TRAINING MANUAL ON
VETERINARY FIRST AID FOR PIG

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ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE
TRAINING MANUAL ON
VETERINARY FIRST AID FOR PIG

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Message

I am glad to know that International Livestock Research Institute (ILRI), an international institute of repute, headquartered at Nairobi, Kenya is going to publish three training manuals on pig sub-sector to train pig producers, veterinary first aid practitioner and pork traders respectively to improve the efficiency and productivity of pig production and marketing systems. Pigs play an important role in supporting the livelihood of tribal communities along with satisfying much needed animal protein and various socio-religious obligations. I sincerely feel that there is need of some technical interventions to transform the subsistence production systems to market oriented production systems and ensure better economic return and better health of the pig keepers as well as pork consumers.

I hope ILRI's training manuals will help in building the capacity of the target groups in order to bring desired changes in pig production and marketing systems.

I take this opportunity to congratulate ILRI for this initiative and convey my heartiest best wishes for release of the manuals and right utilization of the same by all relevant departments, organizations, individuals in the country in general and North Eastern region in particular.

(U K Sangma)
Message

Though 80-90% of the tribal population in the North East India are occupied in pig rearing, however these are mainly confined to small and uneconomical units without any proper management inputs. Almost all the piggery development activities are based on the traditional method of rearing, which to a large extend does not increase productivity nor improve the quality of the products. ILRI's "Training Manual on Small Holder's Pig Management", would be of immense benefit to all pig breeders and producers of the region. The series of Manual that is being published by ILRI are the results of ILRI's in-depth study of the pig system in the North East and thus would be of more relevance to improving pig production through better management interventions.

(L.H. Thangi Mannen)
Foreword

Dr. Rameswar Deka, the author of the Training Manual titled “Veterinary First Aid for Pig” had approached me with a copy of the manuscript and requested to write the foreword for it. When I went through the manual from the point of view of writing the foreword, I was delighted to find that Dr. Deka had very methodically portrayed the pig treatment steps right from securing the animal to injecting the drugs. The manual is definitely expected to serve as a handbook for the pig farmers and the budding veterinary practitioners and Dr. Deka deserves appreciation not only for penning down the treatment steps but also for foreseeing the need for such a manual.

Pig husbandry in entire North Eastern Region of the country is as important as cattle/buffalo or poultry husbandry in other parts of the country since a large percentage of small, marginal and landless farmers are dependent on it. Many a times, pigs serve as the insurance coverage for the poor in times of distress either due to crop failure or even disease etc. in a family. Since pig disease, minor or major, have a direct bearing on its growth and production, it becomes important to guard them against such disease and take up timely treatment measures and I am sure that this manual shall aid and assist the pig growers in that direction. The manual, I feel is the need of the hour particularly due to increasing interest of farmers on pig husbandry on one hand and the type of topography of the region which is characterized by inaccessibility and marginality with resultant difficulty in health service delivery.

I happen to visit some poultry farms in Andhra Pradesh operated by private farmers. In one such farms, I had seen a farm worker conducting the post mortem of a bird that had died in the morning. Astonished, I asked the owner as to how the worker gained the experience to identify the diseased organ. He then informed me that over the years, they had mastered over the art of treatment of poultry as well as the intricacies of post mortem and that few publications from poultry experts together with training had helped to gain the experience. I hope the pig farmers of the region and the country would do likewise by accessing this manuals and other such publications coupled with exposure visits and training.

While complementing the author for this and other related works on pig husbandry, I wish the readers would take the intended benefit from this publication.

(K.M. Bujarbaruah)
Preface

Animal health services are critical for reducing mortality and morbidity and increasing productivity of livestock. Unfortunately, in many parts of India veterinary services suffer from inadequate staffing, poor physical resources, lack of operational funds and poor access to vaccines and drugs. The density of veterinary hospitals is also poor in a number of states, resulting in poor access to services in remote rural areas. This is especially so in the North Eastern region because of difficult terrain, poor road connectivity, low human and animal population density, poor economic conditions of the rural people and the prevalence of low value indigenous livestock. The entry of the private sector in livestock services is minimal in hilly rural areas because of the perceived low returns. Under these circumstances, many of the diseases of livestock in rural areas remain untreated and unattended.

The deployment of community-based animal health workers has proved successful in many parts of the world, including in India. This manual has been developed, based on ILRI’s experience and understanding of pig systems in North East and Central India and in consultation with wide range of stakeholders. The manual is meant to be used by qualified veterinarians who can serve as resource persons to train animal first aid practitioners to serve the community. Those who have been trained can also use the manual as resource book. The content of the manual has been made as simple as possible in order to ensure that it is easy to use. It is expected that the initiative will help in building the capacity of community representatives in veterinary first aid for treating at least some minor ailments of pigs, including administration of medicines, vaccination, guidance on clean and hygiene practices, minor surgical operations (eg. castration of piglets), disease surveillance etc.

The resource person should supplement the material in this manual with relevant practical examples using participatory approaches. Field visits and practical training are an integral part of the whole programme. Adequate attention should be given to build the confidence of the trainees through practical experience. Refresher training to the first aid practitioners will also usually be required to refresh and update their knowledge, especially during the initial stages. Therefore, training should not be seen as a one time event but part of a continual process to build the skills and effectiveness of the practitioners with support from experienced veterinarians.

For sustainability and accountability of services, it is suggested that an effective business model needs to be developed for the first aid practitioners with initial support from the project and the community. The practitioners may also involve in providing other business development services to the community such as input supplies and marketing services. This will assist in the creation of financially viable business models. The first aid practitioners must have access to a qualified veterinarian and have to work under his supervision/guidance. It is not advisable to create the cadre of first aid practitioners in those areas where pig producers are getting easy access to veterinary or extension services either from government or other agencies. While they may help in prevention and treatment of some minor diseases they would not normally be permitted to treat major disease problems.
It is expected that the implementation of training programmes based on this manual will result in a cadre of first aid practitioners who can provide preventive animal health care services in remote rural areas and that this will assist in a reduction in the incidence of diseases of pigs, with a resultant increase in production and productivity which in turn will improve profitability and livelihoods of smallholder pig producers.

We would like to continually improve this manual and we would therefore request to all the readers to give feedback on the content so that we can continue to make it current and relevant.

Dr. Purvi Mehta Bhatt
Head, Capacity Strengthening (CaSt)
ILRI- Nairobi, Kenya
Acknowledgement

We want to thank all those who helped us in preparing the “Training Manual on Veterinary First Aid for Pig”.

We express our immense gratitude and thanks to Dr. Dhireswar Kalita, Principal Scientist, All India Coordinated Research Project (AICRP) on Pig, College of Veterinary Science (C.V.Sc), Khanapara, Guwahati; Dr. P. Khala, Deputy Director, Department of Veterinary and Animal Husbandry, Nagaland; Dr. Arun Sarma, Member, Veterinary Council of India, Assam Chapter; Dr. Apurba Bora, VAS, Department of Animal Husbandry and Veterinary, Govt. of Assam; Dr. Bijoy Choudhury, VAS, Department of Animal Husbandry and Veterinary, Govt. of Assam; Dr. P.N. Konwar, Senior Veterinary Officer, Assam Livestock and Poultry Corporation Ltd (ALPCo); Ms. Ratna Bharali, Journalist and Dr. Basanta Deka, Professor Handique Girls College for reviewing and editing the manual.

We are also thankful to Dr. Babul Chandra Sarma, Professor and Head, Department of Animal Physiology; Dr. Kesab Chandra Nath, Professor, Department of Gynaecology and Obstetrics, Dr. Dilip Kumar Sarma, National Fellow (ICAR), Department of Microbiology, Dr. Dilip Kumar Deka, Professor, Department of Parasitology, Dr. Jyoti B. Dutta, Professor, Department of Epidemiology and Preventive Medicine, Dr. Bijoy Dutta, Associate Professor, Department of Surgery and Dr. Arunima Gohain, Research Associate, Department of Animal Nutrition; all from College of Veterinary Science, AAU, Khanapara, Guwahati for reviewing the relevant section of the manual and making some valuable suggestions.

We are grateful to the National Agricultural Innovation Project (NAIP) being implemented by ILRI and its partners in Mon district of Nagaland which gave us the opportunity to experience and understand the First Aid Practitioners’ needs, expectations, level of understanding, useful methods of training and the requirement for follow up support to the trainee through participatory approaches.

Last but not the least we extend our sincere thanks to many pig producers and veterinary First Aid practitioners of Assam and Nagaland who contributed immensely during the time of training need assessment and field testing of the training manual.

Ramwar Deka
Iain A. Wright
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# Proposed Training Schedule

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<td>9.30 - 10.00 am</td>
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<td>Session 2</td>
<td>Methods of restraining pigs</td>
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<td>Lunch break</td>
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<td>Basic physiological and anatomical structure of pigs</td>
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<td>Method of assessment of diseased pig</td>
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<td>Session 5</td>
<td>Different types of organism causing diseases</td>
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<td>Session 6</td>
<td>Mode of transmission of germs and clean and hygienic practices to prevent them</td>
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<td>Participants’ reflection of Day 2</td>
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<td>Important bacterial diseases of pigs and their control measures</td>
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<td>11.45 am - 1.00 pm</td>
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<td>Lunch break</td>
<td>1.00 - 2.00 pm</td>
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<td>Session 9</td>
<td>Important parasitic diseases of pigs and their control measures</td>
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<td>3.00 - 3.15 pm</td>
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<td>Continuation of the session 11</td>
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<td>Lunch break</td>
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<td>Session 12</td>
<td>Familiarization with some commonly used medicines</td>
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<td>(include 15 minutes tea break)</td>
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<td>6th Day</td>
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<td>7th Day</td>
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<td></td>
<td>Feedback and valedictory session</td>
<td>3.30 - 4.30 pm</td>
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</tbody>
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Note: The proposed time schedule is only indicative, facilitator may modify the schedule as deemed fit locally.

Classroom training : 23.30 hours
Field work        : 13.00 hours
Total time        : 36.00 hours
Total days        : 7 days

Follow up programmes
- First refresher training : after six months
- Second refresher training : after one year
Training Tools and Materials

- Black board/white board
- Chalk pencils/white board marker
- Flip charts, chart papers
- Cards
- Marker
- Masking tape
- LCD projector with accessories (wherever possible)
- Sample of different essential medicines
- Utensils like scissors, forceps, needle, cotton, bandage cloth, thermometer etc.
- Rope

Common technical terms used in this manual

Boar : Adult male used for breeding
Sow : Adult female used for breeding
Piglet : Young one of a pig of either sex
Gilt : A young female kept for breeding
Sty : Pig shed
Farrowing : Act of parturition (delivery)
Castration : Act of disfunctioning the reproductive system of animal
Weaning : Separation of piglets from their mother at a certain age
DAY 1

Registration of the participants.

SESSION 1: Inauguration and Introduction

1.1 Resource Person
Key resource person of the training who will facilitate the course and bridge the linkages between different sessions.

