talk until she was 3 ½ years old. At that time psychologists found out that she suffered from Asperger-Syndrom which is a form of autism. Over time she learned to deal with social timidity and her difficulties in communicating with others, based on her ability of thinking in pictures and not in words, as well as anxiety states occurring during novelties. Such experiences supported her during her studies in Animal Science (BBC 2008).

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### **Sense and Sensibility of Animals**

All domestic animals like cattle, horses, sheep and pigs have retained the instincts of a prey animal. This primal instinct enables a prey animal to escape from a dangerous situation, whether it is a predator such as a coyote or an unknown object.

In comparison to humans, animals have highly evolved senses regarding aural, olfactory and visual detection, which contribute to their survival chances. Animals assume that every single unknown object or odour conceals a predator, consequently strange smells, sounds, lights and shadows distress them. Observations in the wilderness and even in zoos show that prey animals are constantly in fear of predators even when they are in a safe environment, which is the reason why these animals are nervous; they watch out for danger. From an animal's point of view a sudden movement of a person is equal to a sudden appearance of a predator which will attack the prey.

All animals are completely detail-oriented. The 'single most important thing to know about animals' (BBC 2008) is that they see details people do not see; for example cattle will stop at the sight of a shadow, because it may be a cliff. The behaviour of a donkey only to move when it wants to is widely known in our society, we do not realise that their "stubbornness" is their way of protecting themselves. The human brain filters important and less important information from the environment; whereas a donkey perceives everything as a possible danger such as in the form of a cliff or a snake (Grandin and Johnson 2005).

### **Animals Feel Pain and Fear**

In all mammals including humans, pain and fear can cause suffering. For a better understanding of animal behaviour one has to distinguish between both.

Fear is psychological stress for all mammals. When an animal is faced with stressors the body produces a variety of hormonal messengers to help the animal to adapt to the situation. Bratson and Bradshaw (1997 cited Grandin 2003) studied physiological effects on hunted deer. They examined the increase in cortisol levels during hunting. Cortisol is a hormone released from the body during stressful situations in order to provide the body with energy. They came to the conclusion that a deer pursued by hunting dogs evoked a great physiological stress and corresponding increase in cortisol levels as opposed deer shot by professional hunters. Another example can be observed on wild cattle which are not accustomed to handling facilities and people. When the animals are held in a restrainer for branding the resulting fear of the restrainer and pain from the branding iron cause the body to release high levels of cortisol.

In tame cattle that do not fear the restrainers the cortisol level increased as a consequence of the pain from the branding iron.

Indisputable is the fact that animals feel pain. All kinds of animals and humans actively show pain avoiding behaviour when they are injured which is known as 'pain guarding'. For instance dogs, horses, rats and cattle limp after they have hurt their legs. They will avoid pain in not putting weight on the injured leg to protect it from further injuries (Grandin 2003). Furthermore Dr. Grandin alleges that the 'single worst thing you can do to an animal emotionally is to make it feel afraid' (Grandin and Johnson 2005).

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Animals who suffer from pain can still function whereas animals who are frightened show other behavioural characteristics. Take, for example, a limping horse. The horse will not strain an injured leg because of pain, however if it is faced with a predator like a lion it would run away regardless of the injured leg, because of its fear to die. Grandin summarises this behaviour by saying 'Fear has the powerful ability to override pain' (Grandin, 1997). Grandin found that people with autism and animals have a lower pain sensibility in contrast to a higher fear sensibility, which may be based on the predator and prey relationship. Especially prey animals are often feared which makes them cautious and helps them to survive in the wilderness.

### **Fear Pheromones**

Controversially discussed is the question whether or not animals in slaughter plants are distressed because they sense death.

Observations by Vieville-Thomas and Signoret (1992 cited Grandin 2003) revealed that cattle voluntarily walk into a restrainer covered with blood; on the contrary, an animal will refuse to follow another animal showing obvious signs of panic.

The latest research studies on humans done by Dr. Lilianne Mujica-Parodi and her team at Stony Brook University in New York State revealed that fear pheromones, which were present in the perspiration of people who endured a frightening situation, were detected by test subjects. The probands were placed in a brain scanner and were monitored while they inhaled the perspiration of others. The scientists found that the sweat heightened the activity in the amygdale and hypothalamus, which are regions of the brain responsible for the detection of fear, in comparison to a control subject, whose was not exposed to the perspiration of someone who was afraid, did not show an increase of brain activity.

