# Fisiología animal: Presentación

Pensamiento científico

Investigación científica

Experimentación

# Fisiología animal como una disciplina científica integradora y experimental

## Enfoques:

Mecanístico

Comparado

Evolutivo

Ambiental y ecológico

Check for updates

# EDITORIALS

## Waste in covid-19 research

A deluge of poor quality research is sabotaging an effective evidence based response

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The medical research world is responding to the covid-19 pandemic at breathtaking speed. There has been a maelstrom of global research, with mixed consequences. Positives include the greater provision of open access to covid-19 studies, some increased collaboration, expedited governance and ethics approvals of new clinical studies, and wider use of preprints. But many problems have become evident. Before the pandemic,

### Preprints

Preprints have provided valuable early access to study results. Postings in MedRxiv have increased over 400% (from 586 for the last 15 weeks of 2019 to 2572 for the first 15 weeks of 2020), while views and downloads have increased 100-fold.[5] Many

Trials

Preprints

Waste, duplication

- **Using scientific method**
  - Characteristics of scientific hypotheses:
    - Testable against the empirical world
    - Relying on or derived from observation or experiment
    - Verifiable or provable by means of observation or experiment
    - Conclusions are tentative
    - It is falsifiable
- Generate hypothesis (based on prior observations)
- State your methods. Methods are the blueprint for your experiment such as sample size, number of replications, etc.
- Gather and analyze data
- Draw conclusions.
- If a hypothesis is very powerful in explaining a large variety of related phenomena, it may be called a **theory**.

# Experimental Sciences

- Questions about animal life can be grouped into two major categories:

  1. Questions which seek to understand proximate causes that underlie functioning of biological systems at all levels of complexity. represent experimental science. Include problems of explaining how animals perform their metabolic, physiological and behavioral functions at molecular, cellular, organismal and population levels.

  2. Questions addressing ultimate causes that have generated biological systems and their properties through evolutionary time.

- Include questions such as:

  - What factors have caused some birds to acquire complex patterns of seasonal migration between temperate and tropical regions?

  - Answering these questions requires the comparative methods.

Examples of experimental sciences:

- Molecular biology
- Cell biology
- Endocrinology
- Immunology
- Physiology
- Developmental biology
- Community ecology
- Comparative biochemistry
- Molecular evolution
- Comparative cell biology
- Comparative anatomy
- Comparative physiology
- Phylogenetic systems