1.2 Session Objective
At the end of the session, participants should be able to:

- Identify each other and their backgrounds,
- Understand the purpose and objectives of the training,
- Understand the level of knowledge of the participants on diseases of pig and their treatment,
- Set the ground rules for the training.

1.3 Training Methods

- Welcome address: Organizer/facilitator will welcome the participants and explain the objectives of the training.
- Self introduction: Facilitator will ask the participants to state their name, address, occupation, and years of experience on management and treatment of pig.
- Expectation from the training: Facilitator will ask the participants to explain their expectations from the training and will write down the key points in a flip chart/white board/black board in order to revisit the same at the end of the training.
- Pre training feedback: Facilitator will distribute the feedback forms (enclosed at Annexure) amongst the participants and ask them to put tick marks in the boxes under the “Before Training” column. After the evaluation, facilitator will collect the forms and use the same at the end of the training to put tick marks in the boxes under the “After Training” column in order to compare the differences.
- Ground rules: Facilitator will ask the participants what general behavior they expect to experience in order to run the training smoothly and effectively, he will list all suggestions in a flip chart and post the flipcharts where it is visible throughout the training.
SESSION 2: Methods of Restraining Pigs

2.1 Resource Person
An experienced veterinary doctor or a veterinary field assistant.

2.2 Session Objectives
At the end of the session the participants should know different restraining methods of pigs.

2.3 Training Methods
Classroom coaching with the help of photographs, illustrations and rope. Resource person will facilitate the discussion and provoke the participants to respond.

2.4 Contents
Pig need to be restrained (controlled) for check up of general health, administration of medicines, conducting minor surgical operation, giving identification mark etc. First Aid (FA) practitioner must know appropriate techniques of restraining pig for safety of himself as well as the animal. There are different methods of restraining of both pigs and piglets. The most common methods of restraining pigs/piglets are stated below.

2.4.1. Methods of restraining piglets
A piglet can be restrained by two ways:

2.4.1.1 Restraining piglets on its side (for injection/vaccination/treatment)
- At first, the piglet is placed into a room or pen where it is to be restrained.
- After cornering the piglet, the rear leg is held with one hand and the other hand is held to grasp the front leg on the same side of the pig as shown in the picture.
- Holding the front and rear legs, the pig is lifted completely off the floor and the pig is put gently but firmly on its back on the floor.
- The knee is used to put pressure on the side of the pig to retain the control.
2.4.1.2 **Restraining piglet by holding its rear legs (for transportation)**

- At first, the piglet is placed into a room or pen where it is to be restrained.
- After cornering the piglet, the piglet is caught by grasping its hind legs with one or both hands. The grip is quickly adjusted to hold the pig's back against the front of your legs and its nose to the ground.
- The piglet is lifted from the ground by bringing both of its rear legs to about the height of your waist.
2.4.2 Method of restraining older or heavier pigs

For restraining heavier pigs, following methods are commonly used.

2.4.2.1 By using a snare

- For catching a pig with a snare, the pig must be confined to a very small pen, or crowded into a corner with a partition.

- A loop is prepared with a twine rope by giving a slip knot as shown in the photograph. The strength of the material must be proportionate to the animal's size.

- With the handle of the snare in one hand, the loop of the snare is guided into the mouth and over the nose or upper jaw. The snare is made sure to remain above the tongue, pulled back into the mouth, and the loop is not around the lower jaw.

- The snare should be closed as tightly as possible. The push and pull motions must occur simultaneously.

- When the pig is large, it cannot be restrained with only a hand-held rope snare. The rope should be tied off on a post of the shed or iron rod. It is best to limit the length of the rope to only a foot or two in order to restrict the movement of the pig.

- After completion of the intended job, the rope is loosened from the pig by pulling the slip knot and the pig is quickly moved out of the pen.

Fig 4: Restraining a heavier pig with the help of a rope and snare
2.4.2.2 Laying the animal on its side (for surgery, foot trimming, or other management procedures)

- The animal is snared and firmly controlled.
- A loop is formed at the end of a long rope and is placed around the neck of the pig.
- The loop is placed on the top of the pig’s neck, then the rope is brought back and a temporary knot is placed around the body immediately behind the front legs.
- The rope is taken further back along the top line and a second temporary knot is placed just in front of the rear legs.
- The pig can now be laid upon its side by pulling on the end of the rope that extends to the rear beyond the second temporary knot.
- As the animal begins to go down due to the tightening of the knots, it can be guided with the rope and snare to lie on one side or the other.
- When the management task is completed, the temporary knot should be loosened.
- After removing the snare the pig is observed for a few seconds to see if it is recovering properly.

Fig 7: Efforts to restrain a pig by pulling the rope

Fig 8: A restrained pig

**Caution:** Adequate care should be taken for restraining pregnant pigs to avoid any injury to the foetus.
SESSION 3: Basic Physiological and Anatomical Structure of Pigs

3.1 Resource Person
A veterinarian

3.2 Session Objectives
By the end of the session, the participants should have brief idea about the different body systems and important internal organs of pig and their functions.

3.3 Training Methods

- Brief idea about the structure of the body of a pig with the help of drawing, photographs, bones, example of human body structure etc.
- Group work

3.4 Contents
Before explaining about the minor ailments of pig and their first aid, it is essential to have some basic understanding of the anatomical and physiological structure and function of different body systems of pig.

The animal body is constituted of millions of cells. Cell is the smallest building block of the whole body. Within the body, there are several systems and each system consists of number of organs. All the organs within a system work collectively to carry out special functions.

The animal body is made up of the following body systems

- Skeletal system
- Muscular system
- Digestive system
- Circulatory system
- Respiratory system
- Urinary system
- Nervous system
- Reproductive system
### Table 1: Different body systems and their key functions

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<th>Organs of the system</th>
<th>Functions</th>
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<td>Skeletal system</td>
<td>Whole bony structure of the body of a pig</td>
<td>To provide the shape of the body and support the soft body structures and its movement</td>
</tr>
<tr>
<td>Muscular system</td>
<td>Constitutes of several layers of muscle of different types</td>
<td>To support the body to move, cover the bones, internal organs and vessels</td>
</tr>
<tr>
<td>Digestive system</td>
<td>Teeth, mouth, esophagus, stomach, intestine (small and large), rectum. The salivary glands, liver and pancreas serve as accessory organs of the digestive tract.</td>
<td>To digest and absorb foods</td>
</tr>
<tr>
<td>Circulatory system</td>
<td>Heart and blood vessels (artery and vein)</td>
<td>To carry nutrients around the body</td>
</tr>
<tr>
<td>Respiratory system</td>
<td>Nostril, nasal cavities, pharynx, trachea and lungs</td>
<td>For breathing purpose</td>
</tr>
<tr>
<td>Urinary system</td>
<td>Kidneys, urinary bladder, urethra</td>
<td>For excretion of urine</td>
</tr>
<tr>
<td>Nervous system</td>
<td>Brain, spinal cord and nerves</td>
<td>To transmit messages around the body, control body actions and reflections</td>
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<tr>
<td>Reproductive system</td>
<td>Male: Testes, accessory sex glands, penis</td>
<td>To reproduce</td>
</tr>
<tr>
<td></td>
<td>Female: ovaries, fallopian tube, uterus, vagina, vulva, udder</td>
<td></td>
</tr>
</tbody>
</table>

### 3.4.1 Skeletal system

- Skeleton is the hard framework of the body which supports the other body structures (muscle, fats, etc.).

- This is composed of bones, cartilage and ligaments (give example of human body).

### Functions

- Provides the shape of the body.
- Gives flexibility to the body.
- Helps in movement of the body.
3.4.2 Muscular System

What is muscle?

Muscle is the structure formed by the bundles of muscle cells in the form of fibres and possesses the property of contraction or stimulation for effective body movement. Muscular system is mainly composed of muscles, which performs different functions in the body like,

Movement of the skeleton,
- Generation of body heat,
- Circulation of blood etc.
3.4.3 Circulatory system

- This system consists of a network of blood vessels (arteries, veins and capillaries) for circulating the blood.
- Heart receives deoxygenated blood from various parts of the body and pump out the oxygenated blood to different parts of the body.
- The function of blood is to transport nutrients, oxygen, carbon dioxide, waste products, hormones, immune bodies, etc.

What are artery and vein?

**Artery:** Blood vessels which carry blood away from the heart are known as artery. Artery carries oxygenated blood. Exception is pulmonary artery, which carries deoxygenated blood.
Vein: Blood vessels which carry blood from different body parts to the heart are known as veins. Veins carry deoxygenated blood. Exception is pulmonary vein, which carries oxygenated blood.

3.4.4 Nervous System
It acts as the control system of the body. The main constituents of nervous system are the nerve and the brain.
Nerve: A bundle of fibers that passes signals to transmit sensory stimuli of pain, heat, cold, etc. between the brain and other parts of the body. Nerves form a network of pathways for transmitting information throughout the body. It enables the animal to adjust itself or its parts to change in the external or internal stimulus/environment.
Brain: The brain is the master control center of the body. It receives information/sense through the nerves from inside or outside the body. After receiving information, the brain analyzes the information and then sends messages to the body to control its functions and actions.

3.4.5 Respiratory system
- Respiration is the process by which animals obtain and use oxygen and eliminates carbon dioxide.
- The respiratory system consists of the lungs and the air passages leading to them, including the nostrils, nasal cavities, pharynx and trachea.
- Air with oxygen enters into the lung through nostril, nasal cavity and respiratory tract.
- Lung absorbs the oxygen from air and passes out CO₂.

![Lung](https://via.placeholder.com/150)

Fig 15: The lungs of a pig

3.4.6 Digestive system
The pig is an omnivorous animal and it consumes both plant and animal sources of food.
- The digestive tract is a hollow tube-like structure that extends from mouth to anus.
- After ingestion, food passes through the oesophagus and is deposited in the stomach.
- Main function of stomach is to store the ingested food and initiation of digestion of food stuffs with the help of gastric juices produced in it.
- In small intestine, it is transformed into simpler molecular forms to be absorbed. It is absorbed in large intestine also. The undigested food stuff is excreted through anus.
3.4.7 Excretory system

The main excretory organs are: liver, intestine, lungs, kidneys and skin.

It is a biological system that removes excess, unnecessary or harmful materials from the body through faeces, urine, sweat and breathing and maintains the internal stability of the cell.

Liver of pig helps in detoxification, protein synthesis and digestion of fat in the small intestine.

The two kidneys are a pair of organs in body that filter out toxic and other waste materials from the bloodstream and passes out the unnecessary fluid from the body in the form of urine.
Urinary bladder is a hollow muscular organ that stores urine before it is released from the body.

3.4.8 Reproductive system

Male (Boar)

Reproductive functions of the male involve formation of sperm and deposition of the sperm into the female reproductive tract. Testicles are the main part of male genital organ. It produces sperm which is ejaculated through penis.

It also secretes male sex hormone testosterone.

After mating, sperm goes from male genital organ and enters into the reproductive tract of female, where it fertilizes the ova.
Female (Sow)

The reproductive functions of the female include production of ova (egg) and provision of an environment for growth and nutrition of the foetus that develops after fertilization of a mature ovum by a spermatozoon.

