Animal Welfare is the concern felt by humans for all animals, domestic and wild, for those that are economically viable and for those which have outlived their usefulness, and for those which are simply companion animals, or have a role to play in our environment, with or without directly relating to humans.

The goal of animal welfare is the effort to ensure the "freedoms" for all animals:

1. Freedom from thirst, hunger and malnutrition
2. Freedom from discomfort
3. Freedom from pain, injury and disease by prevention or rapid diagnosis and treatment
4. Freedom to express normal behaviour
5. Freedom from fear and distress.

Pigs meant for slaughter must be handled gently and provide adequate rest to meet the welfare of slaughter animals. Welfare of food animals must be governed from the farm till the animal is sticked. There are three reasons for being concerned about animal welfare:

- respect for animals and a sense of fair play;
- poor welfare can lead to poor product quality;
- risk of loss of market share for products which acquire a poor welfare image.

Poor welfare can lead to inferior meat quality. In the fresh meat trade it results in loss of yield and loss of sales through rejection or downgrading of poor quality product. So this is more important for the Indian meat industry to look into the animal welfare activities while transport and before slaughter in the slaughter houses.

Good management combined with well-designed equipment must be used together to insure adequate animal welfare during transport and slaughter.
The quality of the final product produced by the processing plants is largely determined by the quality of the live products supplied. As a result of indifferent loading and transport, a first grade animal can be reduced to a product of poor quality. It is therefore best to proceed with extreme care along the route from shed to shackle.

Thus transportation of animals, especially meat animals, considered as one of the vital function in producing good quality products. People often wonder "are animals afraid of slaughter." It was observed that pig behavior during handling and stunning is the same both on the farm and at the plant. Animal handling both on the farm and in the slaughter plant will cause physiological measures of stress to increase. When animals become agitated during handling it is most likely to be motivated by fear. The fear circuits in the animal's brain have been completely mapped. Rough handling, slipping on the floor and electric prod use resulted in higher cortisol levels.

Steps in slaughter and dressing of pigs

Hog slaughter is carried out in a separate hall from that used for sheep or cattle as the most atmosphere due to the scalding of hog is not conducive to the setting and drying of beef of mutton carcasses. Hold the pig off feed for 6 hours prior to slaughter by provide them adlibitum water. The pigs must be well rested prior to slaughter.
Stunning

Stunning is the process by which animals are rendered unconscious or insensible to pain immediately prior to slaughter and the method of slaughter involving stunning is humane slaughter. Stunning can be done by mechanical instruments, gas anaesthesia and electricity.

Captive bolt pistol may be used for stunning of pigs. A bolt which is attached to the pistol is propelled forwards by the discharged gun from blank cartridges and penetrates the skull and bring about unconsciousness. The instrument is placed on a point one inch or 2.5 cm above the level of the eyes and fired upwards into the cranial cavity.

The survey indicated that the most common cause of a low captive bolt stunning efficacy score was poor maintenance of the captive bolt guns. Guns must be cleaned and serviced per the manufacturer’s recommendations to maintain maximum hitting power and prevent misfiring or partial firing. Each plant should develop a system of verified maintenance for captive bolt stunners. Another major cause of failure to render animals insensible with one shot is poor ergonomic design of bulky pneumatic stunners.

A concentration of 65-70% in air with 45 seconds exposure is more suitable for stunning pigs. Bleeding should be performed within 30 seconds from the time of stunning. Carbon-dioxide stunning is known to yield 0.75% more of blood in bleeding. The current practice is to use 80-95% carbon-dioxide in air.

The three forms of apparatus involved are,

1. Oval Tunnel Method.
2. Dip Lift Method.
3. Ferris Wheel Method.

Advantages: of the gas stunning are

1. Carcasses are relaxed allowing easier dehairing and dressing.
2. Less noise.
3. Reduces labour requirements.
4. Yield of blood is better
5. Muscular haemorrhages are avoided.
6. pH of meat is lowered.

Disadvantages:

1. If the concentration is too low, the pigs will not be properly stunned.
2. If the concentration is too high, there is a tendency for pigs to become stiff and bleed poorly.
3. If the exposure period is too long, superficial congestion of the skin occurs and when the pigs are scalded the skin is bluish in colour.

Electrical stunning is most widely used for pig. This method consists in passing an alternating current through the brain or heart of the animal. Electrically stunned pigs should be bled immediately after achieving the state of unconsciousness, otherwise muscular splash will ensue. The voltage is 75 volts and the time of application is not less than 7 seconds. If high voltage is advocated the time of application should be 3 seconds.
Electrical stunning methods used commercially on pigs are effective and induce instantaneous insensibility. A minimum of 1.25 amps must be passed through a pig’s brain to reliably induce insensibility. This is especially important for heavy pigs (over 225 lbs / 100 kg). The electrical method of stunning may be regarded as efficacious and humane, it causes in coordination of the central nervous system and makes the animal unconscious.