# Niveles de explicación
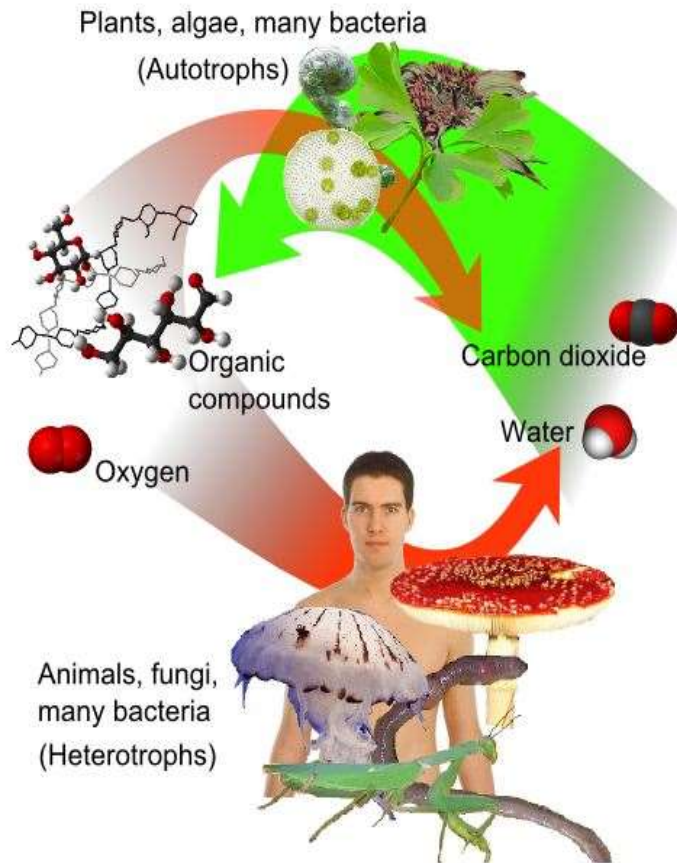


-Técnicas celulares y moleculares
-Análisis bioquímico
-Órganos aislados y sistemas de tejidos
-Comportamiento
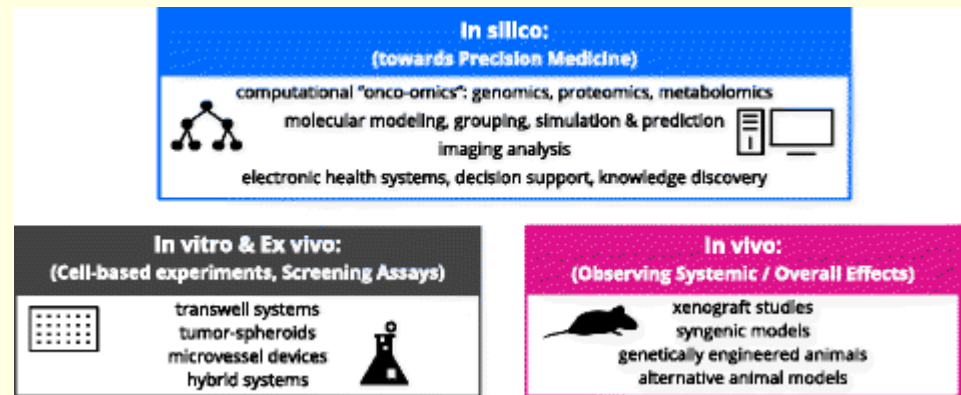
# The Scientific Method

- The scientific method is a way to solve a problem

- This is the method on which all projects should be based.

The Scientific Method involves the following steps:
- Making observations
- Formulating a hypothesis
- Designing a controlled experiment
- Collecting and interpreting data
- Forming a conclusion
- Comparing the conclusion with existing knowledge
- Reporting and publishing the results
- Developing theories and principles

# What is an experiment?

1. An experiment is a **controlled test**.

2. Only **one** variable should be changed at a time.

   a. Independent variable – changed by the experimenter.

   b. Dependent variable (Responding) – the effect.

3. Constants do not change.

4. Controlled variables are those which could change, but are not allowed to.

5. Two parts to an experiment:

   a. Control group – normal conditions.

   b. Experimental group(s) – variables are Changed.

6. Prediction is the goal of experiments.

# How to organise an experiment
## The Principles of Experimentation

1. Plan and design the experiment
2. Be aware of Safety procedures
3. Select organisms at random
4. Use a large enough sample size
5. Use a control group
6. Use Double-blind testing
7. Change one factor at a time
8. Measure changes
9. Analyze the results
10. State possible sources of error
11. Repeat the experiment

10

# An example of an experiment

**Observation**: It has been suggested that large daily doses of Vitamin C protect against the common cold virus.

**Hypothesis**: Vitamin C protects against the common cold virus

**Experiment design**: Ten adult males in their mid twenties who are friends of the investigator were chosen to test the possible value of vitamin C.

5 of them were given 3000mg of vitamin C a day; the other 5 were given a placebo.

Which is the control group?