Terminal condition of the latter function is to give birth at an appropriate time and to continue the nutritional function through lactation.

Parts of female reproductive organs are ovaries, uterine tube, uterus, vagina and vulva. Ovary is the main component of female reproduction system. It produces and also releases ova for fertilization.

![Reproductive system of sow](image)

**Fig 20:** Reproductive system of sow (courtesy: Poperko Peter)

### 3.5 Group Work

Participants will be divided into small groups and assigned to match different body systems or organs with the functions.
DAY 2

SESSION 4: Method of Assessment of Diseased Pig

4.1 Resource Person
An experienced veterinarian

4.2 Session Objectives
At the end of the session, participants should have a fair idea about how to assess a diseased pig.

4.3 Training Methods
Class room coaching with examples from the field.

4.4 Content
4.4.1 Steps involved in assessment of a diseased pig

- **Assess / examine the raising place/ housing system of the animal**
  - Examine the pig house and its surrounding whether it is clean or dirty.
  - Enquire about the source and nature of feed and water.
  - Enquire about the occurrence of similar kind of disease in other pigs in the area and fate of those pigs.

- **Note down the history of the animal**
  - Duration of the disease condition;
  - Symptoms of the disease condition- like not willing to take food, unable to walk properly, diarrhoea, discharge from nostril/ anus/ vulva, etc.;
  - Previous treatment, if any, against the particular disease condition;
  - Past history of any disease;
  - Most uncommon thing that the caretaker has noticed in the animal’s behaviour.

- **Record the respiration and temperature (RT)**
  - Note down the respiration and temperature of the diseased animal;
  - Compare the reading with normal range;

- **Examine the animal and suggest first aid, if required**
  - Examine the animal properly and take first aid care so that health condition of the animal does not deteriorate further.
  - Advise the farmer to maintain clean and hygienic condition in the farm and to isolate the diseased animal from the healthy one.
  - Inform the local veterinarian for further possible treatment and follow his instruction.
Table 2: Symptoms of healthy and diseased pig

<table>
<thead>
<tr>
<th>Character</th>
<th>Healthy pig</th>
<th>Diseased pig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin and hair</td>
<td>Shining hairs and healthy skin</td>
<td>Dull skin</td>
</tr>
<tr>
<td>Tail</td>
<td>Neatly curled</td>
<td>Tail hang straight</td>
</tr>
<tr>
<td>Eyes</td>
<td>Bright with no discharge</td>
<td>Dull with discharge</td>
</tr>
<tr>
<td>Movement</td>
<td>Easy, during resting pig looks relaxed, breathing evenly and quietly</td>
<td>During resting pig is not relaxed and breathing fast</td>
</tr>
<tr>
<td>Appetite</td>
<td>Normal</td>
<td>Loses appetite</td>
</tr>
<tr>
<td>Stool</td>
<td>Normal</td>
<td>Diarrhoea/constipation</td>
</tr>
<tr>
<td>Body</td>
<td>Round and fleshy</td>
<td>Pot bellied</td>
</tr>
<tr>
<td>Discharge</td>
<td>No discharge from any part of the body like nose, mouth, vulva, anus.</td>
<td>Abnormal discharge from any opening</td>
</tr>
<tr>
<td>Temperature &amp; pulse</td>
<td>Within range</td>
<td>Above the range</td>
</tr>
</tbody>
</table>

Source: Why and How of Pig Farming in North-Eastern Region of India, Technical Bulletin No.18, ICAR-NEH

4.4.2 Method of measuring body temperature and respiration

Table 3: Normal respiration rate and temperature of pigs

<table>
<thead>
<tr>
<th>Character</th>
<th>Normal range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiration</td>
<td></td>
</tr>
<tr>
<td>Young</td>
<td>50/ minute</td>
</tr>
<tr>
<td>Old</td>
<td>13-15/minute</td>
</tr>
<tr>
<td>Temperature</td>
<td>39°C (102°F)</td>
</tr>
</tbody>
</table>

Source: Why and How of Pig Farming in North-Eastern Region of India, Technical Bulletin No.18, ICAR-NEH

4.4.2.1 Measurement of temperature

Requirements:
- Mercury thermometer,
- Vaseline (for lubrication),
- Cotton,

Procedure
- The animal is restrained properly.
• Shaken the thermometer to bring down the mercury level below calibrated level.
• The thermometer is made slippery on mercury side using vaseline. This is done for easy insertion of the thermometer in the anus of the animal.
• 2/3" of the thermometer is inserted into the anus gently in a slightly inclined position so that it touches the rectal wall.
• The thermometer is kept in the anus for about 2 minutes.
• The thermometer is removed from anus and it is cleaned with cotton or clean cloth.
• Read the thermometer by holding it about 1foot away at eye level and the temperature is recorded.

![Fig 21: Steps involved in measurement of temperature](image)

![Fig 22: Photograph of a thermometer](image)

4.4.2.2 Measurement of respiration
Number of times an animal breathes per minute is termed as respiration. It may vary depending on the condition of the animal.
Conditions in which respiration rate increases normally are:

- Exercise and work in the field,
- Standing for long time in a hot sunny day,
- In excitement or in stress,
- During advance pregnancy.

Disease conditions where respiration rate increases are:

- Fever, lung infection (pneumonia), heart disease and respiratory tract blockage.

![Measurement of respiration of the pig](image)

**Fig 23: Measurement of respiration of the pig**

**Procedure of measuring respiration**

- The animal is allowed to stand or sit in normal condition.
- The palm of your hand should be held in front of the nostrils. The exhaled air can be felt when it strikes the palm. The number of times air comes out of the nostrils per minute is counted.

**4.4.2.3 Checking of dehydration level**

A fold of skin near the neck area is pulled. When released, it should go back to its original position. If it remains standing for more than three seconds, it is a sure sign that the animal does not have enough liquid in its body.
SESSION 5: Different Types of Organisms Causing Diseases

5.1 Resource Person
An experienced veterinarian.

5.2 Session Objective
By the end of the session, the participants should have brief idea about the different types of organisms causing diseases (e.g. bacteria, virus, parasites, protozoa, fungi, etc.).

5.3 Training Methods
Participatory discussion on different types of organisms causing diseases with the help of examples, illustrations and photographs.

5.4 Content
A brief idea about different types of causative agents (germs) of diseases of pigs is to be given.

The following are the different types of causative agents.

5.4.1 Bacteria
- Bacteria, the common cause of many diseases, is a living organism which can not be seen through our naked eyes. It is visible only with the help of a microscope. A tip of a needle may contain several lakhs of bacteria.
- Bacteria is found most abundantly almost in all living bodies and their surroundings like soil, air, and water if it contains dirt.
- Single-cell microorganisms that can reproduce quickly may cause disease. However, all types of bacteria are not harmful to the living being.
- Bacteria have a wide range of shapes, ranging from round balls to rods and spirals.
- There are medicines, called antibiotics, to treat bacterial diseases (or to kill bacteria).
5.4.2 Virus

- A virus (meaning toxin or poison) is a semi-living infectious agent unable to grow or reproduce outside a host cell. Virus is found almost all living beings.
- Virus is much smaller in size than bacteria. Most viruses are not even visible with a light microscope.
- Virus does not have any specific shape. It varies from very simple helical structure (e.g. coil) to complex structure.
- Viruses infect all types of living body from animals to plants to bacteria.
- Antibiotics have no effect on virus. Vaccine is the only way to prevent viral diseases. For this reason, diseases caused by virus are very difficult to be treated.
5.4.3 Parasites

- It is an organism which lives on or consumes food from the host animal.
- They are two types of parasites: Ectoparasites (which live on outside the body, e.g., lice, ticks, etc.) and Endoparasites (which live on inside the host body, e.g., tapeworm, hookworm, ascaris, etc.).
- Parasites consume the host's nutrition. This leads to deficiency in host's nutrition.
- It reduces reproductive capacity and leads to weakness, reduced health and loss of blood. It may cause skin diseases. Medicines are available to prevent diseases caused by parasites (external and internal).

Fig 26: Round worms (Courtesy: www.altered.states.net/roundworms)

Fig 27: External parasites (sarcoptic mange mite)
5.4.4 Fungi

- Fungi (moulds and yeasts) are found in damp conditions such as in badly stored maize.
- In the process of multiplication some species produce poisons (mycotoxin) which when eaten are capable of causing a variety of clinical signs.
- The following suggestions should keep in mind to prevent fungal infection:
  - Moist corn or cereals should not be stored for long.
  - Grain should not be allowed to ferment.
  - Feed should not be allowed to waste and ferment in feed troughs.
  - Feed should be physically checked before feeding.
  - Feed stuff should be dried if stored during the rainy season.

To treat diseases caused by fungus or its toxin there is a group of medicines called antifungal drugs.
SESSION 6: Mode of Transmission of Germs and Clean and Hygiene Practices to Prevent them

6.1 Resource Person
A veterinary medicine specialist.

6.2 Session Objectives
At the end of the session the participants should have fair idea about
- Mode of transmission of germs and causative agents,
- Different clean and hygienic practices for reducing the incidence of diseases.

6.3 Training Methods
- Participatory discussion of the topic with locally relevant examples
- Group work

6.4 Contents
6.4.1 How infectious agents are spread?
To control infectious diseases, it is helpful to understand how organisms are disseminated and gain access to the pig. Each organism has individual properties which determine how long it will survive outside the pig, how infective it is, and how easily it is transmitted. The methods by which disease spreads include the following:
- Direct contact with the infected pigs, including newly purchased pigs;
- Contamination through sneezing, coughing, animal excreta etc.;
- Mechanical dissemination by vehicles, particularly pig transporters;
- Mechanically by farm equipments, boots and clothing;
- Infection transmitted by people (e.g. influenza);
- Movement of birds, rats, mice, flies, dogs, cats and wildlife (e.g. wild boars);
- Environmental contamination in the pig farm (e.g. moving pigs into a contaminated pen, movement of contaminated feces along defecating passages);
- Contaminated food and water;
6.4.2 Sanitation

It is the process of adopting hygienic measures to reduce the incidence of diseases (microbial load) and create conditions that ensure better health.

Popular proverb says “Prevention is better than cure.”

"Pigs are often thought to be dirty, but actually keep themselves cleaner than most pets. They are seen lying in mud because they do not have sweat glands and constantly need water or mud to cool off."

- The (U.S.) National Pork Producer's Council

Disinfectant

- Compounds used to kill germs are called disinfectant.
- Since causative agents of many diseases are extremely small and many remain indefinitely in dust, cracks and crevices of buildings, disinfection must be carried out carefully to kill the germs from contaminated premises.

Importance of sanitation

Proper sanitation

- Helps in prevention and control of most of the communicable diseases;
- Provides the most unfavorable conditions for the germs;
- Prevents economic losses due to infection;
• Lowers rate of mortality and increases the longevity of animals;
• Helps in minimizing contaminations and production of good quality meat and meat products.