Although the probands perceived and distinguished between the perspiration containing fear pheromones and the one with none, they were not terrified. A possible explanation is given by Simon Wessely psychiatrist at King Centre for Military Health Research at King's College in London who observed that outwardly signs of fear are induced during frightening situations. On this basis it is possible to extrapolate from Dr. Mujica-Parodi's observations on humans to the perception of fear pheromones in animals (Guardian 2008).

Regarding the cow, which walked into the bloody restrainer, however refused to follow a panicking cow. The cow becomes afraid because of the panic reactions of the first cow, though not due to the visual detection of blood, which is the major difference to people. As previously mentioned fear pheromones are released by the body during frightening situations in humans and animals, which is characterised from an animal's point of view by shadows, light, sounds and moving objects. If a cow is stunned without being afraid, it will probably neither release fear pheromones nor show signs of panic, which is why the other next cow will not refuse to follow.

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### **Livestock Handling**

The main problem arising on animals during livestock handling is stress. Consequently the decline of stressors will improve productivity and safety in meat plants, quality of meat as well as animal welfare.

Reducing stress on animals has a beneficial effect on their physiological functions. Stress occurring during handling reduces the immune function in cattle and pigs. The lymphatic system is weakened and as a result pathogenic germs are able to penetrate the intestinal barrier and get into the blood circulation where they are transported to all organs.

As prey animals are herd animals they feel safe among their sort, therefore avoiding the isolation of single animals will reduce the stress on the animal and in the herd.

A curved chute design is more and more common in meat plants. The curved design turns out to be efficient for two reasons. Firstly, it prevents the animal from seeing the end of the chute; secondly it promotes the animal's natural tendency to move in circles around a handler (Grandin 1999).

### **Vision of Animals**

Animals have a wide angle of vision and as previously mentioned, are easily frightened by shadows, noise and moving distractions. Researchers found that cattle have a poor depth perception which may be the reason why cattle will balk and lower their head in order to measure the depth of objects. From an animal's point of view even a slat, drain, shadow or moving people may cause fear and heighten the agitation of an animal. Such stressors can also cause the animal to stop moving, for example, down the chute. For these reasons solid sides chutes are often used to prevent animals from being affected by outside stimuli (Grandin 1999).

### **Light and Shadows**

Areas in meat plants or buildings on farms should be illuminated by diffuse light, however it should not dazzle the animal this could cause the animal to refuse to move.

Observations revealed that cattle and pigs have the habit to move from a dimly illuminated towards a brightly lit area. Furthermore animals often refuse to walk into a dark building whether it is a meat plant or a restrainer to vaccinate the animals. On the one hand the contrast between light and dark leads to a temporary blindness; on the other hand cattle, pigs and

sheep are not able to see in the dark which is contrary to predators, such as cats, who possess a reflecting layer on the retina as a result they can see in the dark ( Grandin 1999).

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### Noise

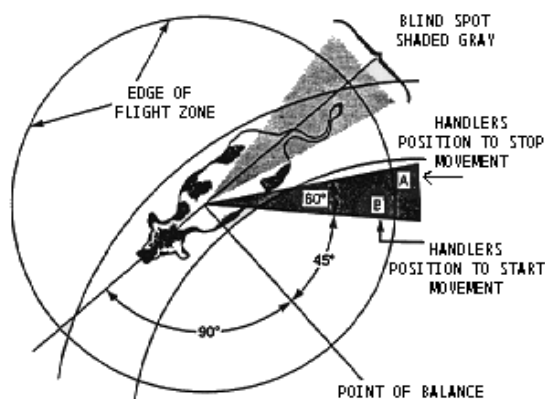
Animals are greatly sensitive to high frequency sounds, such as noise should be minimised during handling; especially unexpected loud noise such as shouts and yells of handlers lead to excitement and stress.

For example a hydraulic pump located besides a chute cause an animal to balk. Studies on calves have shown that a ringing telephone raises a calf's heart rate from 50 to 70 beats per minute (Grandin 1999).

### Flight Zone

Grandin describes this area in the following way 'the flight zone is the animal's "personal space"' (Grandin 1999). A person who enters this zone will make the animal move away. This concept can be used by handlers to reduce stress by making voluntarily animals move in the requested direction instead of using electronic prods.

