CATS and DOG NUTRITION

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NUTRIENT AND ENERGY REQUIREMENTS IN DOGS AND CATS

1. NUTRIENT GROUPS	2. KEY FUNCTIONS / INFORMATION
WATER	• Essential for all body functions, digestion, nutrient transport and temperature regulation.
PROTEIN	• Builds and repairs tissues, supports enzymes, hormones, immune function.
FATS	• Concentrated energy source, supports skin & coat health, absorbs fat-soluble vitamins.
CARBOHYDRATES	• Provide energy; support digestive health.
VITAMINS	• Regulate metabolic processes, support immunity, growth, vision, and more.
MINERALS	• Support bones, teeth, enzyme function, fluid balance and nerve function.

A balanced and complete diet that meets all nutrient and energy requirements is essential for the health, well-being and longevity of dogs and cats.

WATER

1. ACCORDING TO DRY MATTER (DM) INTAKE

Water intake should be
2–4 × DM intake

2. ACCORDING TO BODY WEIGHT (BW)

- **Dogs:** 50–60 ml/kg BW/day

3. ACCORDING TO ENERGY INTAKE

200 kcal/day energy intake
= **200 ml water intake**

Cats drink water less than dogs
(desert animal)

Formation of urinary calculi

Adequate water intake is essential for:

- Body functions
- Digestion
- Nutrient transport
- Temperature regulation
- Kidney health

Fresh, clean water should always be available for both dogs and cats.

ENERGY

1. ENERGY PRODUCING NUTRIENTS

- Carbohydrates
- Fat
- Protein (built of amino acids)

2. FACTORS THAT AFFECT ENERGY REQUIREMENTS

- Growth
- Lactation
- Stress
- Physical exertion
- Breed
- Environmental conditions
- Age

3. CALCULATION OF ENERGY REQUIREMENT

- **RER = Resting Energy Requirement:**
  RER represents the energy requirement for a normal but fed animal at **REST** in a thermoneutral environment.
- RER = 70 ($BW^{0.75}$ kg)
- RER = 30 (BW kg) + 70 for (≥2 to ≤45 kg BW)

- **MER = Maintenance Energy Requirement:**
  MER represents the energy requirement of a **MODERATELY ACTIVE** adult animal in a thermoneutral environment.
- MER = 1.0 – 1.8 RER

- RER can also be multiplied by a factor to account for different life stages of the animal
  – Examples
  - Puppies 3 × RER
  - Kittens 2.5 × RER
  - Gestation 3 × RER
  - Lactation dogs 4 to 8 × RER
  - Lactation cats 2 to 6 × RER

Energy is essential for all body functions, growth, reproduction, activity and maintaining health and well-being.

PROTEIN

KEY POINTS

Cats and dogs do not need protein, they need **amino acids.**

There are **22 amino acids** that animals need.
Animals can synthesize 12 of them.

The remaining ones must be obtained from the diet **(essential amino acids).**

Dogs can synthesize **taurine**, so it does not need to be supplemented in their food.

ESSENTIAL AMINO ACIDS

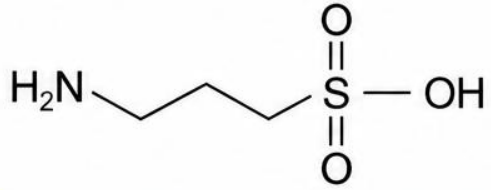
- Arginine
- Histidine
- Isoleucine
- Leucine
- Lysine
- Methionine
- Phenylalanine
- Threonine
- Tryptophan
- Valine

FOR CATS: TAURINE

TAURINE

- Taurine is an amino sulfonic acid and is in the list of 25 amino acids. However, taurine is not part of the peptide chains of proteins.

CHEMICAL STRUCTURE OF TAURINE



- **Taurine is necessary for:**

- Proper bile formation

- Health of the eye

- Functioning of the heart muscle

- Cats require a high amount of taurine for their body functions, but have limited enzymes to produce taurine from other amino acids such as methionine and cysteine.

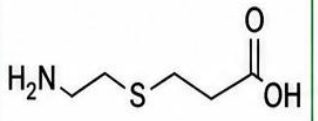
Taurine is essential for cats and must be provided in adequate amounts in their diet.

SYNTHESIS OF TAURINE FROM OTHER AMINO ACIDS

Taurine can be synthesized from the amino acids **methionine** and **cysteine** through a series of enzymatic reactions in the taurier.