6.4.3 Regular sanitation programme
Infections in farms and various disease conditions can be prevented if the following essential features of adequate sanitation are adopted:
• Proper ventilation of the shed;
• Cleaning of all dirt in floor, walls, roof/ceiling at a regular intervals;
• Proper disposal of manure, feed wastes and other excreta daily to prevent breeding place of flies;
• Construction of proper drainage and manure pit and cleaning of the same at regular intervals to facilitate uninterrupted drainage of liquid excreta;
• Cleaning farm utensils with disinfectant like potassium permanganate, bleaching powder, etc.;
• Facilitating proper cleaning and keeping floor dry using lime etc.;
• Burning of all sweepings and scrapings;
• Applying heavy coating of white wash to the floors, walls and partitions, mangers, etc. using 0.5 kg of lime in one gallon of water with disinfectant;
• Judicious spraying of disinfectants surrounding the pig sty at a regular interval along with cleaning of garbage;
• Disposal of dead animal properly by burying away from the human habitation;
• Closely observing newly introduced animals in the farm and keeping them separately (quarantine) for a few days.

Fig 29: Regular cleaning and disinfection work in a farm
6.4.4 Special sanitation programme (when pigs suffer from diseases)

- Diseased animals are to be isolated from healthy ones to prevent spread of infection.
- Curative treatment is to be given to the suspected animals which are to be kept in isolation until they are free of infection.
- The contaminated premises and utensils are thoroughly cleaned using disinfectant. Pig sty and surrounding may be disinfected with lime, phenol, formalin etc.
- Fresh lime can be sprinkled on the floor, walls and ground for disinfecting them.
- Lime or washing soda is commonly used for disinfection of buildings and farm utensils.
- Whitewash acts as more effective disinfectant when phenol up to 5% is mixed. Phenol can also be used for disinfecting metallic objects, clothing etc.
- Iodine, iodophore, potassium permanganate, hydrogen peroxide, etc. may be used for disinfecting skin infection.
- Potassium permanganate is used extensively for wound dressing and foot bath.
- All utensils, mangers, troughs, etc. should be scalded with boiling water to which washing soda may be added.
- All waste products including thrown off from the sick animals are infective and therefore must not be allowed to accumulate, but should be immediately destroyed, buried or rendered harmless.
- To prevent spread of diseases through discharge of nose, mouth, skin, eyes, uterus, dung and urine, all persons other than the attendant(s) of diseased animals should be kept away from infected pens, utensils, clothing etc.
- Dry sweeping or dusting may be dangerous, as the organism may hang about in the air and settle again on different places. All surfaces should be moistened before sweeping and scrapping.
- Infected manure, bedding materials should be taken out carefully and burnt off.
- After completing the disinfection in every detail, the attendant should disinfect his or her hands, arms, booths and other articles of wear.
- Animals in good health should be washed or bathed once or twice in a week.
### Table 4: Common disinfectants, their concentrations and method of use

<table>
<thead>
<tr>
<th>Name of the Disinfectants</th>
<th>Concentration</th>
<th>Method of use</th>
<th>Surface for use</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washing soda (sodium bicarbonate)</td>
<td>3% solution in boiling water</td>
<td>Splashing floor, rinsing utensils</td>
<td>Utensils and floors</td>
<td>Little disinfection power but effective cleansing agent</td>
</tr>
<tr>
<td>Lime</td>
<td>½ kg lime per gallon of water as white wash + 5% phenol.</td>
<td>Sprinkling, dusting of powder of lime alone.</td>
<td>Floors, walls and grounds</td>
<td>Use freshly prepared solution</td>
</tr>
<tr>
<td>Potassium permanganate</td>
<td>1:10,000 solution in water.</td>
<td>Splashing (wet the surface with the solution)</td>
<td>Floors, gutters, and troughs</td>
<td>Disinfection action is due to oxidizing power</td>
</tr>
<tr>
<td>Phenol</td>
<td>2-5% solution in water</td>
<td>Splashing</td>
<td>Metallic objects and clothing</td>
<td>Goods disinfectant</td>
</tr>
<tr>
<td>Bleaching powder (calcium hypochlorite)</td>
<td>30% available chlorine</td>
<td>Dusting</td>
<td>Floors, gutters, passages</td>
<td>To be protected from sunlight</td>
</tr>
<tr>
<td>Boric acid</td>
<td>5-6% solution</td>
<td>Splashing</td>
<td>Skin, floors, walls, equipments, wounds, etc.</td>
<td></td>
</tr>
</tbody>
</table>


### 6.4.5 Disease surveillance

It means close observation of diseases or collection, analysis and interpretation of data related to various aspects of diseases.

- Surveillance may be carried in a small or large area.
- It provides the opportunity to detect diseases at the earliest possible stage so as to effectively limit their harmful impacts.
- It safeguards against possible losses of productivity and control diseases.
- Surveillance of zoonotic disease helps in preventing threats to human health.
- Surveillance is accompanied by an efficient disease reporting system.

The objectives of surveillance programme include:

- Early detection of disease or sign of disease,
- Long-term recording of disease patterns,
- Timely dissemination of disease related information to the community,

A surveillance programme involves several closely linked operations. Generally the operations involved in animal disease surveillance include:

- Data collection,
- Data analysis,
- Data interpretation,
- Formulation of recommendations,
- Dissemination of conclusions.

For First Aid practitioners it may not be possible to do all the above mentioned tasks, but they can closely observe the diseases, their symptoms, mode of transmission, seasonality, favourable climatic condition, etc. and can warn the community in advance about the possibility of outbreak of the similar diseases, if such condition prevails.

6.5 Group Work

Participants will be divided into small groups and they will be assigned to design a hygiene and sanitation drive in their own community with the use of required antiseptic/disinfectant (based on availability, price, etc. in the local context) to prevent transmission of diseases.
DAY 3

SESSION 7: Important Bacterial Diseases of Pigs and their Control Measures

7.1 Resource Person
An experienced veterinary practitioner

7.2 Session Objectives
By the end of the session the participants should be able to explain the prevailing bacterial diseases of pigs.

7.3 Training Methods
Participatory discussion on different bacterial diseases of pig, causative agents, mode of transmission, symptoms, possible treatment and preventive measures.

7.4 Contents
Important bacterial diseases of pigs are:

- Swine Dysentery and
- Hemorrhagic Septicemia.

7.4.1 Swine Dysentery
It is a severe diarrheal disease that primarily affects pigs during the growing-finishing period.

Mode of transmission
- Contaminated food and water,
- Affected animals passes the causal organism in urine and feces, pigs get infected from contaminated food and water,
- Organisms remain alive and multiply in moist soil.

Symptom
- Diarrhea and dysentery,
- Yellow to gray soft faces,
- High Fever 104-105°F,
- Presence of mucus and flecks of blood in the faeces a few days after the infection,
- Partial inappetance,
- An arched back and occasional kicking at the abdomen suggests abdominal pain,
- Prolonged diarrhea leads to dehydration with increased thirst and affected animals become weak, unco-ordinated and emaciated.

![Fig 30: Kicking at the abdomen](image)

**Treatment**
- A veterinarian should be immediately consulted.
- Plenty of water, adding electrolyte, should be provided.
- An anti-diarrheal drug should be given.
- A course of antibiotic (e.g. streptomycin, Norfloxacin, etc.) or sulphur drugs (Sulphanimides) should be given in consultation with a veterinarian.
- In case of emergency, medicine used by man for diarrhea may be used for treating small pigs.

**Preventive measures to be taken**
- Separation of the diseased animal (segregation) from healthy ones,
- Proper sanitation, proper feeding and good care of the sick animals,
- Faeces of infected animals should be disposed properly to reduce the chance of infections,
- Houses and equipment should be thoroughly cleaned and disinfected.

**7.4.2 Hemorrhagic Septicemia**

**Mode of transmission**
- Contaminated food and water,
- Inhalation or ingestion of germs,
- Stressed factors, e.g. transportation,
- Blood sucking parasites.

**Symptom**
- High Fever (42°C or 104-107°F),
- Swelling of throat and neck,
- Difficult respiration with mucous discharge from nose,
- Swollen eyes and enlarged tongue,
- Difficult swallowing,
- Salivation,
- Death within 8-24 hours.

**Treatment**
- Use of Sulphadimidine and antibiotics like Oxytetracycline, Penicillin etc. as advised by a veterinary practitioner.

**Preventive measure to be taken**
- Proper vaccination of the animals should be done at every six months (in the area where it is prevalent),
- The diseased animal should be separated from the healthy ones,
- Proper sanitation, feeding and good care of the sick animals is essential,
- The outbreak should be reported to local veterinary authority as early as possible.
SESSION 8: Important Viral Diseases of Pigs and their Preventive Measures

8.1 Resource Person
An experienced veterinary practitioner.

8.2 Session Objective
At the end of the session the participants will have a fair idea about the important viral diseases of pig, their symptoms, mode of transmission, possible treatment and preventive measures.

8.3 Training Methods
- Participatory discussion using black/white board, flip chart, etc.
- Group work

8.4 Contents
Following viral diseases of pig are prevalent in North-East and Central India:
- Swine Fever,
- Foot and Mouth Disease (FMD),
- Swine Pox.

8.4.1 Swine Fever
It is an acute highly contagious viral disease affecting pig of all ages, characterized by sudden onset, rapid transmission, higher mortality and generalized bleeding. This disease is the biggest threat to pig industry.

Mode of transmission
- Direct contact with the infected pigs,
- Contaminated feed and water,
- Urine, nasal and ocular discharges from infected pig,
- Recovered pig may act as carrier,
- Feeding raw and uncooked meat from the affected pig,
- Clothes, vehicles and workers.
Clinical sign
- High rise in temperature (105-107°F),
- Dullness, depression and loss of appetite,
- Vomiting and/or severe diarrhea (off flavor),
- Sever conjunctivitis and nasal discharge,
- Colour of ear, abdomen and inner side of the legs gradually become purple,
- Nervous sign like convulsion, tremor, etc. followed by terminal coma,
- Abortion may occur in pregnant sow.

Treatment
- An experienced veterinarian has to be consulted.
- There is no treatment but a course of antibiotic (e.g. Enrofloxacin) may prevent the pig from secondary bacterial infection.
- Antipyretic drug (e.g. Paracetamol) may be injected to bring down the temperature if and when required.

Prevention
- The pig must be vaccinated against Swine Fever disease. The method depends on the instruction of the manufacturer.
- The diseased pig has to be separated from the healthy ones.
- Separate arrangement for feeding and watering of the diseased pig should be made. Personal hygiene of the person who is involved in the management of the farm is very important to avoid any spread of infection.
- All the utensils should be cleaned thoroughly with antiseptic solution;
- The pig sty and surrounding have to be cleaned thoroughly. Antiseptic solution should be sprinkled.
- Other pig producers should be informed about the occurrence of the disease. They may be advised to adopt hygienic measures.

8.4.2 Swine Pox
The disease is caused by the swine pox virus. Pigs of all age groups may be affected. However, the disease is more common in the first 4 months of age.