The size of a flight zone varies depending on how wild the animal is. Wild cattle who are not accustomed to people have a flight zone up to 50m in contrast to tamed cattle, whose flight zone varies between 2m and 8m. Understanding the connection between flight zone and animal behaviour can prevent people from injuries. Although animals will often run away, sometimes they turn back and run past a person. When a handler is standing behind the animal in the flight zone it will move forward. As soon as the handler retreats the animal will stop moving. If the animal should back up the handler should stand in front the animal's point of balance. It should always be kept in mind that it is best to work on the edge of the flight zone to avoid excitement.



Often animals like horses or cows rear up and become excited while waiting in a single chute or a horsebox, because people are penetrating the animal's flight zone by leaning over the chute or coming extremely close to the animal; this makes the animal feel afraid and get panic reactions. If the person retreats from the flight zone it will settle back down and become calm (Grandin 1999).

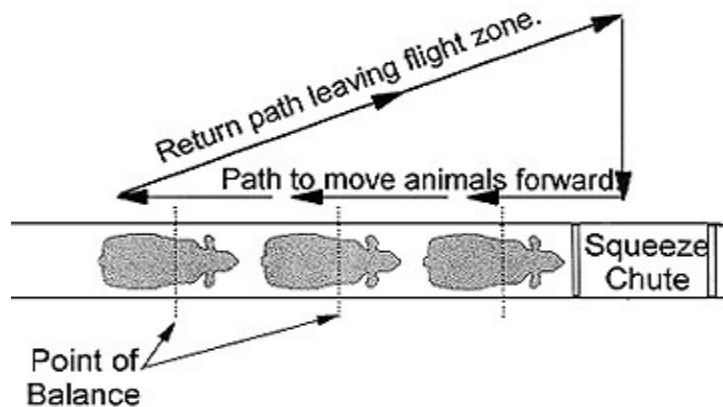
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### Point of Balance

At the shoulder of an animal is the point of balance. Walking quickly past this point will make the animal move forward in the opposite direction as the handler. When an animal is driven into a chute, the handler walks inside the flight zone in the opposite direction to that which is desired.

To return to the start position the handler should walk outside of the flight zone. Feed rewards facilitate an animal's movement in a desired direction (Grandin 1999).



### Achievements of Animal Welfare in Slaughterhouses

The following report is a summary of data collected in 1996 from USDA – U.S. Department of Agriculture and data collected in 2008 by Grandin during audits at slaughterhouses in the U.S. and Canada. In 1996 most of the establishments complied with AMI – American Meat Industry guidelines for animal handling. McDonald's was the first to conduct audits in meat plants as part of their new food safety standards in corporation with Grandin in 1999. These audit programs resulted in a greater compliance to guidelines by other restaurant companies such as Burger King and Wendy's as well as by other meat plants. Since the commencement of stunning audits in meat plants in 1996 the percentage of establishments passing the audit has increased equally to the amount of meat plants receiving an acceptable score for vocalisations (Grandin 1996, Grandin 2008).

### Cattle Handling

#### Cattle Stunning

The AMI guidelines constitute that 95 % of cattle must instantly be made insensible with one shot from a bolt gun. Furthermore all cattle must be insensible and unconscious on the bleed rail in order to pass an audit.

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## Animal Welfare during Pre-Slaughter

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USDA – Survey 1996

<b>Number of Plants</b>	<b>Gun Type</b>	<b>Rating</b>	<b>Percent Missed</b>
2	Cartridge/Pneumatic	Excellent	0%
2	Pneumatic	Acceptable	5%
1	Pneumatic	Not Acceptable	9%
6	Cartridge/Pneumatic	Serious Problem	15%

Major problems causing a missed stunning included a lack of stun gun maintenance a lack of employees; for example one meat plant employed one operator to stun cattle at a rate of 390 head per hour. In comparison other plants recruiting two people for 390 head of cattle passed the audit. Consequently, the number of employees has a great influence on the effectiveness of animal stunning.