The different types of electrical stunning systems are,

- **Low voltage electrical stunning** - The voltage used is 75 volts. The time of application not less than 7 seconds.
- **High voltage electrical stunning** - The voltage used is 300 volts or more and the application time must be at least 2 seconds and usually 2-3 seconds. This system uses automatic restraints to ensure operators safety.
- **Head to back or leg stunning** - Current is applied simultaneously to the head and the back or leg.

Disadvantage:
1. Missed shock (crurisation), in which the animal though paralysed, is fully conscious due to improper electrical conditions.
2. Muscle splash or blood splash ensues if there is a delay between stunning and sticking.

**Sticking and bleeding:**

The sticking knife is inserted in the middle of the neck at the depression anterior to the sternum and is then pushed forward to sever the anterior venacava, brachiocephalic trunk at the entrance of the chest; sometimes the carotid artery is also pierced, thus providing a thorough bleeding for 6 minutes.

After complete bleeding was over clean the carcass and drop the carcass into the scalding tank.

**Scalding:**

A scalding tank may be used. Scalding water should be at a temperature of 60° C. The sticked pig must be drowned inside the hot water, head side down for a period of 6 minutes until the hair pulls off easily; After this they are removed from the tank and scraped. If scalding tank large enough to immerse the slaughtered pig is not available, the alternate hygienic method is place the slaughtered pig on a stainless steel cradle and pour hot water at about 85°C over the slaughtered animal and scrap.

**Dehairing:**

Manual scarping or mechanical dehairing can be used to remove bristles. The bristles and remnants of bristles finally seen on the carcass after scraping may be singed. Then wash the carcass with water under pressure to clean the exterior surface before evisceration.

**Evisceration:**

i) In case of male animals penis must be loosened.

ii) Loosen the bung and pull out several inches to rectum so that the bung is free from its attachments. Then tie with a thread.
iii) The thoroughly scraped and cleaned carcass is opened down the midline on the ventral side form the anus to the point of jaw.
iv) Split the breast bone and aitch bone.
v) Loosen the intestines, liver, and stomach by slipping down.
vi) Remove the diaphragm, cut out the membrane leaving only the muscle intact and enter the thoracic cavity and remove the organs leaving alone the pluck.
vii) Loosen the tongue and then pull out the pluck.
viii) The head may be decapitated at the atlanto-occipital junction leaving the jowl.

Halving the carcass:
An incision was made down the medial line of back and the carcass is split down the middle of the vertebral column of the back bone using a splitting saw. The left and right halves are thoroughly washed with cold water both outside and inside. Then weigh the carcass and apply a tag. Chill the sides as rapidly as possible.

Styles of dressing and yield:
a. Shipper's style: Unsplit carcass with head on and leaf fat in. Yield -74 to 76%
b. Packers' style: Two sides with jowl attached, but head removed and leaf fat out. Yield -68 to 70%.
c. Farmers' style: Carcass split on either side of the back bone making two sides and back bone

ESSENTIAL FACILITIES FOR HYGIENIC MEAT PRODUCTION
The principles of food safety risk management should be incorporated wherever appropriate in the design and implementation on meat hygiene programmes. Further, newly recognized meat-borne risks to human health may require measures in addition to those that are usually applied in meat hygiene; for example, the potential for zoonotic transmission of central nervous system disorders of slaughtered livestock means that additional animal health surveillance programmes may need to be undertaken.

Practical application of a risk-based approach in meat hygiene
The practical application of risk management principles in meat hygiene requires an understanding of:

- the components of a meat hygiene programme
- application of a risk analysis framework;
- risk assessment
- risk management
- the different roles of industry, government and other stakeholders in the design and implementation of a meat hygiene programme.
Good hygienic practice in meat production

- Animals presented for slaughter should be sufficiently clean so that they do not compromise hygienic slaughter and dressing.
- The conditions of holding of animals presented for slaughter should minimize cross-contamination with food-borne pathogens and facilitate efficient slaughter and dressing.
- Slaughter animals should be subjected to ante-mortem inspection, with the competent authority determining the procedures and tests to be used, how examination is to be implemented, and the necessary training, knowledge, skills and ability of personnel involved.

Hygiene, dressing and carcass handling

During initial dressing operations and with due consideration to minimizing contamination:

- Slaughtered animals that are scalded, flamed or similarly treated should be scoured of all bristles, hair, scurf, cuticles and dirt;
- The trachea and oesophagus should remain intact during bleeding.
- Bleeding should be as complete as possible; if blood is intended for food, it should be collected and handled in a hygienic manner;
- Exposure of the tongue should be done in such a way that the tonsils are not cut;
- Before the removal from the head or any parts intended for human consumption, the head should be clean and, except in the case of scalded and dehaired carcasses, skinned to an extent sufficient to facilitate inspection and the hygienic removal of specified parts;
- Lactating or obviously diseased udders should be removed from carcasses at the earliest opportunity;
- Removal of udders should be done in such as way that the contents do not contaminate the carcass;

GHP for evisceration (traditional combined horizontal/vertical methods)

The following GHP principles should be applied in all evisceration methods and stages:

- Do not puncture the viscera
- Prevent leakages from the viscera (alimentary tract), uterus, urinary bladder and gall bladder during separation cuts.
- Prevent contact of viscera with floors/walls
- Regularly wash hands/aprons and sterilize knives
- Identify/correlate viscera with the related carcasses
- In larger abattoirs, where the carcasses hang from rails (no cradles) and are conveyed through the dressing operation, the whole evisceration is conducted in a vertical position.