Mode of transmission
- The virus is transferred from pig to pig by direct contact,
An infected pig may transmit the infection to a healthy pig by rubbing of skin.

Pig lice may carry the virus for weeks and months.

Clinical sign

- High rise of temperature (105- 107° F) is accompanied by nasal and ocular discharges.
- Initially, skin lesions of pox (follicular growth) of about 1 cm diameter appears. Ultimately, red-brown scabs develop on skin within 8-11 days.
- In severe cases, the lesions may be located inside the mouth.
- Pig becomes dull and depressed.
- Conjunctivitis and keratities may develop in piglet.

Treatment

- A veterinarian should be consulted and assisted.
- Antiseptic (e.g. Povidone iodine ointment) or antibiotic ointment or lotion may be applied to control secondary bacterial infection and help in wound healing.
- A course of antibiotic (e.g. Enrofloxacin) may prevent the secondary infection.

Prevention

- Infected animal should be separated from other healthy animals.
- Infected animal should be kept in clean and hygienic condition.
- Pig sty, utensils and surrounding of the sty should be thoroughly cleaned to prevent from fly, lice, tick, mites etc.
- To keep the pig free from lice, Ivermecein injection may be given @ 1-2 ml subcutaneously under the supervision of an experienced veterinarian.

8.4.3 Foot and Mouth Disease (FMD)

FMD is an acute and highly contagious disease of pig and other livestock. Morbidity (occurrence of disease) is very high but mortality (death) is very less. The disease is caused by a virus.

Mode of transmission

The disease is spread at an extremely rapid rate through

- Direct contact with the infected animal,
- Urine, faeces, saliva of infected animal,
- Contaminated feed, water, grass, raw or temporarily cooked garbage containing infected meat or animal products,
- Semen of infected animal,
- Free living birds may carry the infection.

Clinical sign
- Vesicular eruption in the buccal cavity (oral mucosa), tongue, feet, hoof, teat and udder,
- Profuse sticky, foamy and stringy salivation,
- Lameness (unwillingness to move),
- High rise of temperature (104° - 106°F),
- Possible abortion of pregnant animal,
- High mortality rate in case of piglets showing the sign of severe gastro enteritis,
- Difficulty in eating and lack of appetite due to painful tongue and mouth lesions.

Treatment
- Only symptomatic treatment can be provided.
- Antiseptic (e.g. Povidone iodine lotion/ ointment) or antibiotic ointment/ lotion may be applied to control secondary bacterial infection and facilitate wound healing.
- A course of antibiotic may prevent secondary infection.
- Washing foot and mouth lesions with potassium permanganate solution (1%) is useful.
- Normally, the disease subsides after 1-2 weeks.

Prevention
- Proper vaccination,
- Good sanitation, strict hygiene, clean and dry sheds,
- Isolation of the affected animals,
- Slaughter of affected animals,
- Proper feeding (specially soft and liquid food should be given) and good care,
- Thorough cleaning of the houses and equipments,
- Reporting the outbreak to local veterinary authority.
8.4.5 Vaccination schedule

There is no specific treatment against viral diseases and, therefore, vaccination is the only measure to prevent them. It is essential to strictly follow the vaccination schedule recommended by the manufacturer of the vaccine. However, the veterinary experts suggest the following vaccination schedule.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Vaccine</th>
<th>Age of vaccination</th>
<th>Dose</th>
<th>Immunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swine Fever</td>
<td>Freeze dried tissue culture</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; dose at 2 months of age and a booster dose after 4 weeks followed by regular vaccination at 6 months</td>
<td>1ml S/c</td>
<td>6 month or 1 year</td>
</tr>
<tr>
<td>Foot and Mouth diseases</td>
<td>Polyvalent tissue, inactivated tissue culture</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; dose at 2 months of age and a booster dose after 4 weeks followed by regular vaccination at 6 months interval</td>
<td>2ml I/m</td>
<td>5 months</td>
</tr>
</tbody>
</table>

Note: Vaccine should be stored at 4°C temperature right from the point of production to injection of the vaccine. It should never be exposed to normal room temperature even during the time of transportation. Therefore, while the vaccine is transported from the point of procurement to the farm, it should be transported in a thermos flask with ice or in ice pack. During the time of vaccination, it should not be kept under room temperature for long time. If possible, an icebox should be used.

8.5 Group Work

- The names of the diseases should be written on one side of a paper and the main symptoms of the diseases are written on other side of the paper. The participants should be asked to match the diseases with symptoms.

- The participants should be asked to form small groups. A disease condition is given to each group to explore the preventive/curative measures that need to be adopted in their local context.
SESSION 9: Important Parasitic Diseases of Pigs and their Control Measures

9.1 Resource Person
An experienced veterinary practitioner.

9.2 Session Objective
At the end of the session the participants should have a fair idea about different parasitic diseases of pigs, their symptoms, mode of transmission and possible treatment.

9.3 Training Methods
Class room training on different important parasitic diseases of pig with examples of human diseases of parasitic origin.

9.4 Contents
There are two types of parasites: internal parasites (living inside the body of a pig) and external parasites (living outside the body coat).

9.4.1 Internal parasites
The internal parasites (worms) get nutrition from pigs and, therefore, parasites grow faster but the animal cannot grow. Gradually, it becomes dull, depressed and weak. It makes the farming system less profitable.

Contributing factors for parasitic infestations
- The pig should not be allowed to scavenge outdoor in unhealthy condition. They must not have access to faeces.
- Faeces accumulating for more than 3-4 days help eggs to proliferate.
- Moist wet areas as well as dirty floors encourage survival of eggs.
- No all-in, all-out management.
- Failure to carry out routine treatments contributes to unhealthy environment to develop.
- Parasites feel comfortable in continuously used pens.
- Carrier pigs are also home to the parasites.
Some commonly found internal parasitic diseases of pig are as follows:

### 9.4.1.1 Ascariasis (round worm)

*Ascaris suum* is a large round worm found in small intestine and lives on food taken by pig.

**Symptoms**
- Unthrifty appearance,
- Pot-bellied condition (enlargement of stomach),
- Roughness of body coat and stunted growth,
- Difficult breathing/pre-pneumonic condition,
- Eggs of the worm are passed in faeces,
- Hairy pigs,
- Blood in faeces.

**Transmission**
Through contaminated food and water

**Treatment**
De-worming drugs like *Piperazine* (@ 100-400 mg/kg), *Fenbendazole* (@ 5mg/kg body weight, orally) etc. are effective against round worm.

### 9.4.1.2 Swine Cysticercosis (Cysticercus cellulosae)

Pig is the intermediate host of *Taenia solium*. The adult worm is found in small intestine of man and its larvae are found in muscles, brain, etc, which may be transmitted to human beings by ingestion of inadequately cooked pork. Egg of the tapeworm, which human being cannot see by naked eye, is highly dangerous.

**Symptom**
- No apparent clinical symptoms are exhibited by pig except it being a generalised infection.
- The meat of the infected animals show white or little brownish pin heads (cotton seed-like follicle) in muscles commonly known as measly pork.
- Emaciation (abnormally thin and weak).

**Treatment**
De-worming drugs like *Praziquantel* is effective against adult tape worm.

**Prevention**
- Pork having measly pork/ cotton seed-like follicle in the muscle should not be purchased.
The pork should be thoroughly cooked for a long time to destroy the larvae which do not survive above 57°C.

Hygiene and sanitation should be improved.

9.4.1.3 Lung worm infestation
Lung worm with Metastrongylus infestation affect pigs in the lung.

Symptom
- Respiratory discomfort;
- Coughing with discharge from nose (nasal discharge);
- Loss of appetite;
- Poor feed conversion;
- Weight loss.

Transmission
- Through earthworm, snails etc.

Treatment
- De-worming drugs like Thiabendazole (e.g. Thiabendol)/Albendazole (e.g. Albomar)/Fenbendazole (e.g. Panacure) tablet is used for treating affected pigs.
- Liver tonic and/or vitamin should be given to pigs for few days before feeding de-worming drugs to pig.
Precautions

- De-worming drugs should not be fed when the pig is too weak.
- De-worming drugs should not be given if the pig is suffering from any disease.
- De-worming drugs should be administered only during cooler hours of day, especially in the evening.
- Experienced veterinarian should be consulted to treat pregnant animal with de-worming drugs.

Prevention

- Good sanitation, strict hygiene, clean and dry sheds are effective preventive measures.
- De-worming drugs should be given at a periodic interval (once or twice in a year)
- The sheds and the equipments should be kept thoroughly cleaned and disinfected.

9.4.2 External parasites

There are five groups of external parasites. They are ticks, mites, lice, mosquitoes and flies. They are present on the skin and may cause skin diseases which result in considerable skin irritation, loss of blood and poor growth. Some can transmit diseases. Flies can mechanically transmit bacteria and viruses from one pig to another. The biting flies transmit directly or and contaminated feed transmit indirectly. Flies can also transmit infections from one pig farm to another if they are less than 3 km apart. Mosquitoes can transmit the deadly Japanese B. encephalitis virus from pigs to people.

9.4.2.1 Mange/ Scabies

It is a chronic condition caused by a mite Sarcopes scabiei, Demodex suis

Symptom

- It causes itching and constant irritation leading to restlessness and body scratching, red papules, wrinkled skin, loss of hair, rough body coat, thickened skin, etc.
- Initially, the mange is seen in the ear as thick asbestos like scab, loosely attached to the skin and very rich in mites.
- In chronic case, they cover the head, neck and other parts of the body.
- Abrasions of skin and loss of hair occur.

Transmission

- Through direct contact.
Treatment

- Use of insecticide spray/dip/ointment,
- Use of Ivermectin injection (0.5ml 2ml subcutaneously) under direct supervision of veterinarian.

Fig. 32: Scabies

Prevention

- The pig sty should be thoroughly cleaned.
- The concrete wall, floor and surrounding should be burnt with the help of blow lamp.
- The pig has to be washed at least once in a week with potassium permanganate. Infected pig may be washed with Melathion @0.5% solution.
- New born or uninfected pigs should be separated from older mange infected pigs.
- Animals with chronic lesions should be identified and culled.
- Boars should also be treated as often as sows, as they are likely to remain affected.
- Cracks and crevices in the floor and wall should be repaired so that the larvae of mange cannot hide themselves there.

9.4.2.2 Lice infestation (Haematopinus suis)

Symptoms

- Itching,
- Irritation,
• Anaemia,
• Lice visible.

Transmission
• By direct contact.

Treatment
• Lice can be easily eliminated from the farm. It is important to treat the whole herd to break the cycle from the sow to the sucking pig.
• The entire breeding herd should be treated in one operation.
• Ivermectin, Diazinon, Lindane or Deltamethrin 1% should be used. Two doses given ten days apart totally eradicate lice. All medicines are ineffective against the eggs. It is necessary to treat twice.
SESSION 10: Important Metabolic and Reproductive Diseases of Pig

10.1 Resource Person
A veterinary medicine specialist.

10.2 Session Objectives
Understanding different metabolic and reproductive diseases of pig, their causes, symptoms and possible treatments.

