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LABORATORY ANIMAL

A **laboratory animal** is an animal used in scientific research to study biology, diseases, treatments, and the effects of drugs or chemicals. These animals help scientists understand how the body works and test the safety and effectiveness of new medicines before they are used in humans. Common laboratory animals include mice, rats, rabbits, and guinea pigs. They are carefully bred and housed under controlled conditions to ensure accurate and ethical research results.

- ***COMMON LABORATORY ANIMAL***

🐭 **1. Mice**

- **Why used**: Small size, easy to handle, reproduce quickly.
- **Scientific benefit**: Share about 95–98% of their genes with humans.
- **Common uses**: Genetics, cancer, immunology, drug testing.

🐀 **2. Rats**

- **Why used**: Larger than mice, easy to train, intelligent.
- **Scientific benefit**: Good for behavioral, neurological, and toxicology studies.
- **Common uses**: Psychology, addiction research, cardiovascular studies.

🐇 **3. Rabbits**

- **Why used**: Calm nature, larger body size, easy blood collection.
- **Scientific benefit**: Useful in eye, skin, and immune system studies.
- **Common uses**: Antibody production, eye irritation tests, vaccine testing.

🐹 4. Guinea Pigs

- **Why used**: Sensitive to vitamin C deficiency (like humans).
- **Scientific benefit**: Model for respiratory, nutritional, and auditory studies.
- **Common uses**: Allergy, asthma, and hearing research.

🐒 5. Monkeys/Primates

- **Why used**: Closely related to humans genetically and behaviorally.
- **Scientific benefit**: Useful in brain and infectious disease studies.
- **Common uses**: Neuroscience, HIV, and vaccine development.

🐶 6. Dogs (e.g., Beagles)

- **Why used**: Calm, easy to train, well understood physiology.
- **Scientific benefit**: Cardiovascular and pharmacology studies.
- **Common uses**: Drug safety, heart disease research.

🐱 7. Cats

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- **Why used**: Good model for neurological disorders.
- **Scientific benefit**: Similar brain structure to humans.
- **Common uses**: Vision and brain research.

- **Description, handling & Hrs application**

🐭 **1. Mice (Mus musculus)**

✅ **Common Strains:**

- **BALB/c**: Used in immunology.
- **C57BL/6**: Popular for genetics and neuroscience.
- **Swiss albino**: Common for toxicology.

📌 **Description:**

- Small, fast-breeding mammals.
- Lifespan: 1.5–2 years.
- Easy to house and manage.

🤲 **Handling:**

- Hold by base of the tail and support body gently.
- Can use a tunnel or cup method for less stress.

🏠 **HRS Application:**

- **Husbandry**: Clean cages 1–2 times/week, 12:12 light/dark cycle, temp 20–26°C.
- **Restraint**: Tail hold, scruff hold, or use a restraint tube.

- **Sampling**: Blood from tail vein, saphenous vein, or retro-orbital (under anesthesia).

🐀 2. Rats (*Rattus norvegicus*)

✅ **Common Strains:**

- **Wistar**: General purpose.
- **Sprague Dawley**: Toxicology and pharmacology.
- **Long Evans**: Behavioral studies.

📌 **Description:**

- Larger than mice, intelligent, social.
- Lifespan: 2–3 years.

👐 **Handling:**

- Grasp around shoulders or support under chest and rump.
- Avoid holding by tail.

🏥 **HRS Application:**

- **Husbandry**: Temp 20–26°C, bedding changed weekly, social housing recommended.
- **Restraint**: Manual or restraining cones.
- **Sampling**: Blood from tail vein, saphenous vein, or cardiac puncture (terminal).

🐇 3. Rabbits (*Oryctolagus cuniculus*)

✅ **Common Breeds:**

- **New Zealand White**: Most common for lab use.
- **Dutch Belted**: Used in eye research.

📌 **Description:**

- Docile, large ears make blood collection easier.
- Lifespan: 5–8 years.

🤲 **Handling:**

- Support hind limbs to prevent injury.
- Hold securely against your body.

🧪 **HRS Application:**

- **Husbandry**: Temp 16–22°C, require hay and chewing material.
- **Restraint**: Cradle securely or use a rabbit restraint box.
- **Sampling**: Blood from ear vein/artery or central artery.