Grandin - Survey 2008

Captive bolt stunning accuracy in 32 U.S. and Canadian beef plants

<b>Number of Plants</b>	<b>Percentage of Plants Insensibility with Effective</b>	<b>Rating</b>	<b>Percentage of Cattle Stunned with One Shot</b>
24	75%	Excellent	99% to 100%
8	25%	Acceptable	95% to 99%
0	0%	Not Acceptable	90% to 94%
0	0%	Serious Problem	Less than 90%

Insensibility in 32 U.S. and Canadian beef plants

<b>Number of Plants</b>	<b>Percentage of Plants</b>	<b>Rating</b>	<b>Percentage of Cattle Rendered Insensible</b>
31	97%	Excellent	100%
1	3%	Serious Problem	Less than 100%

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Cattle Vocalisation

The vocalisation of animals is always an indicator of distress due to handling and stunning methods. Vocalising cattle often cause excitement and anxiety in other animals. Surveys have shown that an improvement in handling practices and in the training of operators and handlers decreases the amount of vocalising animals.

Animals are counted as they move through stunning chute areas, where they are scored as a vocaliser or a non-vocaliser.

USDA – Survey 1996

Vocalisation scores during handling for cattle and calves in the stunning area and crowd pen in 8 plants

<b>Number of Plants</b>	<b>Number of Animals Rated</b>	<b>Number Vocalised</b>	<b>Rating</b>	<b>Percent Vocalised</b>
1	200	1	Excellent	0.5%
2	150	4	Acceptable	2.6%
3	175	7	Not Acceptable	7%
4	150	12.5	Serious Problem	25%

Grandin-Survey 2008

Percentage of cattle vocalising during handling and stunning in 32 U.S. and Canadian beef plants

<b>Number of Plants</b>	<b>Percentage of Plants</b>	<b>Percentage of Cattle Vocalising Insensible</b>	<b>Rating</b>
22	69%	0% to 1%	Excellent
9	28%	2% to 3%	Acceptable
1	3%	3% to 10%	Not Acceptable
0	0%	Greater than 10%	Serious Problem

One plant scored 4% on vocalization at the restrainer entrance due to excessive balking; reasons for this included moving stunner air hose located above the restrainer, water spraying on the restrainer and a flashing light near the restrainer.

Audits revealed two main problems during cattle handling; Firstly sharp edges and worn out equipment often hurt or injured the cattle; secondly the excessive use of electric prods by operators caused an increase in Vocalisation.

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**Pig Handling**

Regarding the acquisition of data concerning handling methods of pigs it is necessary to annotate that excited pigs are squealing continuously. Slaughterhouses have improved their handling methods by replacing electric prods, which caused fear, pain and excitement, with flags, to make the pigs move.

**Pig Stunning**

USDA-Survey 1996 Placement accuracy of electric stunner electrodes on pigs in plants

<b>Number of Plants</b>	<b>Percent Incorrect Placement</b>	<b>Percent Neck Stuns</b>	<b>Percent Vocalised When Stunner Applied</b>	<b>Rating</b>
3	0%	0%	0%	Excellent
3	1%	1%	0%	Acceptable
2	2.3%	1%	3%	Not Acceptable
1	8%	10%	2%	Serious Problem

Grandin- Survey 2008

Stunner placement accuracy and hot-wanding in 13 U.S. pork plants with electrical stunning systems

<b>Number of Plants</b>	<b>Percentage of Plants</b>	<b>Rating</b>
12	92%	100% Correct Placement: Excellent
1	8%	99% Correct Placement or 1% Hot-Wanded: Acceptable
0	0%	96% to 98% Correct Placement or 2% to 3% Hot-Wanded: Not Acceptable
0	0%	Less than 96% Correct Placement or Greater than 3% Hot-Wanded: Serious Problem

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Pig Vocalisation

USDA-Survey 1996

<b>Number of Plants</b>	<b>Percent Vocalised</b>	<b>Rating</b>
3	0%	Excellent
3	1.5%	Acceptable
1	14%	Not Acceptable

Grandin-Survey 2008

Percentage of pigs vocalising in the restrainer in five U.S. pork plants with electrical stunning systems

<b>Number of Plants</b>	<b>Percentage of Pigs Vocalising in the Restrainer in Electric Stunning Systems</b>	<b>Rating</b>
2	Less than 2%:	Excellent
2	2% to 5%	Acceptable
1	6% to 10	Not Acceptable
0	Greater than 10%	Serious Problem

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### **Recommended Animal Handling Guidelines and Audit Guide 2007 Edition**