The following GHP principles should be applied in all carcass splitting/washing methods and stages:

- Sterilize the splitting equipment between carcasses
- Use only potable water for carcass washing
- Wash the carcasses as little as possible to prevent/reduce the spread of contamination from individual spots on to larger areas of the same carcass

Pork we eat
- Prevent/reduce airborne cross-contamination between carcasses by not creating aerosols during washing.
- Remove any surface contamination by trimming rather than by washing
- Wiping cloths must not be used.

Post-mortem inspection
Post-mortem inspection systems should include
- Procedures and tests that are risk-based to the extent possible and practicable,
- Confirmation of proper stunning and bleeding;
- Availability of inspection as soon as is practicable after completion of dressing;
- Visual inspection of the carcass and other relevant parts, including inedible parts, as determined by the competent authority;
- Palpation and/or incision of the carcass and other relevant parts, including inedible parts, as determined by the competent authority according to a risk-based approach;

GHP for refrigeration
The following GHP principles should be applied in all carcass refrigeration methods and stages:
- Move the carcasses into the cooler as soon as possible to speed up surface drying and hinder bacterial growth.
- Keep the carcasses on rails and without touching floors/walls and other carcasses to prevent cross contamination
- Do not overload the cooler
- Adjust the cooling regime optimally in terms of air temperature, speed and relative humidity, to achieve rapid refrigeration to a deep muscle temperature of 4°C with no condensation or excessive weight losses.
- Do not open the cooler doors either unnecessarily or frequently to avoid temperature fluctuations.

Expected storage life of different types of meat under refrigeration temperature

<table>
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<tr>
<th>Type of meat</th>
<th>Expected storage life at -1°C</th>
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<tr>
<td>Pork</td>
<td>1-2 weeks</td>
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<tr>
<td>Edible offal</td>
<td>7 days</td>
</tr>
<tr>
<td>Bacon</td>
<td>4 weeks (at -3°C)</td>
</tr>
</tbody>
</table>

- Carcasses should be chilled as soon as possible after washing to speed up surface drying and hinder bacterial growth.
- The cooler conditions should be such that a deep carcass temperature of 6-7°C is achieved 12-16 hours for pigs.

Chilling of Carcass
1. Pork carcasses to 4º C and the offals to 3º C before despatch.
2. If the hot carcasses are to be dispatched it must be properly covered and transported in the refrigerated vehicles.

**Processing**

1. The carcasses are fabricated into wholesale cuts and packed as per the consumers demand.
2. The room temperature should be maintained between 10-15 °C.

**Freezing**

1. The packed retail meat is frozen to reach -18 °C and then distributed to different retail shops in refrigerated vehicle.

**Basic equipment required for slaughter and dressing**

- Slaughtering requirement, particularly for small-scale operations, need not be elaborate and expensive.
- The amount of equipment will depend on the slaughtering procedures employed.
- If possible, all equipment should be made of stainless steel or plastic, be rust-resistant and easily cleaned and sanitized.
- Equipment that does not come into contact with the meat (eg. overhead rails, working platforms, stunning pens) is usually made of galvanized steel.
<table>
<thead>
<tr>
<th>Inputs</th>
<th>Process Step</th>
<th>Outputs</th>
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<td>1. Receiving and holding in pens</td>
<td>Dead stock for rendering</td>
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<td>Water</td>
<td>2. Washing</td>
<td>Condemned stock for rendering</td>
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<td>Water</td>
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<td>Water</td>
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<td>Water</td>
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<td>Flame (LPG)</td>
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<td>Water</td>
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<td>10. Removal of ear canal, eyewells, stick wound</td>
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<td>11. Ringing/thumbing of bung</td>
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<td>12. Evisceration</td>
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<td>13. Post-mortem examination/retrieve) trimmings-examination</td>
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<tr>
<td>Carcass (loins/link)</td>
<td>14. Washing, soaking, branding</td>
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<td>Packaging materials, labels</td>
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<td>21. Loadout</td>
<td>Chilled/frozen carcasses, packed pork cuts and trimmings</td>
</tr>
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</table>
Conclusion

Based on the number of animals to be slaughtered, select the procedure which is easily adoptable and follow the good hygienic practices discussed in each and every stage of slaughter and dressing till chilling and fabrication to produce wholesome pork by a small and medium entrepreneur with minimum investment and maintenance.