🐹 **4. Guinea Pigs (Cavia porcellus)**

✅ **Common Strains:**

- **Hartley**: Albino, widely used.
- **Dunkin-Hartley**: For respiratory and nutritional research.

📌 **Description:**

- Sensitive to vitamin C deficiency.
- Communicate with squeaks.

🤲 **Handling:**

- Use both hands to support body.
- Never pick up by limbs or tail (they have none).

🧪 **HRS Application:**

- **Husbandry**: Require vitamin C in diet, temp 20–26°C.
- **Restraint**: Manual hold around chest and rump.

- **Sampling**: Blood from saphenous vein or ear.

🐒 5. Monkeys (Non-human Primates)

✅ **Common Species:**

- **Rhesus macaque**, **Cynomolgus monkey**: Used in neuroscience, vaccines.

📌 **Description:**

- Closest to humans in structure and function.
- Lifespan: 15–25 years.

🫀 **Handling:**

- Only trained personnel should handle.
- Chemical restraint (sedation) often used.

🧪 **HRS Application:**

- **Husbandry**: Enrichment required, temp 20–28°C, group or pair housing.
- **Restraint**: Sedation, squeeze cages.
- **Sampling**: Blood from femoral vein or saphenous vein.

🐶 6. Dogs (e.g., Beagle)

✅ **Common Breed:**

- **Beagle**: Friendly, medium-sized, easy to handle.

📌 **Description:**

- Used for cardiovascular and safety testing.
- Lifespan: 12–15 years.

Handling:

- Gentle leash control, muzzle if needed.
- Positive reinforcement works well.

HRS Application:

- **Husbandry**: Kennel housing, daily exercise, 15–24°C.
- **Restraint**: Manual or with leash/harness.
- **Sampling**: Blood from cephalic or jugular vein.

7. Cats (Felis catus)

Common Use:

- Vision and neurological studies.

Description:

- Require calm environment.
- Lifespan: 12–16 years.

Handling:

- Calm approach, scruff if needed.
- Use towel wrap if aggressive.

HRS Application:

- **Husbandry**: Quiet, clean housing, toys/enrichment.
- **Restraint**: Scruffing, towel wrap, or sedation.
- **Sampling**: Blood from cephalic or jugular vein.

Transgenic Animal – Simple Definition:

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A **transgenic animal** is an animal that has a **new gene** from another **animal, plant, or human** added to its body using **special science techniques**. This gene is added to help study diseases, test new medicines, or improve certain traits.

🔍 **More Detailed (Still Easy to Understand):**

- Scientists take a gene (a small piece of DNA) from one living thing.
- They **insert it into the DNA** of an animal like a **mouse, cow, or fish**.
- The animal **grows up with that new gene** in all its cells.
- This animal is now called a **transgenic animal**.

□ **Why Transgenic Animals Are Made:**

- To **study human diseases** (like cancer or diabetes).
- To **test new drugs** safely before giving them to people.
- To **produce useful proteins** (like insulin or antibodies).
- To improve **farming animals** (e.g., faster growth or disease resistance).

🐭 **Example:**

A **transgenic mouse** with a **human cancer gene** is used to study how cancer grows and how to treat it.

- **Transgenic Animals** – including their **production**, **maintenance**, and **applications**:

🧬 1. Production of Transgenic Animals

🔷 Step-by-step (Simple):

1. **Gene Selection**: Scientists choose a gene from another organism (e.g., human).
2. **Gene Insertion**: The gene is added to an animal embryo using special techniques like:
   - **Microinjection**: Injecting DNA into a fertilized egg.
   - **Viral Vectors**: Using viruses to carry the gene into the DNA.
   - **CRISPR**: A modern tool to cut and add genes exactly.
3. **Embryo Transfer**: The modified embryo is placed into a female animal (surrogate mother).
4. **Birth of Transgenic Animal**: The animal is born with the new gene in all its cells.

🐾 2. Maintenance of Transgenic Animals

🔷 Important Care:

- **Controlled Environment**: Clean, safe cages with stable temperature and light.
- **Special Feeding**: Diet may be adjusted depending on the gene or health condition.
- **Health Monitoring**: Regular checks for infections, behavior, and gene expression.

- **Breeding Control**: Only animals with the correct gene are selected to reproduce.
- **Record Keeping**: Data on genetics, health, and research use must be maintained.

