

SCIENTIFIC DIETS FOR PETS AND IMPORTANT CONSIDERATIONS IN THEIR CARE

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ABSTRACT

Proper nutrition is a key factor determining the health, growth, and lifespan of pets, especially dogs and cats. This article presents the principles of formulating a scientific diet based on nutritional requirements for protein, lipids, carbohydrates, vitamins, minerals, and water. It also analyzes differences in nutritional needs by species, age, and physiological condition, and compares commercial pet food with homemade diets. The paper further identifies common feeding mistakes such as unbalanced diets, excessive energy intake, and the use of inappropriate food. In addition, care-related factors including body condition monitoring, environmental hygiene, vaccination, physical activity, and regular veterinary check-ups are emphasized to ensure overall pet health. The findings indicate that applying a scientifically balanced diet combined with proper care plays an important role in disease prevention and improving the quality of life of pets.

Keyword: *Pets; diet; nutrition; dogs; cats; veterinary care; animal health; commercial pet food; homemade food.*

1. INTRODUCTION

In the context of modern society, pets, especially dogs and cats, are increasingly playing an important role in human life, not only as animals but also as members of the family. The rapid increase in the number of pets has led to a growing demand for improved quality of care, in which nutrition is a core factor determining the health, growth, reproduction, and lifespan of animals. However, in practice, the awareness of a portion of pet owners regarding scientifically balanced diets remains limited, resulting in various consequences such as nutritional imbalance, obesity, malnutrition, and metabolic disorders.

In addition, the diverse development of the pet food market, with a wide range of products of varying quality, poses challenges in selecting appropriate diets. The use of substandard commercial pet food or the preparation of homemade diets without a scientific basis may lead to deficiencies or excesses of essential nutrients. Moreover, the nutritional needs of pets are not fixed but vary depending on species, breed, age, physiological condition, and health status, requiring owners to have sufficient knowledge to adjust diets appropriately.

Alongside nutrition, care-related factors such as environmental hygiene, vaccination, parasite control, and physical activity are closely associated with the overall health status of pets. A lack of proper coordination between diet and care practices may reduce the effectiveness of disease prevention and treatment.

Based on these issues, this article aims to synthesize and systematize the principles of formulating scientific diets for pets, while also analyzing important considerations in their care in order to improve feeding efficiency, disease prevention, and the quality of life of animals under current pet-raising conditions.

2. BASIC NUTRITIONAL REQUIREMENTS OF PETS

The nutritional needs of pets, especially dogs and cats, form an essential foundation for maintaining physiological functions, growth, reproduction, and disease prevention. A balanced diet must provide adequate amounts of essential nutrients, including protein, lipids, carbohydrates, vitamins, minerals, and water. Deficiency or excess of any component may lead to metabolic disorders and serious health problems.

2.1. Protein

Protein is the most important nutrient in the diet of pets, playing a vital role in tissue building and repair, as well as in the formation of enzymes, hormones, and antibodies. Protein requirements depend on species, age, and physiological condition.

In adult dogs, the minimum protein content in the diet typically ranges from 18 to 25 percent of dry matter, while puppies or pregnant and lactating dogs require higher levels, up to 25 to 30 percent. For cats, which are obligate carnivores, protein requirements are significantly higher, usually from 26 to 30 percent or more, due to their limited ability to synthesize certain essential amino acids.

Protein quality is as important as quantity. Animal-based proteins such as meat, fish, and eggs generally have high biological value and contain essential amino acids such as lysine, methionine, and tryptophan. In particular, cats require taurine, an essential amino acid that they cannot synthesize in sufficient amounts. Taurine deficiency may lead to retinal degeneration and dilated cardiomyopathy.

Protein deficiency can result in stunted growth, weakened immunity, and reproductive disorders, whereas excessive protein intake over a long period may increase the metabolic burden on the liver and kidneys, especially in older animals or those with underlying conditions.

2.2. Lipids (Fats)

Lipids are a concentrated source of energy, providing about 2.25 times more energy than protein and carbohydrates. They also play an important role in cell membrane structure and in the absorption of fat-soluble vitamins such as A, D, E, and K.