10.3 Training Methods
- Classroom coaching on different metabolic and reproductive diseases of pig
- Group work

10.4 Content
10.4.1 Metabolic and reproductive diseases of pigs

Table 6: Different metabolic and other diseases of pig their causes, symptoms and possible treatment

<table>
<thead>
<tr>
<th>Name of the disease</th>
<th>Cause</th>
<th>Symptoms</th>
<th>Treatment</th>
<th>Preventive measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastritis</td>
<td>Stress, feeding of finely ground feed, maize, etc.</td>
<td>• Loss of appetite,</td>
<td>• Antacid (Sorbacid gel, Gelusil MPS, etc.)</td>
<td>• Plenty of drinking water needed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Occasional vomiting</td>
<td>• Anti-histamine (Aciloc, Histac, etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Weight loss</td>
<td>• Liver tonic (Livol etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Black colour faeces</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Diarrhoea • Many reasons.  
  • *E.coli*  
  • Over feeding the sow after farrowing  
  • Feeding of decomposed sour feeds

Diarrhea • Anti-diarrhoeal drug  
• Plenty of water mixed with electrolyte powder (1 sachet in 1 lit of water)

• Change in feed  
• Controlling diet just after farrowing  
• Supplying lime water with 15 to 20 gm iron sulphate

Anaemia  
• Deficiency of iron,  
• Worm infestation  
• Poor feeding

• Weakness  
• Frequent breathing

• Iron injection on 7th and 14th day of age  
• Paint the udder of sow with iron sulphate and sugar, so that piglets consume iron during suckling

Mineral mixture during pregnancy & lactation

**Table 7: Different reproductive diseases of pig**

<table>
<thead>
<tr>
<th>Name of the disease</th>
<th>Cause</th>
<th>Symptom</th>
<th>Treatment</th>
<th>Preventive measure</th>
</tr>
</thead>
</table>
| 1. Anestrus         | Nutritional deficiency  
  • Anatomical abnormality  
  • Mummified foetus in sow | Prolonged gestation | As per advice of a qualified veterinarian | • Proper management of nutrition.  
• The animal should not be used for breeding purpose. |
| 2. Repeat breeding | Anatomical  
• Infectious  
• Nutritional | Repeat breeding | As per advice of a qualified veterinarian | To dispose of the animal if it does not respond to the treatment |
<table>
<thead>
<tr>
<th>3. Abortion</th>
<th>Infection like Brucellosis, viral disease, Nutritional deficiency, Abortion</th>
<th>As per advice of a qualified veterinarian</th>
<th>Isolation/segregation of the animal, Better nutrition during pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Still birth</td>
<td>Infection, Nutritional</td>
<td>Dead fetus</td>
<td>As per advice of a qualified veterinarian</td>
</tr>
</tbody>
</table>

| 5. Udder oedema and no-milk condition after farrowing | Poor feeding especially minerals & vitamins during pregnancy, Less water intake and constipation; Poor milk production, poor health of the piglets, fluid accumulation beneath the skin or deep inside | Mix Ostocalciu-m and virmeral medicine and to provide 3/4 teaspoonful daily. Offer cow milk/goat milk to piglets, To treat the sow with small dose of oxytocin (0.5-1 ml) every 6 hrs interval, if required | Mineral and vitamin mixture during pregnancy, Plenty of water 2-3 days prior to farrowing, Reduction of feed intake before farrowing, but forages can be added |

10.4.2 Physical characteristics of gilt having genital abnormalities
- Male like appearance,
- Enlargement of external genitalia with prominent clitoris or deformed genitalia.

The animals showing above disorders should be culled as early as possible.

**Body characteristics indicating future low reproductive efficiency**
- Too much slope in the rump region,
- Excessive muscling - indication of poor mothering ability, low milk production,
- Foot and joint problem, e.g. sore foot pad, enlarged and inflamed joint, etc.,
- Less number of teat (normal 6-7 pairs),
- Pinned nipple, inverted nipple.

10.5 Group Work
Participants will be divided into small groups and each group will be asked to discuss on reproductive disorders of pig commonly seen in the locality, problems faced and control measures taken by them, and to explain the key learning to the other groups.
DAY 4

SESSION 11: Some Minor Surgical Problems of Pig and their Remedies

11.1 Resource Person
An experienced veterinary surgeon.

11.2 Session Objective
By the end of the session the participants shall have fair idea about the different minor surgical problems of pigs (e.g. castration, cutting of needle teeth, hernia, atresia ani, wounds, etc.) and their treatment.

11.3 Training Methods
Participatory discussion and experience sharing

11.4 Contents
11.4.1 Castration
It means removal of testes or making them non-functioning in males (or ovaries in female) to prevent breeding.

Purpose of castration
- Indiscriminate breeding can be checked by eliminating undesirable males through castration.
- Castration makes animals more docile.
- Castrated males can be housed along with females.
- Meat of castrated male is of superior quality.

Time of castration: Any part of the year
Age of castration: 1.5 - 3 months of age

Requirement
- Brand new blade or castrating knife,
- Antiseptic solution (e.g. Betadine solution),
- Antiseptic powder (e.g. Nebsulph powder) or other locally used antiseptic (Turmeric powder),
- Suture,
- Forceps,
- Cotton.

**By incision** (Knife/blade method)
- The piglet is made to lie down on one side on a clean floor.
- Hands and new blade/castrating knife are sterilized with cotton soaked in spirit.
- The scrotum is washed with an anti-septic solution like Betadine solution.
- An incision on the lower third of the scrotum is made with the sterilized knife/blade.
- In case of older piglets, more than 2.5 months, local anesthesia should be injected (0.5 ml) in both the testicles under the skin 5 minutes before the operation.
- Incision should extend well down to the end of the scrotum and proper drainage of blood should be made.
- Remove the testicles by pressing and pulling them out. The cord is detached.
- Scrotum and surrounding parts are again thoroughly disinfected with tincture of iodine or Povidone iodine lotion.
- Anti-septic powder (e.g. Nebasulf) should be applied.
- Fly repellent (e.g. Himax ointment) should be applied on the surrounding of the incision point.

![Fig. 33: Castration process](image)

**Precaution**
- Incision method should not be done in rainy weather; if performed, the piglet should not be allowed to go out in rain.
- To prevent infestation from flies, fly-repellent like Iodoform or Himax should be used.
- It is advisable to do castration by incision on a bright clear day to avoid complications.
- Piglet must be handled carefully to avoid excitement/stress.
- Piglet must be kept under close observation till the wound is healed completely.
- Hands and tools should be properly cleaned and sterilized.

11.4.2 First Aid to Cut-wound

Cut wounds generally have even edges, bleeding is sometimes profuse. The cut-wound should be treated under the supervision of an experienced veterinarian.

Requirements

- Cotton,
- Saline solution,
- Haemostatic drug (e.g. Stryptochrome, Dicyanene, etc.),
- Scissors,
- Shaving blade,
- Anaesthetic drug (e.g. Lignocaine HCl),
- Curved cut-edge needle,
- Suture material (e.g. nylon, black braided silk, catgut, etc.),
- Forceps.

Procedure

- The animal has to be restrained properly.
- If there is bleeding, it should be controlled by application of tourniquet (bindings) or by using haemostatics (e.g. Stryptochrome, Dicyanene, etc.) or by using locally available medication (which can stop bleeding).
- The edges of the wound and its surroundings should be cleaned, clipped or shaved.
- The area should be washed with lukewarm water or saline solution.
- If any artery is severed, it needs to be sutured/stitched under the supervision of a veterinarian.
- Using a thin layer of dry cotton Tincture Benzoin co. should be applied to the sutured wound edge.
• The cut-wound has to be regularly cleaned for complete healing.

• A course of antibiotics (e.g. Ampicillin, Cloxacillin, etc.) should be given as per veterinarian's advice.

• The suture should be removed after 7-10 days.

Precaution

• The wound should be checked for pus formation.

• The wound area should be prevented from licking by the animal.

• Should apply fly repellent like Himax.

11.4.3 Dressing of Maggotted Wound

Maggotted wound can be detected by presence of an offensive smell, dribbling of blood-mixed exudates and presence of maggots in the wound. A maggotted wound requires treatment under the supervision of an experienced veterinarian.

Requirements

• Cotton,

• Turpentine oil,

• Forceps.

Procedure

• First the surface of the wound should be cleaned with dry cotton or soaked in warm saline water or tincture iodine.

• In case of a superficial wound the maggots can be removed with the help of forceps.

• For deep-seated maggots a cotton plug soaked in turpentine oil is paced in the wound for a minimum of half an hour.

• After this period, removing the cotton plug, the dead maggots can be removed with the help of forceps.

• All the dead tissues present have to be removed.

• The wound is scrubbed with tincture of iodine.

• The wound is dressed everyday with tincture of iodine and a fly-repellant like Himax, and Topicure are applied in the surrounding area of the wound.
A course of antibiotics (e.g. Ampicillin, Cloxacillin, etc.) and an anti-inflammatory drug may be given after consulting a veterinary practitioner.

Fig. 34: Dressing of maggotted wound
11.4.4 Abscess
It is the collection of pus in an abnormal cavity. The condition mainly occurs due to trauma. It needs treatment under the supervision of an experienced veterinarian.

**Treatment**
- The abscess is washed with potassium permanganate.
- The hair surrounding the abscess is trimmed with a pair of scissors.
- A vertical incision is made in the affected area.
- The pus is allowed to completely drain out.
- The cavity of the abscess is filled with potassium permanganate to remove the pus, and dead tissues.
- After thorough cleaning, the cavity is to be dried with gauge or clean cloth.
- A gauge dipped in Tincture of iodine is kept for 24 hrs to break the pyogenic membrane.
- Repeated the procedure till healthy tissues appear.
- A fly-repellent like Himax, Dressol FR, etc. should be used surrounding the incision.
- A course of antibiotics should be administered by consulting a veterinarian.

11.4.5 General management of wounds
- The wound area is gently trimmed and cleaned.
- The wound is washed with lukewarm (little warm) water or saline solution to remove any debris.
- Homeostasis drugs need to be given to stop bleeding (in consultation with a veterinarian), if required.
- The tissues are gently handled and no irritant material like salt is used.
- The wound is covered with dressing materials like cotton, gauge bandage.
- The wound must be protected from contamination and dirt.
- Using dry cotton the discharge is absorbed.
- Development of any further trauma should be prevented.
- Comfortable stay of the animal in a separate pen should be ensured.

11.4.6 Atresia Ani
It is a condition where the rectum ends blindly not allowing excretion of faeces. Piglet cannot defecate until the anus is opened surgically. Treatment of atresia ani should be done by a veterinary practitioner or a person trained in surgical intervention.
11.4.7 Clipping Needle Teeth
The needle teeth/ canine teeth are very sharp in piglets and may cause injury to sow's udder or facial skin of other piglets in the event of fighting. If the volume of sow's milk is adequate for the number of piglets in the litter, clipping needle teeth is unnecessary. The needle teeth should be clipped under the supervision of an experienced veterinarian.