3. Applications of Transgenic Animals

Scientific and Medical Uses:

1. **Disease Research**:
   - Models for cancer, diabetes, Alzheimer's, etc.
   - Helps understand how diseases start and progress.
2. **Drug Testing**:
   - Test safety and effectiveness of new medicines.
   - Reduces the need for human trials early on.
3. **Production of Medicines**:
   - Animals like goats or cows produce human proteins (e.g., insulin, clotting factors) in milk.
4. **Organ Transplant Research (Xenotransplantation)**:
   - Pigs with human-like genes may be used to grow organs for transplant.
5. **Agricultural Improvements**:
   - Animals that grow faster, resist diseases, or produce more milk/meat.
6. **Environmental Research**:
   - Transgenic fish used to study water pollution by glowing when toxins are present.

🐻 **Examples of Transgenic Animals:**

- **Transgenic mice**: Most common, used in disease and gene function studies.
- **GloFish**: A glowing fish made with jellyfish genes.
- **Transgenic goats**: Produce medicine in milk (e.g., anti-clotting protein).

- **Anesthesia and Euthanasia in Experimental Animals**

🐵 **1. Anesthesia in Experimental Animals**

🔷 **What is Anesthesia?**

Anesthesia is a way to make animals **unconscious and free from pain** during surgery or experiments. It helps animals **not feel stress, pain, or fear** while procedures are done.

✅ **Types of Anesthesia:**

1. General Anesthesia

- Affects the whole body.
- The animal is fully unconscious and feels no pain.

Common Drugs:

- **Ketamine + Xylazine** (injected): Used in mice, rats, rabbits.
- **Isoflurane** (gas): Used in most lab animals through a mask or chamber.
- **Pentobarbital** (injected): Strong anesthetic for rodents and small animals.

2. Local Anesthesia

- Only numbs a small part of the body.
- The animal stays awake but feels no pain in that area.

Common Drugs:

- **Lidocaine**, **Bupivacaine**: Used for small cuts or surgeries.

🛠 **How to Monitor Anesthesia:**

While the animal is under anesthesia, you must:

- Check if the animal is breathing well.
- Make sure the heart is beating regularly.
- Keep the animal warm.
- Pinch the toe or tail to see if the animal reacts (to check depth of anesthesia).

☠️ **2. Euthanasia in Experimental Animals**

🔹 **What is Euthanasia?**

Euthanasia means **peacefully ending an animal's life** to avoid pain or suffering. It must be **quick, painless, and kind**.

✅ **Good Euthanasia Should Be:**

- Gentle and stress-free.
- Done only by trained people.
- Follow legal and ethical rules.
- □ **Common Euthanasia Methods:**

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Method	Used In	Details
Anesthetic overdose	Mice, rats, rabbits	Large dose of drugs like **sodium pentobarbital** makes the animal sleep, then stop breathing.
CO_2 (carbon dioxide) gas	Mice, rats	Animal is placed in a chamber filled slowly with CO_2 gas. It falls asleep and dies peacefully.
Cervical dislocation	Small rodents only	Neck is quickly broken to cause instant death. Must be trained to do this.
Decapitation	Rodents (rare use)	Head is removed quickly. Only done for special experiments. Needs approval.
Barbiturate injection	Dogs, cats, monkeys	Strong drug given into a vein. Animal becomes unconscious and dies peacefully.

⚖️ **Ethical and Legal Points:**

- Must follow animal care laws (like **IAEC** or **CPCSEA** rules in India).
- Use the **least painful** method possible.
- Always use anesthesia first for large animals or painful procedures.
- Only trained and approved people should perform euthanasia.
- Record the method used, date, and reason.

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Maintenance and Breeding of Laboratory Animals

1. Maintenance of Laboratory Animals

Maintenance means providing animals with everything they need to stay **healthy, comfortable, and stress-free** in the laboratory.

Basic Requirements:

a. Housing:

- Use clean cages (plastic or metal).
- Size depends on the species (e.g., mice need less space than rabbits).
- Provide soft bedding (e.g., wood shavings, paper).
- Ensure proper **ventilation**, **light**, and **temperature**.

b. Environmental Conditions:

Factor	Ideal Range
Temperature	20–26°C (varies by species)
Humidity	30–70%
Light cycle	12 hours light / 12 hours dark
Noise	Keep environment quiet to avoid stress

c. Cleaning:

- Clean cages at least **once or twice per week**.
- Clean water bottles, food trays, and rooms regularly to prevent disease.