The fat requirement in dogs typically ranges from 8 to 15 percent of the diet, while cats require about 10 to 20 percent depending on their developmental stage and activity level. Essential fatty acids such as omega-3 (EPA, DHA) and omega-6 (linoleic acid, arachidonic acid) are important for maintaining healthy skin and coat, supporting nervous system function, and regulating inflammatory responses.

In cats, arachidonic acid must be supplied through the diet because their bodies cannot synthesize it from plant-based precursors. Lipid deficiency may cause dry skin, hair loss, reduced reproductive capacity, and weakened immunity. Conversely, long-term high-fat diets may lead to obesity and related conditions such as diabetes or lipid metabolism disorders.

2.3. Carbohydrates

Carbohydrates are not considered essential nutrients for cats, but they serve as a quick energy source and help spare protein in the diets of dogs. In dogs, carbohydrates may account for 30 to 60 percent of the diet, depending on activity level and type of feed.

Common carbohydrate sources include rice, corn, potatoes, wheat, and legumes. In addition to providing energy, certain complex carbohydrates such as dietary fiber support the digestive system, improve intestinal motility, and help maintain a stable gut microbiota.

However, carbohydrate intake should be carefully controlled. Cats have a more limited ability to digest starch compared to dogs, so diets that are too high in carbohydrates may lead to obesity and increase the risk of diabetes. For both dogs and cats, low-quality or poorly digestible carbohydrates may cause digestive disturbances such as diarrhea or bloating.

2.4. Vitamins

Vitamins are micronutrients required in small amounts but play essential roles in regulating physiological and metabolic processes. They are divided into two main groups: water-soluble vitamins (B-complex and C) and fat-soluble vitamins (A, D, E, and K).

- Vitamin A: essential for vision, growth, and immune function. Cats cannot convert beta-carotene from plants into vitamin A, so it must be supplied directly from animal sources.
- Vitamin D: involved in calcium and phosphorus metabolism and necessary for bone development.
- Vitamin E: an important antioxidant that protects cell membranes.

- Vitamin K: required for blood clotting.
- B-complex vitamins: involved in energy metabolism and nervous system function.

Vitamin deficiencies can lead to various specific disorders such as rickets (vitamin D deficiency), neurological disorders (vitamin B deficiency), or weakened immunity. However, excessive supplementation, particularly of fat-soluble vitamins, may also cause toxicity.

2.5. Minerals

Minerals play structural roles in bones and teeth and are involved in numerous biochemical processes in the body. Key minerals include:

- Calcium and phosphorus: essential for skeletal development, with an ideal Ca:P ratio typically ranging from 1.2:1 to 1.5:1.
- Iron: involved in hemoglobin formation and oxygen transport.
- Zinc: necessary for skin, coat health, and immune function.
- Sodium, potassium, and chloride: maintain electrolyte balance and osmotic pressure.

Mineral imbalances, especially during growth, can lead to bone deformities, osteoporosis, or urinary stones. For example, excessive magnesium and phosphorus intake may be associated with stone formation in cats.

2.6. Water

Water is the most essential component, accounting for approximately 60 to 70 percent of a pet's body weight and participating in nearly all physiological processes such as digestion, circulation, excretion, and temperature regulation.

Water requirements depend on diet (dry or wet food), activity level, and environmental conditions. On average, dogs require about 50 to 70 ml of water per kilogram of body weight per day, while cats tend to drink less and are more prone to dehydration if their diet mainly consists of dry food. Water deficiency may lead to dehydration, electrolyte imbalance, and an increased risk of kidney disease, especially in cats. Therefore, it is important to ensure a constant

supply of clean, accessible water that is refreshed regularly.

3. FORMULATING A SCIENTIFIC DIET

Formulating a scientific diet for pets involves not only providing sufficient essential nutrients but also ensuring balance and suitability with the biological characteristics and specific needs of each individual. A proper diet should be designed based on various factors such as species, age, physiological condition, activity level, and health status. Personalizing diets is an important trend in modern veterinary nutrition, contributing to improved feeding efficiency and disease prevention.

