RESTRAINT, ELECTRICAL STUNNING AND BLEEDING OF SHEEP AND PIGS
RESTRAINT
METHODS OF RESTRAINT

• Simplest methods are
  - RESTRAINER CONVEYOR
  - RESTRAINING BOX/ROOM

• Forbidden methods are specified in OIE Chapter 7.5
FUNCTION OF RESTRAINT

Minimise poor slaughtering and protect welfare:

• Prevent an animal from moving
• Expose head and stabilize for stunning procedure
• In some cases block the visual stimuli
• Keep stress level to a minimum
MOVING TO THE RESTRAINING AREA

- Entrance to the conveyor
- Has to be very well designed
- Experienced handlers
- Design – false floors -
RESTRAINING PRACTICE

• Animal must only be moved into the restraining area of operator is immediately ready to stun it and bleed it.

• Stunning only to be performed when an operator is ready to bleed the animal immediately
ELECTRICAL STUNNING “ON THE FLOOR” OR IN A RESTRAINER CONVEYOR
DEFINITION OF STUNNING

• Stunning is any intentionally induced process which causes loss of consciousness and sensibility without pain
Electrical stunning causes immediate however impermanent and reversible loss of consciousness and sensibility caused by high level of (electric) energy delivered to the brain of animal which causes reversible change of electric action potential of neuron cells within the brain of animal.

This status is very similar to epilepsy seizures.
PURPOSE OF ELECTRICAL STUNNING

- To render animal unconscious so it does not feel any pain (‘insensible’)
- To enable further safe and prompt killing of an animal while it is unconscious.
- Unconsciousness means animal cannot be aware of any peripheral stimuli, including pain
THREE KEY ELEMENTS

• ELECTRICAL PARAMETERS
• CORRECT POSITION
  - Position where maximum impact can be expected
• TIME OF APPLICATION
ELECTRICAL PARAMETERS

OHM’S LAW

\[ I = \frac{V}{R} \]

I = Electrical current (Amp)

V = Voltage (Volts)

R = Resistance (ohms)
ELECTRICAL PARAMETERS
OHMS LAW

Plumbing analogy

Low pressure
Low voltage

High pressure
High voltage

Flow rate = current (Amps)

Pipe diameter = resistance ( )
RESISTANCE/IMPEDANCE
ELECTRICAL PARAMETERS
OHM’S LAW

\[ I = \frac{V}{R} \]

\( R = \text{Resistance} = 150 - 400 \text{ Ohms} \)

\( I = \text{Electrical current (Amp)} = 1 \text{ Amp} \)

\( V = \text{Voltage (Volts)} = ? \)
ELECTRICAL PARAMETERS AND TIME OF APPLICATION

- 1 Amp for adult sheep and goat (50 Hz current)
- 0.7 Amp for lamb (OIE Recommendation)
- 1 Amp for lamb (EU Regulation)
- According to research, 0.6 Amp were sufficient to stun both adult sheep and lamb
- 150 V is a minimum current recommended resistance per animal may vary not always 1 Amp is achieved.
- Time of application between 1-3 seconds
VIDEO - ELECTRICAL PARAMETERS
ELECTRICAL PARAMETERS

OHM’S LAW

\[ I = \frac{V}{R} \]

- \( I = \text{Electrical current (Amp)} \)
  - \( I = 1.3 \text{A / pig} \)

- \( V = \text{Voltage (Volts)} \)
  - \( \text{Min. 250 volts} \)

- \( R = \text{Resistance (ohms)} \)
  - \( R = 150 - 350 \text{ ohms} \)
ELECTRICAL PRINCIPLES
POSITION OF ELECTRODES
VIDEO STUNNING PRACTICE
POSITIONS OF ELECTRODES (VIDEO)
VIDEO – ELECTRICAL STUNNING
DEFINITION OF STUNNING

• Stunning is any intentionally induced process which causes **loss of consciousness and sensibility without pain**

• **How is that achieved?**
ELECTRICAL STUNNING
IMMEDIATE LOSS OF CONSCIOUSNESS

- When applying electrodes to head of animal, electric current will cross brain within 15 msec.
- Peripheral stimuli to brain reflex response takes 70 - 120 msec.
- Loss of consciousness will be achieved 5-8 times quicker than “ability” of a sheep to feel pain.
PHASES OF ELECTRICAL STUNNING

SHEEP is unconscious about 30 sec after electrical stunning

• Tonic phase
  • Lasts from 10 to 20 sec.