Which is the experimental group?
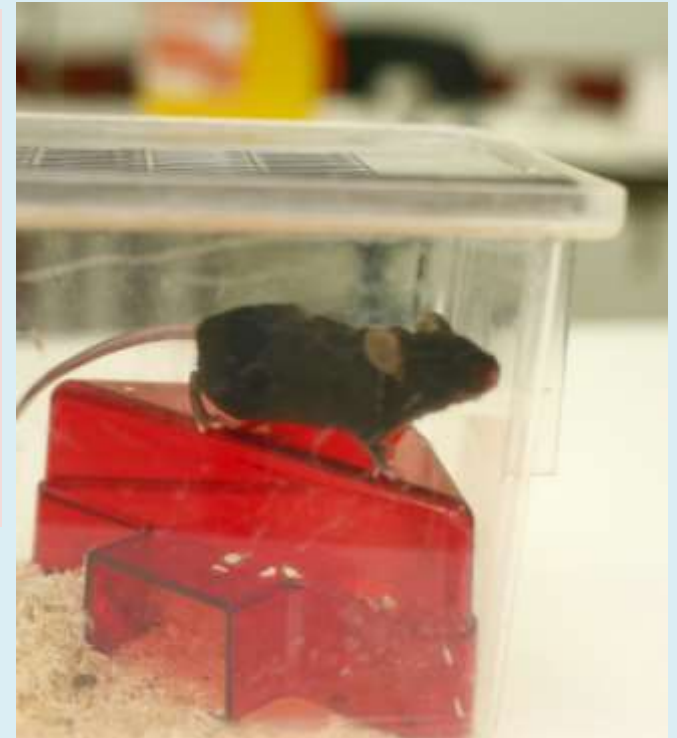
Is this a good experiment?

# Animal Research and Alternatives

*Learning objectives*

- Know basic facts of animal research
- Explain why animal models are used
- Assess whether the 3Rs are moral

**Starter:**

**What do you think when someone says "animal testing" or "animal research"**



Understanding
ANIMAL RESEARCH

# Why are animals used?

Researchers aim to understand how our body functions (*physiology*) and the diseases that affect us (*pathology*).

They must study living systems and the effect that diseases have on them – this often involves research that would not be ethical to carry out on humans, so animals are used.