FROM METHIONINE

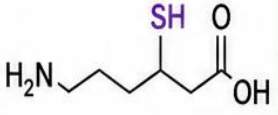
Methionine



Transamination

Aminotransferase

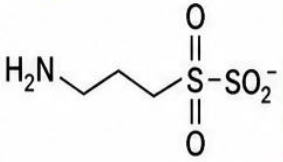
Cysteine



Oxidation

Cysteine dioxygenase

Cysteinesulfinate

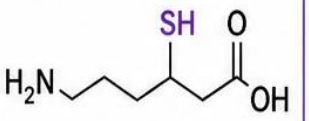


Decarboxylation

Cysteine sulfinic acid decarboxylase

FROM CYSTEINE

Cysteine



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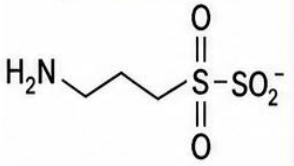
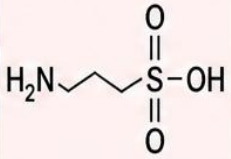


Decarboxylation

Cysteine sulfinic acid decarboxylase

TAURINE



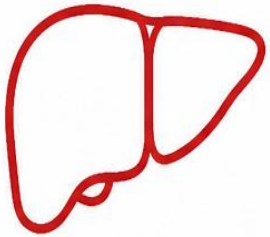
Cats have limited ability to synthesize taurine from methionine and cysteine. **Therefore, taurine is an essential nutrient for cats** and must be obtained from the diet.

ENZYMES INVOLVED

Aminotransferase	Cysteine dioxygenase	Cysteine sulfinic acid decarboxylase
Converts methionine to cysteine	Oxidizes cysteine to cysteinesulfinate	Decarboxylates cysteinesulfinate to taurine

Two Reasons Why Taurine is Important for Cats

1. Cats have insufficient enzyme activity in the liver to convert methionine and cysteine into taurine (cysteine dioxygenase and cysteine sulfinic acid decarboxylase).



   - Therefore, cats cannot synthesize adequate amounts of taurine from cysteine.

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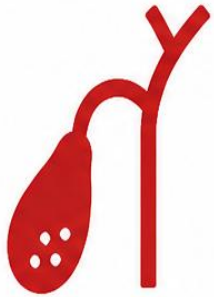
2. During the formation of bile salts, other animals can use glycine in place of taurine. However, cats cannot use glycine for this purpose and are therefore obligate users of taurine.



If taurine is deficient

- Dilated cardiomyopathy,
- Retinal degeneration,
- Reproductive failure
- The weak birth
- Retardation of growth in surviving puppies
- Immune suppression can occur

Dilated cardiomyopathy

Retinal degeneration

Reproductive failure

The weak birth

Retardation of growth in surviving puppies

Immune suppression can occur

Taurine Supplementation for Cat Foods

- 1 g/kg = 0.1% for dry foods
- 2 g/kg = 0.2% for canned foods

1 g/kg
= 0.1%
for dry foods

2 g/kg
= 0.2%
for canned foods

ARGININE

ARGININE → ORNITHINE → AMMONIA DETOXIFICATION

ARGININE → conversion (in cats: ONLY this pathway) → **ORNITHINE** → binds AMMONIA (NH_3) → **UREA CYCLE** → **UREA** (excreted in urine)

WHY ORNITHINE IS IMPORTANT?

It binds ammonia produced from protein breakdown and converts it to urea for safe excretion.

WHAT HAPPENS IN ARG. DEFICIENCY?

- Ammonia accumulates
- Hyperammonemia
- Signs: salivation, vocalization, ataxia
- Can be fatal

WHEN CAN IT OCCUR IN CATS?

- Cats not eating
- Cats with liver disease (e.g., hepatic lipidosis)

KEY TAKE HOME MESSAGE

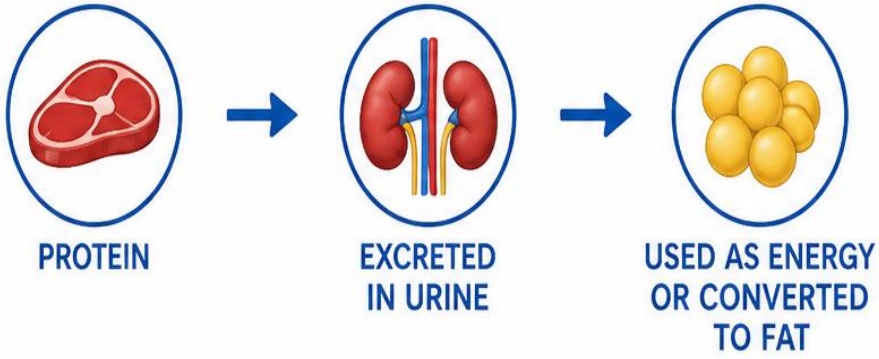
In cats, **ARGININE** is the **ONLY** source for ornithine production.

Without enough arginine, ammonia cannot be detoxified and severe health problems or death can occur.

Adequate arginine in the diet is essential for ammonia detoxification and cat health.