🍽️ d. Feeding:

- Provide species-specific food (pellets, hay, etc.).
- Always give **clean drinking water** (bottles or automatic systems).

🩺 e. Health Monitoring:

- Daily observation for signs of illness (e.g., weight loss, dull coat).
- Keep records of animal health, treatments, and experiments.

🐻 2. Breeding of Laboratory Animals

Breeding means **producing young animals** for research purposes.

✅ Basic Terms:

- **Male = Sire**
- **Female = Dam**
- **Litter = Group of babies born at one time**

🔁 a. Breeding Methods:

1. **Monogamous Breeding**
    - One male + One female
    - Simple and controlled breeding
    - Used for mice, rats
2. **Polygamous Breeding**
    - One male + Multiple females
    - Saves space and increases production

- Used in large colonies

3. **Harem Breeding**
   - Like polygamous, but females stay with the male continuously
4. **Timed Mating**
   - Male and female are paired only for a short time
   - Used when the exact mating time is needed

🔎 **b. Detecting Pregnancy:**

- **Vaginal plug**: A sign that mating has occurred (seen in mice/rats).
- **Weight gain**, **nest building**, and **behavioral changes** may be noticed.

🍼 **c. Care of Newborns (Pups/Kits):**

- Do not disturb the mother and babies for the first few days.
- Keep warm and quiet environment.
- Check that babies are nursing (look for a "milk spot" in mice).

📋 **d. Record Keeping:**

- Maintain breeding records: date of birth, parents, number of babies, health.
- Helps in planning experiments and colony management.

⚖️ **Ethical Considerations:**

- Follow guidelines of **IAEC**, **CPCSEA**, or local animal welfare authorities.
- Avoid overcrowding or unnecessary breeding.
- Separate sick or injured animals immediately.
- Euthanize humanely if needed, under approved guidelines.

Committee for the purpose of control and supervision of experiments on animals

When Central Government after being advised by the board holds view that it is required to regulate or supervise The experiments on animals , the official gazette should constitute a committee comprising of sufficient number of officials as well as non – official

Sub Committee : The committee can ever constitute several sub - committees to effectively exercise its power perform duties or to investigate report and counsel the committee related to any matter

Staff of the committee

The committee that a point officers and other employees in sufficient number to effectively exercise its power and perform its duties

Duties of the committee and power of the committee to make rules relating to experiments on animals :

It should be duty of committee to take steps so that animals can be prevented from getting exposed to unnecessary pain and suffering during or after experiments

When experiments are performed in any institution responsibility is placed on its incharge and when experiments are performed by individual outside and Institute then individual responsible itself

Experiments are performed carefully under effect of anesthesia so that animals do not feel pain

The animals injured during the experiments are killed when they are still under effect of anaesthesia

Experiments on large animals should be avoided if sufficient books , models , films are available

Experiment should not be performed nearly to gain manual skill

Animal should be carefully look after before and even after the experiment

Record should be maintained with respect to the experiments performed on animals

Power of entry and inspection :

Committee can appoint any officer to inspect any institution or place performing experiments on animals to assure that whether or not the rules are followed and report should be maintained

- **Transfer and acquisition of animals for experiments :**

- ✓ Transferring animals by selling or by breeder to unregister establishment is not legal under this act
- ✓ Any establishment after purchasing animal should not sell them to any other and unregistered breeder or establishment
- ✓ Importing an animal which is already available in country by breeder or establishment is not legalised

Records :

Record should be maintained and prevented to the committee whenever asked for

Number or species of animals in laboratory should be informed to secretary or officer appointed by committee

Power to suspend or revoke registration

when the rules are not followed by establishment , breeder or IAEC , it may cancel their registration after giving a warning

Committee can cancel registration of establishment or breeder not acting in accordance with provision

Offences and Penalties :

1. If individual-

Hide any animal to avoid inspection

Does not allow any individual or police officer to enter and inspect the place where experiments are conducted

Exhibit or trains any animals not registered under this amendment
Exhibit or trains any animals with respect to which he / she is not registered

If found to be guilty of any of these offences , then fine of 500 or imprisonment of 3 months or both .