

Introduction to Animal Nutrition

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Key concepts, components, and practical considerations for the health and productivity of livestock, companion animals, and wildlife.

1. Why Nutrition Matters

Reason	Impact on Animals
Growth & Development	Supplies building blocks for tissues, bones, and organs.
Reproduction	Influences fertility, gestation length, milk production, and offspring vigor.
Immune Function	Adequate nutrients support disease resistance and recovery.
Productivity	Determines milk yield, egg production, meat quality, wool, and work performance.
Longevity & Welfare	Prevents metabolic disorders, obesity, and nutrient deficiency diseases.

2. Basic Nutrient Classes

Nutrient	Primary Function	Common Sources
Energy (Carbohydrates, Fats, Proteins)	Fuels maintenance, activity, growth, and lactation.	Grains, oilseeds, molasses, animal fats.
Protein (Amino Acids)	Tissue synthesis, enzymes, hormones, immune proteins.	Soybean meal, fish meal, alfalfa, meat bone meal.
Minerals	Structural (Ca, P), electrolyte balance (Na, K, Cl), enzyme cofactors (Zn, Cu, Se, Mn).	Limestone, dicalcium phosphate, salt, trace mineral premixes.
Vitamins	Metabolic regulators, antioxidant protection, vision, bone health.	Vitamin A (carotene), D, E (tocopherol), B complex, C (for some species).
Water	Solvent, temperature regulation, nutrient transport, digestion.	Fresh, clean water; electrolytes in hot climates.

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Nutrient	Primary Function	Common Sources
Fiber (Digestible & Indigestible)	Stimulates gut motility, provides energy via fermentation (ruminants).	Forages, beet pulp, soybean hulls, hay.

3. Species-Specific Digestive Strategies

Species Group	Digestive Anatomy	Main Energy Source	Special Nutritional Needs
Ruminants (cattle, sheep, goats)	4-compartment stomach (rumen, reticulum, omasum, abomasum)	Volatile fatty acids (VFAs) from fiber fermentation	High-quality forage, adequate rumen-available protein, mineral balance (Ca:P ~ 2:1)
Monogastrics (pigs, chickens, dogs, cats)	Simple stomach, pancreas, small intestine	Starch & simple sugars; dietary fats	Precise amino-acid balance (lysine, methionine), vitamin A for poultry, taurine for cats
Avian (laying hens, turkeys)	Crop, gizzard, short intestine	Grains + supplemental fats	Calcium for eggshell (~ 3–4 % of diet), vitamin D, balanced methionine
Fish	Simple gut, variable stomach presence	Lipids & highly digestible proteins	Omega-3 fatty acids (EPA/DHA), water-soluble vitamins, low ash
Companion Animals	Similar to monogastrics but with species-specific quirks	Dogs: mixed diet; Cats: obligate carnivores	Cats need preformed arachidonic acid, vitamin A, taurine; dogs tolerate plant proteins

4. Formulating a Balanced Diet

1. **Determine Nutr