Protein Requirements of Dogs

Species and Growth Stage	Recommended Protein %	Recommended Fat %
Puppy	28%	17%
Adult dog	18%	9–15%
Performance dog	25%	20%
Racing sled dog	35%	50%
Lactating dog	28%	17%



- **Too much protein?**
- If a healthy dog eats too much protein, some gets excreted in the urine and the rest gets used as calories or is converted to fat.
- If a dog has a kidney problem, high protein diets are not recommended.
- Protein is the most expensive cost component in the food.

Carbohydrates

What You Need to Know

- Most commercial dry foods contain between 30% and 70% carbohydrates.
- Wild felines and canines do eat some CHO (berries and intestinal contents of the prey).
- While carbohydrates are an important part of dry commercial pet foods,

Carbohydrates Sources

- Rice, Wheat, Corn, Barley, Oats
- Potatoes, Bananas

- The cooked or extruded forms of carbohydrates are easily and rapidly digested by dogs and cats.
- Raw cereal grains are not well digested.
- Cause digestive disorders.

STARCH DIGESTIBILITY

AMYLASE ACTIVITY & ADAPTATION

- Amylase activity in dogs is **3 times more** than cats.

CATS

- Cats can tolerate **3–4 g** starch **/ kg** body weight per day without diarrhea.

DOGS

- Dogs can tolerate well over **2.5 times more** well-cooked starch **(10–12 g/kg BW/day)**

Carbohydrates: Fiber Content and Structure

FIBER CONTENT IN PET FOODS

Fiber is an important type of carbohydrate that provides health benefits without being digested.

Typical Crude Fiber Range in Dry Pet Foods

Life Stage / Type	Crude Fiber (%)
Puppy	2 – 5%
Adult dog	2 – 4%
Senior dog	3 – 6%
Active / Performance dog	2 – 4%
Weight management dog	5 – 9%
Cat (adult)	2 – 4%
Hairball control cat food	4 – 7%

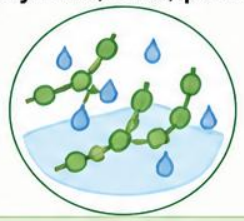
Fiber level affects stool quality, digestion, satiety and overall gastrointestinal health.

FIBER STRUCTURE

Dietary fiber is made up of complex carbohydrates that can be classified into two main groups:

1. Soluble Fiber

- Dissolves in water to form a gel-like substance.
- Fermented by gut microbiota.
- Slows gastric emptying and nutrient absorption.
- Sources: beet pulp, psyllium, oats, pectin.



2. Insoluble Fiber

- Does not dissolve in water.
- Increases fecal bulk and promotes intestinal motility.
- Helps prevent constipation.
- Sources: cellulose, hemicellulose, lignin, wheat bran.

Both soluble and insoluble fibers work together to support healthy digestion and the gut microbiome.

KEY BENEFITS OF FIBER

- Improves stool quality
- Supports healthy digestion
- Increases satiety and helps control body weight
- Supports immune and gut health
- Feeds beneficial gut bacteria (prebiotic effect)

LIPID DIGESTION

Fat digestion is high in both cats and dogs.

Dogs
92%
(80–99%)

Cats
76%

FATTY ACIDS

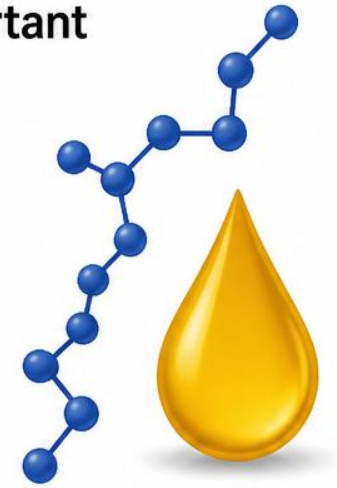
- In mammals there are 4 important unsaturated fatty acids series

1- palmitoleic (omega 7)

2- oleic (omega 9)

3- linoleic (omega 6)

4- linolenic (omega 3)



ESSENTIAL FATTY ACIDS IN DOGS AND CATS

- ω-6-linoleic ---------- Arachidonic acid
- ω-3-linolenic -------- EPA (eicosapentaenoic acid)

AA

Arachidonic Acid

– Dogs can convert LA (linoleic acid) to AA (arachidonic acid), whereas in cats arachidonic acid synthesis is limited.

– Therefore, a sufficient amount of arachidonic acid in cat diets should be taken into consideration.

– Otherwise, symptoms of inadequate essential fatty acids occur.

SYMPTOMS RELATED TO DEFICIENCY OF ESSENTIAL FATTY ACIDS

SEEN IN CATS

- Insufficient growth
- Hyperkeratosis in the skin
- Shedding of hair
- Delay in blood clotting time
- Mouth and skin lesions
- Fat in the liver
- Prolonged wound healing time
- Degeneration of testes, kidneys and adrenals
- Thrombocytopenia

Essential fatty acids are vital for skin and coat health, immune function, growth, and overall well-being in cats.