Despite the difference in appearance between humans and animals they have a very similar biology (they are *anatomically* similar). Even mice and men are around 99% genetically similar.
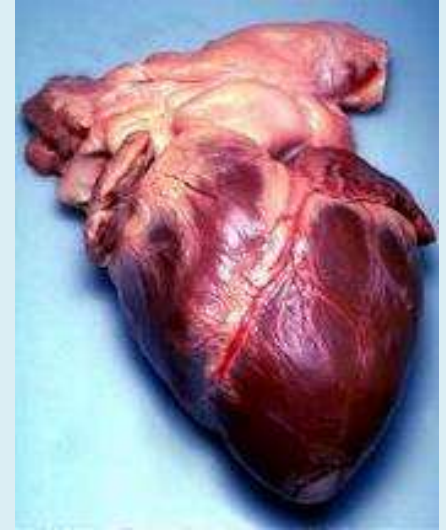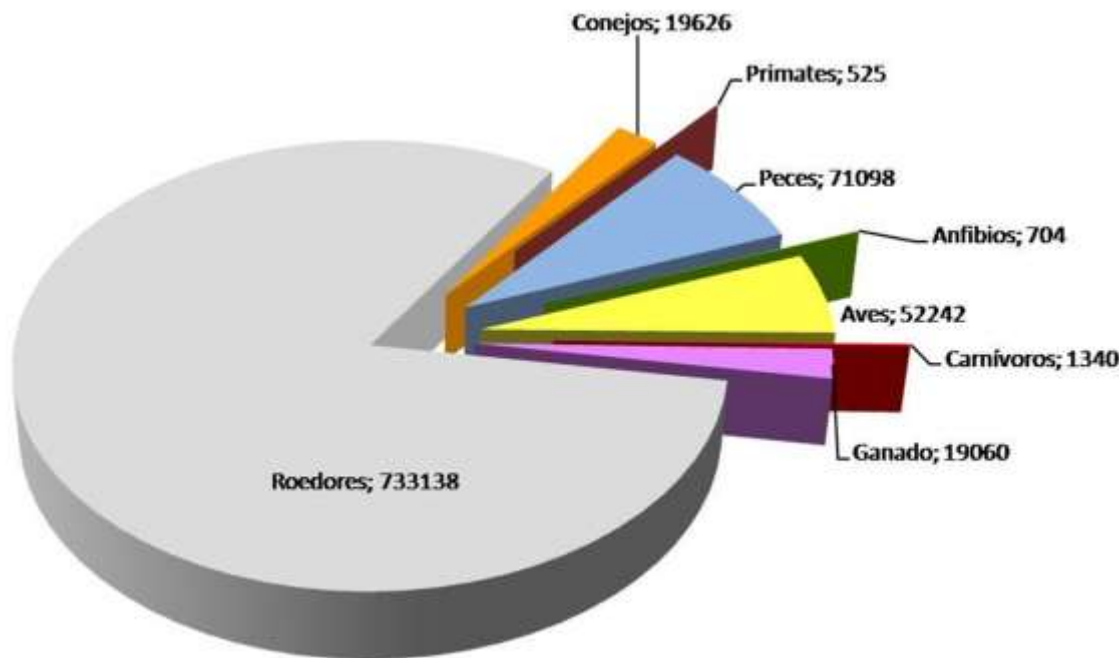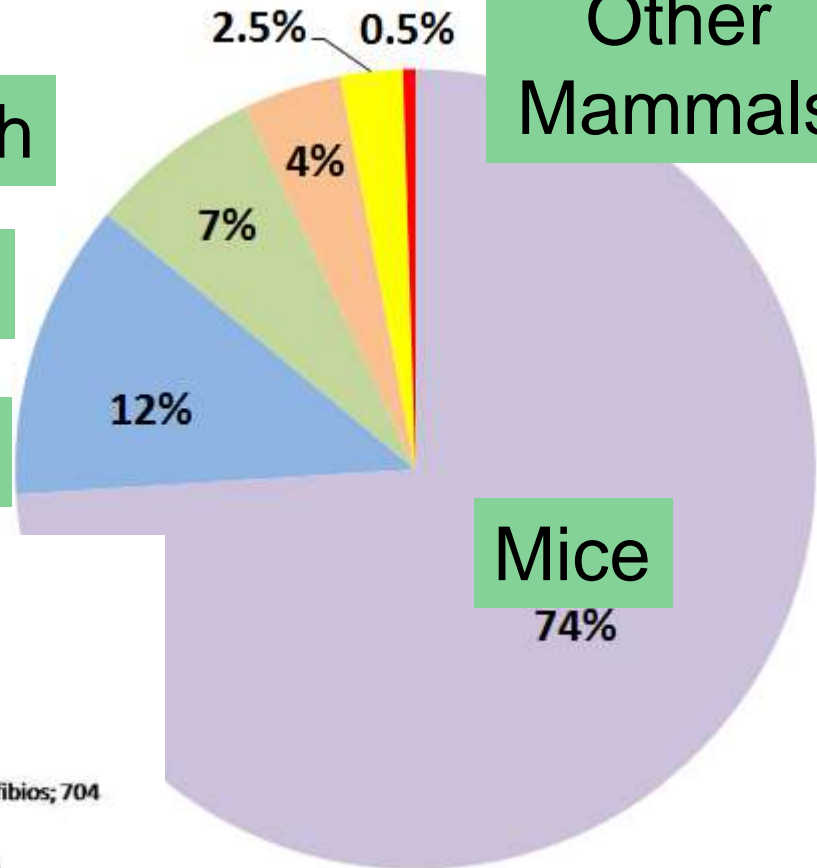
# Which Percentage Applies To Which Animals?

Reptiles / Amphibians

Fish

Birds

Rats

Mice

Other Mammals

2.5%   0.5%

4%

7%

12%

74%

Conejos; 19626

Primates; 525

Peces; 71098

Anfibios; 704

Aves; 52242

Carnívoros; 1340

Ganado; 19060

Roedores; 733138

# Modelos animales

**Comparing two animals, write down how you think the regulations on animal welfare will differ.**

**Species you could discuss:**
Fruit Flies
Mice
Fish
Cows
Birds
Dogs
Monkeys

**Points to consider:**

Cage sizes

Cage enrichment (toys etc.)

Housing animals together

Playtime

Veterinary checks

What research can be done

# The 3Rs

The 3Rs are principles of good science designed by scientists to improve animal welfare and scientific accuracy.