3.1. By Species

Differences in physiological characteristics and feeding behavior among pet species are the first factors to consider when formulating diets.

For dogs:

Dogs (*Canis lupus familiaris*) are omnivores with high adaptability to a wide variety of foods. Their digestive system can process both animal and plant proteins as well as complex carbohydrates. Therefore, a dog's diet can be flexible, including meat, fish, grains, vegetables, and fiber sources. However, despite their omnivorous nature, animal protein should still constitute the primary component due to its high biological value. A dog's diet must be balanced in terms of energy and nutrients to prevent obesity, a common issue in pets raised in urban environments. In addition, nutritional requirements in dogs vary depending on breed (large or small), activity level, and living conditions.

For cats:

Cats (*Felis catus*) are obligate carnivores with unique metabolic characteristics that make them highly dependent on animal-based nutrition. They have high protein requirements and cannot synthesize sufficient amounts of certain essential nutrients such as taurine, arachidonic acid, and vitamin A from plant precursors.

Taurine is an essential amino acid for cats, playing a critical role in cardiovascular function, vision, and reproduction. Taurine deficiency can lead to

dilated cardiomyopathy, retinal degeneration, and impaired reproductive performance. Therefore, a cat's diet must include high-quality animal protein sources. Additionally, cats have a more limited capacity to utilize carbohydrates compared to dogs, so dietary starch content should be strictly controlled. Inappropriate diets may increase the risk of obesity and diabetes, especially in indoor cats.

3.2. By Age

The nutritional needs of pets vary significantly across different life stages; therefore, diets must be adjusted accordingly.

Young animals (growth stage):

During this stage, pets experience rapid growth and have higher requirements for energy, protein, and minerals, particularly calcium and phosphorus, compared to adulthood. Diets should be energy-dense and easily digestible, while maintaining a balanced nutrient ratio to support the development of bones, muscles, and internal organs. Nutritional deficiencies at this stage may result in stunted growth, rickets, or weakened immunity. Conversely, excessive energy intake, especially in large-breed dogs, may lead to skeletal development disorders.

Adult stage:

At this stage, the goal of nutrition is to maintain stable body condition, appropriate body weight, and normal physiological function. Diets should be balanced in protein, lipids, and carbohydrates, in accordance with the pet's activity level. Portion control is crucial to prevent obesity, which is a risk factor for many diseases such as diabetes, cardiovascular diseases, and joint degeneration.

Senior animals (aging stage):

As pets age, they tend to have reduced activity levels, decreased muscle mass, and diminished digestive function. Therefore, diets should contain lower energy to prevent weight gain, while increasing fiber content to support digestion. In addition, supplementation with nutrients that support joint health, such as glucosamine and chondroitin, along with antioxidants and omega-3 fatty acids, is recommended to slow the aging

process and improve quality of life. Protein intake should still be maintained at an appropriate level to minimize muscle loss.

3.3. By Physiological Condition

Physiological status has a significant impact on nutritional requirements and should be considered when formulating diets.

Pregnancy and lactation:

During pregnancy and especially lactation, the energy and nutritional requirements of pets increase substantially, often 1.5 to 2 times higher than normal. Diets should be rich in protein, energy, and micronutrients to support fetal development and milk production. Nutritional deficiencies during this stage may negatively affect both the mother and offspring, leading to reduced survival rates of the young or maternal exhaustion.

Disease conditions:

For pets with conditions such as liver, kidney, cardiovascular diseases, or metabolic disorders, diet plays an important supportive role in treatment.

- Kidney disease: requires reduced protein intake (while maintaining high quality), lower phosphorus, and controlled sodium levels.
- Liver disease: requires easily digestible protein and supplementation with antioxidants.
- Heart disease: requires sodium control and taurine supplementation, especially in dogs.

These diets are typically specialized and should be formulated under veterinary guidance. Improper dietary adjustments may worsen the condition.

3.4. Commercial Food and Homemade Diets

Choosing the appropriate type of food is a key factor in developing a scientific diet.