- The top teeth or both the top and bottom teeth may be clipped, based on the handler's preference and experience.
- It is important that only the sharp tip of the tooth be cut.
- If the tooth is cut too close to the gum, the tooth may be shattered causing gum infection.
- The sharp edges of shattered teeth may also traumatize the tongue.

11.4.8 Ear Notching
It is an identification system of pig. It is used mainly for pigs insured in organized breeding farm. There are several methods of identification, one of which is ear notching. Notches are placed on the margin and tip of the ears of a pig. This allows accurate recording of litter number and date of birth.

Procedure
- The piglet is held firmly.
- Sterilized a pair of sharp scissors or ear-puncture.
- The ear is cleaned with cotton and spirit.
- A small part of ear is cut or punctured either in the middle or sideways.
- Too small or too large notches should not be made.

11.4.9 Foot Rot
It is a condition of foot caused mainly by bacterial infection. The condition may occur due to unhygienic floor condition.

Treatment
- Cracks of broken floor should be repaired.
- The affected foot is washed with water-based anti-septic solution like potassium permanganate or saturated salt solution.
- The foot is dried with cotton or gauge bandage or a clean cloth.
- The foot is painted with Tincture Iodine or Povidone Iodine.
- A course of antibiotics and analgesic may also be given after consulting a veterinarian.
SESSION 12: Familiarization with Commonly Used Medicines

12.1 Resource Person
A veterinary practitioner (surgeon) or a veterinary medicine specialist.

12.2 Session Objectives
By the end of the session, the participants will be familiar with some of the important medicines used in treatment of pigs, their uses, doses and methods of administration.

12.3 Training Methods
The essential medicines are exhibited in the class room to show the followings aspects:
- Manufacturing and expiry dates,
- Composition of the medicines,
- Storage of the medicines/vaccines,
- Explanation of indication, doses and routes of administration of each medicine,
- Group work.

12.4 Contents
12.4.1 Important lessons to be learnt before using any medicine

12.4.1.1 Name of medicines
Each medicine is composed of certain chemicals/drugs (e.g. Paracetamol, Ampicillin, Albendazole, etc.). The name of the chemical/drug by which medicine is composed of is called generic name (common name/general name). Generic name remains the same in all the medicines composed of the same chemical(s)/drug(s). Trade name (e.g. Paracetol, Moxel, Albomar etc.) is given by the manufacturing company to identify their manufacturing product/s; therefore trade name of the same medicine varies from company to company. Doctors generally prescribe medicine in trade name as quality of medicine may vary from company to company.

12.4.1.2 Date of manufacturing and expiry
Each medicine is manufactured on certain date/month. It is written on the vial/sachet, which is called date of manufacturing. Again, each medicine has certain life span within which it should be used for treatment. The last date/month of effectiveness is called date of expiry. Medicines must not be used beyond the date of expiry under any
circumstances. First Aid (FA) practitioners should always check the date of expiry before purchasing any medicine.

12.4.1.3 Storage
Medicines should be stored in cool dry place away from the direct sunlight. Medicines should not be kept open. It should be tightly closed and kept away from the reach of children. Other than vaccine no medicine should be refrigerated.

12.4.1.4 Shaking/mixing
Liquid medicine should be shaken well before use to mix the content.

12.4.1.5 Indication
It means the disease or condition against which a particular medicine is used. This is generally written on the medicine. In absence of any indication, FA practitioner should consult an experienced veterinarian.

12.4.1.6 Contra-indication
It means the disease or condition against which the particular medicine should not be used.

12.4.1.7 Dose
It is the quantity/volume of medicine to be administered/used per animal per day for treatment. Doses of medicine to be administered/used depend on the body size of the animal. Smaller the animal smaller is the dose, larger the animal larger is the dose. This is generally written on the cover of medicine. When necessary, the FA practitioner should consult an experienced veterinarian.

12.4.1.8 Route of administration:
The route of administration varies based on type of medicine
Bolus/Tablet: Generally fed orally
Syrup: Generally fed orally
Ointment/lotion/powder: Generally applied externally on the skin
Vial of injection: Injected through different route i.e. Intramuscular, Intravenous, Subcutaneous

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### 12.4.2 Medicines commonly used for treatment of animals

Some of the medicines are quite frequently used by the pig producers or community First Aid even without any suggestion/guidance from the experienced veterinarian. These commonly used medicines have been explained below with the indication, dose, route of administration etc. to prevent any misuse of the same.

#### Table 8: Medicines which are commonly used in treatment of animals

<table>
<thead>
<tr>
<th>Kind of drugs</th>
<th>Meaning/Actions</th>
<th>Name of drugs (trade name)</th>
<th>Indication</th>
<th>Dose</th>
<th>Route of administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotic</td>
<td>To kill bacteria or to treat diseases caused by bacteria (antibiotic should use for 5 consecutive days without fail)</td>
<td>Oxytetracycline inj</td>
<td>Broad spectrum antibiotic effective against many diseases</td>
<td>0.5 ml to 10 ml depending on body size for 5 days</td>
<td>Intramuscular (I/M) inj.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steclin bolus</td>
<td></td>
<td>1-2 bolus</td>
<td>Orally</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ampicillin and Cloxacillin (eg. Vetclox Forte inj)</td>
<td>Broad spectrum antibiotic use mainly to treat any wounds/abscess</td>
<td>5-10 mg/kg body weight</td>
<td>I/M inj</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enrofloxacins (eg. Enrodec-10)</td>
<td>Broad spectrum antibiotic</td>
<td>1ml/20 kg body weight</td>
<td>I/M inj</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Streptopenicillin (eg. Dicrusticin-S inj)</td>
<td>Broad spectrum antibiotic</td>
<td>2ml/50 kg body weight</td>
<td>I/M inj</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amoxycillin and cloxacillin (eg. Moxel inj)</td>
<td>Broad spectrum antibiotic</td>
<td>5-10mg/kg body weight</td>
<td>I/M inj.</td>
</tr>
<tr>
<td>Deworming drugs</td>
<td>To kill internal worms or to treat parasitic infection</td>
<td>Albendazole (eg. Albomar suspension)</td>
<td>Gastrointestinal round worm, lung worm, tape worm</td>
<td>5-10 ml twice daily for 3 days</td>
<td>Orally</td>
</tr>
<tr>
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</tr>
<tr>
<td></td>
<td></td>
<td>Fenbendazole (eg. Panacure bolus/tab)</td>
<td>do- 150 mg bolus per 30 kg body weight for once 5mg/kg body weight 1 bol/100kg body weight</td>
<td>Large</td>
<td>Orally</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Curaminth bol/tab</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zycloz bol.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analgesic &amp; Antipyretic</th>
<th>Used for relief of pain or fever</th>
<th>Oxalgin NP bol</th>
<th>For the relief of pain</th>
<th>Animal 1-2 bol Small animal-1/2-1 bol 1ml/25kg body weight</th>
<th>orally I/M inj</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Oxalgin NP inj.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paracetamol (eg. Paracetol inj)</td>
<td>To get relief from high fever</td>
<td>2-10 ml twice daily as required</td>
<td>I/M inj</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anti inflammatory drugs</th>
<th>To get relief from all types of inflammation/swelling</th>
<th>Phenylbutazone, analgin etc. (eg. Zobid M inj)</th>
<th>To get relief from swelling</th>
<th>1 ml/25 kg body weight 1 ml/25kg body weight</th>
<th>I/M inj</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Purpose</td>
<td>Treatment</td>
<td>Frequency</td>
<td>Route</td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>Antidiarrheals</td>
<td>To treat diarrhoea</td>
<td>NTzole bolus</td>
<td>1-2 bolus twice daily</td>
<td>Orally</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ayurvedic medicine (eg. Neblon powder, Diaoak powder)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diarrhoea</td>
<td>0.5 -2 tsf thrice daily</td>
<td>Orally</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digestive tonic</td>
<td>To treat anorexia, digestive disorder</td>
<td>Herbal preparation (eg. Himalayaan Batisa powder, Digestone powd)</td>
<td>3-15 gms once or twice daily</td>
<td>Orally</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Promote appetite and digestion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liver tonic</td>
<td>To make the liver healthy</td>
<td>Herbal preparation (eg. Livol powder, Liv 52 tab/powder)</td>
<td>1-3 tsf. Twice daily for 10-15 days</td>
<td>Orally</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>To correct liver damage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antacid</td>
<td>To counteract acidity</td>
<td>Aciloe tab or inj</td>
<td>1 tab/ 10 kg body weight 1ml/5 kg body weight 1-5 tsf. thrice daily</td>
<td>Orally</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I/M</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Mineral &amp; Vitamin mixture</td>
<td>To stimulate growth, better utilization of nutrients and maintenance of mineral requirement in the body</td>
<td>Multivitamin and minerals (eg. Milkmin powder, Gwala powder, Agrimin pow, etc.)</td>
<td>0.5 -2 tsf. per day 25 g daily with feed</td>
<td>Orally</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Promote growth, higher milk yield, treat deficiency diseases, nourishing pregnancy &amp; lactation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrolytes</td>
<td>To maintain fluid level in the body, especially during the time diarrhea, vomiting etc.</td>
<td>Electrolyte powder (eg. Electral, ERS etc.)</td>
<td>Maintain the fluid level within the body</td>
<td>Mix 1 sachet in 1 lit of water and provide plenty of electoral water</td>
<td>Orally</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Skin application</td>
<td>To prevent infection in skin</td>
<td>Povidone iodine (eg. Betadine sol, Wokadine sol)</td>
<td>On skin pre and post operatively, wound, burns,</td>
<td>Use in affected part of the skin</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nebasulf powder/ Neosporin Powder</td>
<td>On skin post operatively to prevent infection</td>
<td>Use in affected powder</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tincture iodine</td>
<td>Use to disinfect the area of injection in the body</td>
<td>Use locally on the skin</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ayurvedic preparation (eg. Himax ointment)</td>
<td>To keep the fly away from affected part of the skin</td>
<td>Use on surrounding of the affected part/ wound</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The list of medicine is indicative only. Local qualified veterinarian may add or delete any medicine from the list based on prevalence of the disease in the locality, effectiveness of the medicine, own experience and local regulation, if any.

### 12.5 Group Work:

Participants will be divided into small groups and each group will be asked to write the trade name, generic name, manufacturing date, expiry date, indication, dose and route of administration of each medicine in a flip chart and present to other groups.
DAY 5

SESSION 13 : Methods of Administration of Medicines and use of a few Surgical Equipments

13.1 Resource Person
A veterinary practitioner (surgeon)

13.2 Session Objectives
By the end of the session, the participants should be familiar with the administration of some of the important medicines and use of a few medical equipments like needle, syringe, scissors, forceps, thermometer, thermos flask, cotton, bandage etc.

