

Introduction to Animal Science

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1. What Is Animal Science?

- **Definition** – The scientific study of domestic and non-domestic animals, focusing on their biology, physiology, genetics, nutrition, behavior, and management.
 - **Goal** – To improve animal health, productivity, welfare, and the sustainability of animal-based food systems.
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2. Historical Perspective

Period	Milestones	Impact
Ancient civilizations (?3000 ?BC)	Domestication of sheep, goats, cattle, pigs	First systematic use of animals for food, labor, and clothing
Middle Ages	Development of selective breeding (e.g., cattle “improvement” in England)	Early genetic concepts, improved yields
19th-century	Foundations of modern veterinary medicine; Mendel’s genetics (1865)	Scientific basis for breeding and disease control
20th-century	Emergence of animal nutrition, reproductive technologies, and animal welfare science	Integrated, multidisciplinary approach
21st-century	Genomics, precision livestock farming, sustainability research	Data-driven decisions, reduced environmental footprint

3. Core Sub-Disciplines

Sub-discipline	Primary Focus	Typical Applications
Animal Nutrition	Digestive physiology, feed formulation, nutrient metabolism	Optimizing growth, milk production, reproduction

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Sub?discipline	Primary Focus	Typical Applications
Reproductive Physiology	Estrous cycles, gamete biology, assisted reproductive technologies (AI, IVF)	Improving fertility, genetic progress
Genetics & Breeding	Heritability, selection indices, molecular markers	Developing superior breeds for meat, milk, wool, disease resistance
Animal Physiology	Organ system function, stress responses, thermoregulation	Managing health under varied environments
Animal Behavior & Welfare	Social structures, stress indicators, enrichment	Enhancing welfare, meeting regulatory standards
Health & Disease Management	Immunology, epidemiology, biosecurity, veterinary therapeutics	Preventing and treating infectious and metabolic diseases
Production Systems	Extensive, intensive, organic, pasture? based, integrated crop?livestock	Designing efficient, sustainable farm enterprises
Environmental Impact	Greenhouse gas emissions, nutrient runoff, life?cycle assessment	Reducing carbon footprint, improving resource use efficiency

4. Fundamental Concepts

4.1. Animal Biology Basics

- **Cellular Structure** – Mammalian cells have specialized organelles (mitochondria, ribosomes) that support high metabolic rates.
- **Metabolism** – Energy derived from carbohydrates, fats, and proteins; balance between **anabolism** (building) and **catabolism** (breakdown).
- **Homeostasis** – Maintenance of internal stability (temperature, pH, electrolytes) through feedback mechanisms.

4.2. Nutrition Essentials

Nutrient	Function	Example Sources
Carbohydrates	Primary energy for glycolysis	Grains, corn, barley
Proteins	Tissue growth, enzyme synthesis	Soybean meal, fish meal

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Nutrient	Function	Example Sources
Fats	Concentrated energy, fatty acid supply	