**Refinement** – Finding ways of making animals' lives better in labs, this can include toys for animals or better training for technicians

**Reduction** – Using as few animals as possible to get good results

**Replacement** – Using non-animal alternatives wherever they exist

# Alternatives

Scientists use many ways to try to replace animals used in research. These include using cell cultures, computer modelling and human studies.
Researchers **must,** by law, use these techniques if they would be as effective as using animals.
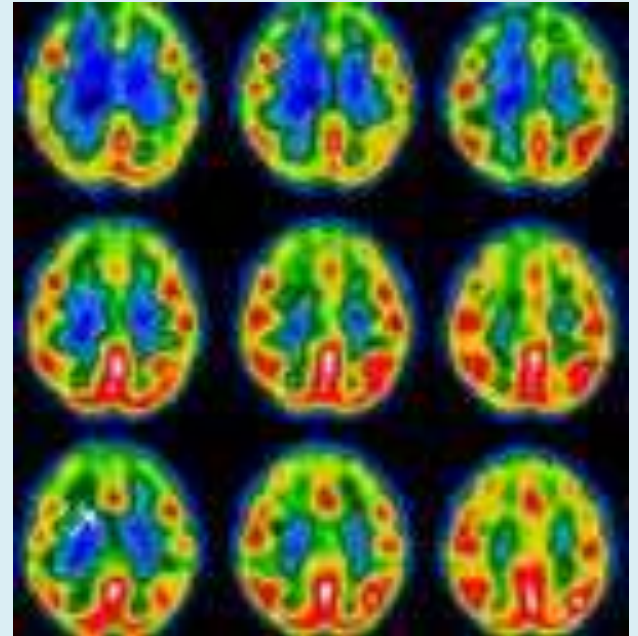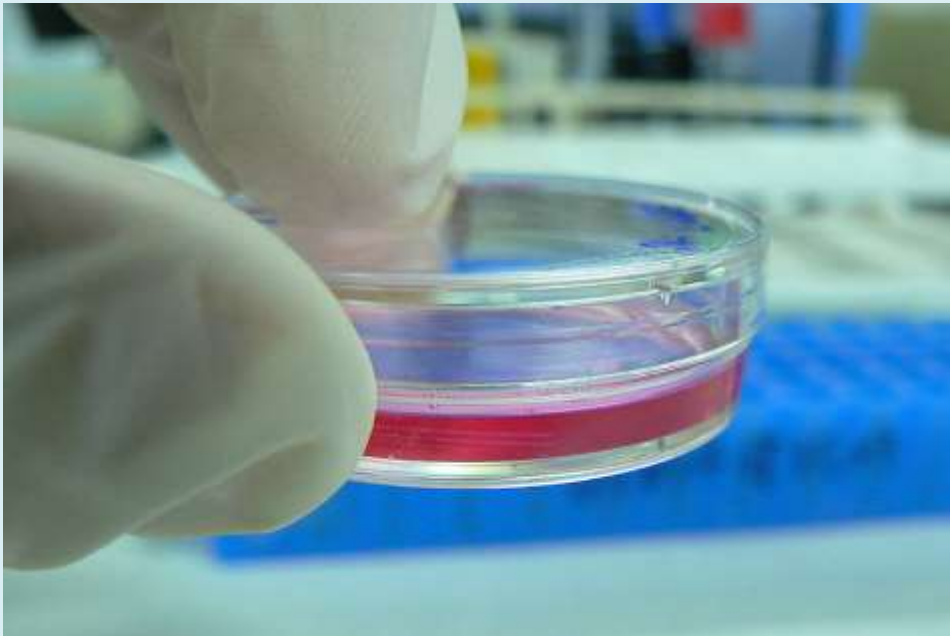
# Alternatives

Researchers also try to use the "lowest" type of animal possible for their experiment – perhaps a fish instead of a sheep or a fruit fly instead of a mouse.

Why do you think scientists try to replace animal use? Why use "lower" animals – **do you agree with this idea?**



**or**