13.3 Training Methods
- Class room demonstration of different methods of administration of drugs;
- If it is injectable medicine, explain how to withdraw medicine from a vial;
- If it is vaccine, show how to transport, store, mix and administer vaccine;
- Show how to use needle and syringe, forceps, scissors etc;
- How to prepare cotton gauze;
- How to prepare a bandage.

13.4 Contents
First Aid practitioner must have knowledge on different methods of administration of medicines in order to
- Provide medicines without much inconvenience and harm to animal;
- Make use of drugs properly without wastage/ underdose/ overdose;
- Treat animals properly;
- In case of oral medication, the medicines should be acceptable or palatable to them;
Different methods are:

13.4.1 Feeding boluses/tablets:

The bolus/tablets are grinded and mixed with the feed specially molasses, banana etc. The amount of feed should be less so that the animal takes the medicines properly. Molasses/banana mixed with medicine should be offered to pig while they are hungry especially before offering normal feed and water.

13.4.2 Feeding syrup/suspension:

Drenching is a method that is satisfactory for giving moderate amount of liquids or suspension. This should only be done by an experienced veterinarian.

13.4.3 Injections:

Medicines which act very rapidly or those which cannot be administered orally are commonly administered by injection.

Methods of administration of medicines:

13.4.3.1 Method of withdrawing medicine from a vial

- Sterilize the needle and syringe (if glass syringe is used) with warm water. If disposable (use and through) plastic syringe is used, sterilization is not required.
- Select the vial of medicine to be used;
- Select the appropriate size of syringe (eg.2ml, 5ml, 10ml, 20ml) based on the volume of medicine to be injected;
- Select the appropriate size of needle (eg. 16, 17, 18, 19,20 gauge etc.) based on the age and size of the pig;
- Remove the plastic/steel cap of the vial and invert it;
- Fix the needle with the syringe;
- Insert the needle in the vial through the rubber cap;
- Draw the required volume of medicine by pulling the plunger;
- Expel the air fully from the syringe (remaining above the medicine) by pushing back the plunger; Take extra care, so that no air bubble remains above the medicines. If required, little medicine may also be expelled through the needle to
confirm the expulsion of air completely;

- Always keep part use bottle/ vial in a fridge or in cool place away from the reach of children;

- Burn or bury the needle, syringe, vial, medicine etc. carefully in a place away from the homestead.

Fig.35: Steps followed for drawing medicines through needle and syringe

13.4.3.2 Intramuscular injection (into muscle)

In swine the preferred site for intramuscular injection is the thigh muscle.

Method used in young pigs

- Collect required materials and drugs;
- Restrain the animal and select suitable site in the thigh region;
- Clean the site of injection with tincture of iodine;
- After determining the proper dose, pull the drugs into the syringe;
- Pierce the needle into the site to enter deep into the muscle;
- Gently inject the contents of the syringe;
- Take out the needle and gently massage the area with cotton soaked in tincture of iodine;
Method used for adults

- In adult pigs, the method is almost same, but after drawing the medicine from the vial, the needle is separated from the syringe and thrust in the muscle of pig using the dagger method (piercing the needle with a bit of force from a little bit of distance) without stopping, and then the syringe is fitted.

- Check for blood by drawing back on the plunger;

- Be sure that the needle is not improperly placed into a vein or artery, and then the content is injected deep into the muscle.

Precaution

- Fluids injected intramuscularly are not absorbed so fast as those given in the veins, but are absorbed faster than those injected under the skin;

- Special care must be taken to avoid infection because deep sores may follow which are painful and difficult to treat;

- The needle should be thrust quickly through the skin at right angles to it and into the muscle without stopping;
To make sure that needle has not penetrated a blood vessel, pull the plunger of the syringe out a little before injecting contents. If blood is sucked into the syringe, choose another site or different depth at the same site.

- Expel the air completely from the syringe by pushing the plunger with medicine to the mouth of the needle.

13.4.3.3 Subcutaneous injections (under the skin)

In pig the preferred site for subcutaneous injection is base of the ear.

Method

- Collect the required materials and drugs;
- Restrain the animal in proper way;
- Draw the required medicine into the syringe;
- Clean the base of the ear by applying tincture iodine;
- Pull a fold of the skin at the base of the ear by the index and thumb fingers;
- Pierce the needle through the skin in an oblique, thrusting the needle quickly and firmly;
- Push steadily the contents of the syringe;
- Take out the needle and gently massage the area to hasten absorption.

![Fig.38: Method of sub-cutaneous injection](image)

Precaution

- In the above method, tip of the needle should be located in between skin and muscles;
- Serious results may follow if certain fluids are injected into a vein. To make sure that the point of the needle is not inserted in vein, the plunger of syringe be pulled out a little before injection is given. If blood appears, another site should be used;
• Care should be taken not to inject fluid into a muscle, otherwise a large swelling and abscess may later result;

13.4.3.4 Administration of vaccine

Example- Raksha Ovac (Foot and Mouth Disease vaccine)

Administration: The vaccine should be kept cold until used and each bottle should be well shaken before contents are withdrawn. Only sterile/disposable syringes and needles should be used. The vaccine should be injected by deep intramuscular route through an area of clean, dry skin with precautions taken against contamination, at the mid neck region.

Dose: 1ml

Caution:

In rare cases hypersensitivity may occur, immediate treatment with antihistaminics (eg. Avil injection) is advocated. Vaccine is thoroughly tested before release into the market. Under field conditions it is extremely difficult to avoid the accidental introduction of bacteria when withdrawing doses of Vaccine from the bottles. Part-used bottles of vaccine should therefore be discarded at the end of the day's operations.

Transportation and storage:

The optimum transport and storage temperature is between 2°C and 8°C. The antigenicity of the vaccine deteriorates if the temperature is allowed to rise above this range. The rate of deterioration depends on both temperature and time.

13.4.3.5. Iron injection:

The use of injectable compounds to prevent piglet anemia is widespread. Although oral iron products have been shown to prevent anemia, most pork producers and veterinarians still rely on injectable iron.

• Iron and other products may be injected into piglets in several locations, but the neck muscle is preferred;
• The piglet is held between the left elbow and body, and the right ear is grasped and pulled firmly forward;
• The skin is pricked with the needle and pushed upward, and the needle is inserted to the hub;
• The injection is administered, the needle is withdrawn, and the ear is released simultaneously;
• Pushing the skin upward prior to injection prevents leakage;
• The best needle for most injectable is 18 gauge and 12 mm, but a 20 gauge needle may be used for thin liquids;
• The iron injection site is preferred over the ham area.
SESSION 14: Distribution and Demonstration of the First Aid Kit to the Participants

14.1 Resource Person:
An experienced Veterinarian

14.2 Session Objective:
By the end of the session, each participant should receive a First Aid kit and should have clear idea about the use of each item and will also be clear about what they would do during the time of field visit.

14.3 Training Method:
Distribute the kit and explain the use of each item one by one and provoke the participants to ask additional questions for clarification.

14.4 Content
Possible content of a First Aid kit
- Cotton;
- Bandage cloth;
- Syringe (different sizes, 2 ml, 5 ml, 10 ml);
- Needle (of different size, 16, 17, 18, 19 gazes);
- A pair of scissors;
- Two pairs of forceps;
- A thermometer;
- Some commonly used medicines (antiseptic solution, ointments, mineral vitamin mixture, liver tonic, antibiotic, antipyretic, antidiarrhoeal, deworming drugs, fly repellants etc.).
SESSION 15: Field Visit and Demonstration of First Aid Practices

Try to practically demonstrate the followings. After demonstration ask the participants to practice the same.

- How to restrain the animal;
- Explain the body parts of a pig and location of different internal organs;
- Explain the scope of contamination, mode of transmission of germs;
- Explain how to take sanitary measures to prevent the transmission of germs/diseases;
- Try to show any diseased pig and explain how to assess the disease problem;
- Show how to measure the respiration and temperature of a pig;
- Field demonstration how to take the history of a disease condition;
- Show different types of medicines and their uses;
- Demonstrate how to administer tablet, bolus and suspension to pig;
- Demonstrate how to inject intra muscular injection and subcutaneous injection;
- Demonstrate how to carry, store, mix and inject vaccine;
- Demonstrate how to treat the cut wound and maggoted wound;
- Demonstrate how to castrate a male piglet and cut needle teeth.
SESSION 15 continues

Group Work:
At the end of the field visit, participants will be divided into small groups and each group will be asked to share their learning on a particular topic (mentioned in the list above) of field demonstration and make a small presentation in front of all the participants.
Annexure:

Use the following evaluation form before and after the training to evaluate the knowledge of the participants and effectiveness of the training.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Knowledge (use tick mark)</th>
<th>Usefulness of the learning (use tick mark)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
</tr>
<tr>
<td>Knowledge on restraining (control) methods of pigs</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Brief idea on structure and function of different body systems/ organ of a pig</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Knowledge on healthy and diseased pig and assessment of a diseased pig</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Idea on different organisms causing diseases to pig</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Knowledge on mode of transmission of organisms</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Knowledge on hygiene and sanitary measures to be adopted in pig farm</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Knowledge of different bacterial diseases of pigs</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Knowledge on different viral diseases of pigs</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Knowledge on different parasitic diseases of pigs</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Knowledge on metabolic and reproductive diseases of pig</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Knowledge on treatment and preventive measures of pig diseases</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

70
| Knowledge on different minor surgical problems of pig |  |
| Knowledge on different commonly used medicines for treatment of pigs |  |
| Knowledge on different modes of administration of medicines |  |
| Field experience |  |
| **Total response** |  |
| **Give marks out of 10** |  |
| Content of the training manual |  |
| Resource person |  |
| Teaching method |  |
| Venue and logistics |  |
| Food |  |
| Overall effectiveness of the training course |  |
BIBLIOGRAPHY


Baxter Seaton, 1984- Intensive Pig production, Granada publishing ltd.


Chakrabarti A., 1996- A Textbook of Preventive Veterinary Medicine, (1st edi), Kalyani Publishers, New Delhi


Deka R. & Thorpe W., 2007- Assam's Pig subsector Current status, constraints and opportunities, International Livestock Research Institute (ILRI), New Delhi

Deka R. & Thorpe W., 2008- Nagaland's Pig subsector Current status, constraints and opportunities, International Livestock Research Institute (ILRI), New Delhi

Deka R. & Wright I., 2009, Potential for Livelihood Improvement through Livestock Development in Jharkhand, International Livestock Research Institute (ILRI), New Delhi


Grandin T. 2005 (2nd edi) - Livestock handling and Transport, CABI publishing

Kumar Amresh, 2006- Veterinary Surgical techniques, Vikas Publishing Pvt. Ltd


Pal Mahendra- Zoonoses


Prasad J. 2009; Goat, Sheep and Pig Production and Management (3rd edi), Kalyani Publishers, Ludhiana

Rastogi S.R.- Essentials of Animal Physiology

Roberts Stephen J., 1982- Veterinary obstetrics & Genital diseases (Theriogenology) 2nd edi), CBS Publishers & distributors.

Sainsbury David, 1963- Pig housing. Farming Press Ltd.


www.thepigsite.com