In 1978 the Animal welfare Act, which covered livestock slaughter in federally inspected meat plants, was passed. As a result veterinary surgeons monitored the compliance with existing slaughter regulations in meat plants. In 1991 Grandin contributed to the development of a guideline on animal welfare for meat packaging operations by AMI – American Meat Institute. As a consequence of the observations in slaughterhouses a new guideline GMP – Good Management Practices for Animal Handling and Stunning written by Grandin, was published in 1997. In the following years major leading restaurant chains began to develop animal welfare practices, for example conducting audits on their suppliers. In 2005 AMI's Foundation and GMP's guidelines were merged into a single document which was updated in 2007 and resulted in today's Recommended Animal Handling Guidelines and Audit Guide 2007 Edition.

The following paragraphs concisely constitute accomplishments in the field of animal welfare in slaughterhouses:

#### **Effective Stunning**

In meat plants 95 % of cattle and sheep should be rendered with one shot. Regarding pigs electric wands should be properly placed on the animal's head.

#### **Bleed Rail Insensibility**

A sensible animal on the bleed rail is an automatic failure; nevertheless it is possible that it may occur in this case no more than two cows per 1,000 and one pig per 1,000 should be sensible. Animals that show any sign of returning to sensibility should be immediately re-stunned. Furthermore all animals must be completely insensible before procedures such as skinning, head removal or dehorning. Plants are encouraged to aggregate audits to monitor stunning systems.

#### **Slips and Falls**

The amount of slips should not exceed 3%; whereas falls, which means that the body should not touch the floor, should occur in less than 1% of all animals going through the meat plant.

#### **Vocalisations**

The vocalisation level should be monitored in a restrainer and should not exceed 3% concerning cattle and 5% regarding pigs.

#### **Electric Prod Use**

Electric Prods should never be used in CO<sub>2</sub> or group stunning systems besides this it should be used less than 25 % of all animals.

#### **Wilful Acts of Abuse**

The deliberate hitting or beating of an animal, dragging of a conscious animal constitutes an automatic audit failure.

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### Conclusion

Animals have highly evolved senses, whereby they perceive smallest stimuli from the environment. As prey animals every unknown object or odour is regarded as a predator. Both pain and fear cause suffering on animals. Firstly, researchers found that cattle walk voluntarily into a bloody restrainer, however refuse to follow a panicking cow. In animals fear pheromones are released by the body during frightening situations, which are characterised by shadows, darkness, noise and moving objects. If a cattle is stunned without being afraid, it will neither release fear pheromones nor show signs of panic. Secondly, animals show a pain avoiding behaviour such as limping when its leg is hurt.

In order to reduce stress arising during handling practices in meat plants, operators use the animal's natural instincts. Solid sides chutes prevent the animals from being distressed by outside stimuli. Handlers use the concept of the flight zone, into which the handler enters and therefore make the animal move into the desired direction. Furthermore if the handler walks quickly past the animal's shoulder it will move into the opposite direction, this behaviour is known as the point of balance.

Accomplishments of audits since 10 years resulted in an increase in animal welfare. Slaughterhouses improved handling methods by considering handling advises such as flight zone, point of balance, shadows or moving objects. Today, a positive feedback from an audit is necessary for slaughterhouses as it influences their relationship with customers, for example restaurants. Managers are responsible for the implementation of animal welfare scores concerning stunning, animal insensibility, slipping and falling, vocalisation and electric prods. In 2003 the U.S. Congress passed the Animal Welfare Act in which Congress determined (among other things) that the use of humane methods of handling and slaughtering livestock prevents needless suffering of animals' (FSIS, 2003).

Nevertheless animal welfare remains an important issue because of increasing globalisation. In the future, the slaughtering of cattle, pigs, sheep, horses and other animals will increase as companies open up to foreign markets in which the guidelines for animal welfare are less strict. Therefore, it is necessary that audits and guidelines are internationally adapted. Grandin summarises this development in the following way 'We have the responsibility to treat the animals right so that they do not suffer' (Grandin, The Woman Who Thinks Like a Cow). Another problem which will become more relevant in the future, not only regarding animal welfare, is a rising abstraction. Politicians and managers are not related on the basis of their work whereby they have no apprehension of the implementation of policies on agriculture or social fields.

As the work of Grandin on animal welfare clarifies it requires small alterations to achieve improvements, if one has a comprehension of the influence on things; briefly speaking even small changes make a difference.

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