• Clonic phase
  • Follows tonic phase
  • Lasts FROM 15 to 45 sec.
TONIC PHASE

- The animal collapses
- The whole body of the animal becomes rigid
- Breathing will stop
- The position of the eye is fixed
- When current flow stops the tonic seizure continues
- Hind legs are flexed under the abdomen
- Forelegs may initially be flexed but they usually straighten out
CLONIC PHASE

- A **clonic** stage follows tonic phase lasting between 15-45 seconds when there is:
  - Involuntary kicking of both fore and hind legs
  - Hind legs kick
  - Forelegs paddle
  - Gradual relaxation
  - If the animal is not bled recovery
    - rhythmic breathing starts
HOW TO VERIFY GOOD STUNNING

- Immediate collapse
- Tonic and clonic phases clear and present
- No corneal reflex
- No rhythmic breathing
- No reactions to skin stimuli (i.e. poked or pinched ear or rostrum etc.)

- Looking for at least 2 indicators
MONITORAMENTO
CORNEAL REFLEX (VIDEO)
INADEQUATE STUNNING

• Any of the following indicate an inadequate stun:
  • No tonic or clonic seizure
  • Return to rhythmic breathing
  • Focused eye movements
  • Constricted pupils
  • Vocalisation during stunning
  • Return of the head righting reflex.

• !! In case of Rhythmic breathing occurrence before or during sticking is essential TO STUN animal IMMEDIATELY AGAIN !!
RE-STUNNING (VIDEO)
REASONS OF FAILURE OF EFFECTIVE STUNNING

• Incorrect position of application of electrodes
• Carbon layers at electrodes
• Insufficient parameters of electric current.
• High tissue resistance

Corrective measures ....???????
VIDEO – RECOVERY
In Doubt = Re-Stun !!!!
RECAPITULATION

• Three important elements of proper stunning
• Electrical parameters
• Phases of stunning
• How to differ good stunning from bad stunning
• Signs of recovery
REDUCTION IN ELECTRIC RESISTANCE

• Improving contact between electrodes and the skin of the animal
• Daily maintenance and cleaning of tongs
• By wetting an animal skin
POORLY DESIGNED STUNNING EQUIPMENT
EQUIPMENT
BLEEDING
BLEEDING AFTER STUNNING (SHEEP)

• Electrical stunning is reversible and each sheep starts regain consciousness within 30 seconds
• Bleeding has to prevent regain consciousness and kill animal by cutting supply of oxygen to brain
• Sheep has to be dead before end of period of unconsciousness – 30 seconds
BLEEDING AFTER STUNNING (PIGS)

• Electrical stunning is reversible and each PIG starts regains consciousness within 40 seconds
• Bleeding has to prevent regain consciousness and kill animal by cutting supply of oxygen to brain
• Pig has to be dead before end of period of unconsciousness – 40 seconds
BLEEDING OF PIGS

- When both carotids are severed (deep cut) it takes: 
  22 - 25 sec in pigs

- When only one carotid and one jugular vein are severed it takes 
  70 - 105 sec (pigs and sheep)

- When only the jugular veins are severed it takes 
  298 sec (pigs and sheep)

- When pigs are bled by severing the main blood vessels where they emerge from the heart (chest bleeding) there is a loss of visual evoked responses (VER’s) – sign of functional grain on average in 18 seconds with a range of between 14-23 seconds
HOW LONG DYING/BLEEDING TAKES

- When both carotids are severed (deep cut) it takes **15 seconds** to loss of brain responsiveness.
- When only one carotid and one jugular vein are severed it takes **70 seconds**.
- When only the jugular veins are severed it takes **298 seconds**.
- When sheep were bled by severing the main blood vessels where they emerge from the heart (chest bleeding) there is a loss of visual evoked responses (VER’s) – sign of functional grain on average in **4 seconds**.
BLEEDING AFTER STUNNING (SHEEP)

Phases following head-only electrical stunning

- Tonic Phase
- Clonic Phase
- Bleeding
- Recovery Phase

STUN 10 15 20 30 40 50 60 70
Time in seconds
CROSS SECTION OF A SHEEP NECK

Diagram labels:
- Muscle
- Spine
- Oesophagus
- Carotid artery
- Trachea
- Jugular vein
BLEEDING AFTER STUNNING

stick immediately
VIDEO – GOOD BLEEDING
GOOD BLOOD FLOW
POOR BLEEDING
VIDEO – RECOVERY
BLEEDING PRACTICE – AN OVERVIEW VIDEO
After incision of the blood vessels, no scalding carcass treatment or dressing procedures should be performed on the animals for at least 30 seconds, or in any case until all brain-stem reflexes have ceased.
THANK YOU FOR YOUR ATTENTION

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de la santé animale

World Organisation
for Animal Health

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