Commercial pet food:

Commercial pet food is produced based on

standardized nutritional formulations, ensuring a complete and balanced supply of essential nutrients. High-quality products are often tested and meet international nutritional standards. The advantages of commercial food include convenience, ease of storage, consistent composition, and reduced risk of micronutrient deficiencies. In addition, there are specialized product lines tailored to different life stages or medical conditions. However, pet owners should select products with clear origins, transparent ingredient lists, and suitability for their pets' needs.

Homemade diets:

Homemade diets allow owners to control ingredients and cater to pets' preferences. However, formulating such diets requires adequate nutritional knowledge to ensure balance. Common mistakes in homemade diets include micronutrient deficiencies (such as calcium, vitamins, and minerals), improper nutrient ratios, or the use of unsuitable ingredients. Feeding only meat or plain rice can lead to serious nutritional imbalances. Therefore, if applying a homemade diet, it is advisable to consult a veterinary nutritionist or use scientifically validated formulations.

3.5. General Principles in Diet Formulation

Regardless of the type of food, a scientific diet should follow these principles:

- Meet the full nutritional requirements according to species and individual needs
- Maintain balance among nutrient groups
- Be appropriate for age, physiological condition, and health status
- Ensure food safety and hygiene
- Be regularly monitored and adjusted based on the pet's body condition

In total, formulating a scientific diet is a complex process that requires comprehensive knowledge of pet nutrition and physiology. Proper application of these principles not only optimizes health but also helps prevent many common diseases in veterinary practice today.

4. COMMON FEEDING MISTAKES

In practice, many pet owners still make common mistakes in formulating diets, which negatively affect animal health. One of the most frequent errors is feeding pets human food, which often contains high levels of salt, seasonings, and additives that are unsuitable for the digestive systems of dogs and cats. This can lead to digestive disorders, liver and kidney damage, and metabolic diseases. In addition, overfeeding is a primary cause of obesity in pets, especially under conditions of confinement and low physical activity. Failure to control portion sizes according to body weight and activity level also contributes to energy imbalance. Moreover, diets that lack variety and fail to provide all essential nutrient groups may result in micronutrient deficiencies, affecting growth and immune function. Another commonly overlooked mistake is not providing sufficient clean water, which increases the risk of dehydration and kidney-related diseases, particularly in cats.

5. CONSIDERATIONS IN PET CARE

Caring for pets involves not only providing an appropriate diet but also includes various factors related to health management and the living environment. The coordinated application of these care measures contributes to improved feeding efficiency and disease prevention.

5.1. Monitoring Body Condition

Regular monitoring of body weight and overall condition is necessary to evaluate the effectiveness of the diet and make timely adjustments. Indicators such as the Body Condition Score help assess nutritional status, thereby preventing both malnutrition and obesity.

5.2. Hygiene and Living Environment

A clean, dry, and well-ventilated living environment is essential to limit the growth of bacteria, viruses, and parasites. Housing areas, feeding spaces, and equipment should be cleaned regularly to reduce the risk of disease transmission.

5.3. Vaccination and Parasite Control

Proper vaccination and regular deworming are essential measures for preventing infectious diseases and parasitic infections. Following vaccination and deworming schedules as recommended by veterinarians helps ensure long-term health protection for pets.

5.4. Physical Activity

Physical activity plays an important role in maintaining a healthy body weight, improving cardiovascular health, and reducing stress in pets. Depending on species, breed, and age, an appropriate exercise regimen should be established to support overall development.

5.5. Regular Veterinary Check-ups

Routine health check-ups help detect early signs of abnormalities and underlying diseases, allowing for timely intervention. Veterinarians can also provide guidance on adjusting diets according to each pet's health condition.

6. CONCLUSION

A scientifically balanced diet plays a central role in pet care and health improvement. Understanding nutritional requirements by species, age, and physiological condition enables owners to develop appropriate feeding strategies, contributing to disease prevention and extended lifespan. In addition, combining proper nutrition with comprehensive care measures such as environmental hygiene, vaccination, physical activity, and regular health monitoring creates a solid foundation for sustainable development and improved quality of life for pets under modern care conditions.

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