

Are Your Dog and Cat Missing Vital Minerals?

A new study reveals that balancing minerals for dogs and cats is more art than science — learn what that means for your pet's diet.

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STORY AT-A-GLANCE

- Minerals are vital for your pet's heart, bones, nerves, and immune system, but getting the right balance is tricky — too little or too much can both harm health
- A 2024 Journal of Animal Science study revealed that defining safe mineral levels for dogs and cats remains complex, even after decades of research and regulatory efforts
- Essential minerals like calcium, zinc, copper, and selenium depend on factors such as diet type, processing methods, and bioavailability — the body's ability to absorb and use nutrients
- Outdated data and misinformation about "natural" or homemade diets often lead to dangerous mineral imbalances, making professional guidance and AAFCO-approved foods essential
- Experts urge updated, science-based guidelines to reflect modern pet diets and help pet parents make informed choices that keep their dogs and cats thriving

Have you ever wondered what's really in your pet's food and whether it's enough to keep them healthy? You might assume that because you buy a "complete and balanced" diet, your dog or cat is getting all the nutrients they need. But when it comes to minerals, things are not that simple.

From shiny coats and strong bones to heart rhythm and nerve function, minerals help keep every cell in your pet's body working properly. Yet despite their importance, scientists are still debating how much of each mineral dogs and cats truly need, and how much might be too much.

A 2024 study published in the Journal of Animal Science by experts from the Pet Food Institute highlighted just how complex this question really is — showing that even after decades of research, defining safe and effective mineral levels for dogs and cats remains more art than science.¹

Why Minerals Matter More Than You Think

You've probably heard about protein, fat, and vitamins, but minerals are the quiet heroes of your pet's diet. They don't provide energy like calories do, yet without them, your pet's organs, muscles, and immune system can't function properly.

The study explains that minerals come in two categories — macrominerals and trace (microminerals).² Your pet needs macrominerals like calcium, phosphorus, magnesium, sodium, and potassium in larger amounts. The trace minerals, such as iron, zinc, copper, iodine, selenium, and manganese, are needed only in tiny doses, but their impact is

enormous. For instance:

- **Calcium and phosphorus** build strong bones and teeth.
- **Zinc** supports skin health and wound healing.
- **Copper** helps make red blood cells and keeps your pet's coat rich in color.
- **Iron** carries oxygen through the blood.
- **Selenium** and **iodine** protect the thyroid and immune system.

When your pet's mineral balance is right, everything from digestion to mood can improve. But when minerals are missing — or present in excess — problems can appear quietly and grow over time.

The Balancing Act — Too Little vs. Too Much

Minerals are tricky because both deficiency and excess can cause harm. A small shortage can lead to dull fur, fatigue, or slower growth. A big one can trigger serious illness. But adding more isn't always better. For example, too much calcium can block the absorption of zinc, copper, and magnesium. High phosphorus can damage the kidneys. Excess selenium can even be toxic.

Unlike vitamins, minerals don't break down with heat or time. Instead, they interact with one another inside your pet's body, creating complex "give-and-take" relationships. The challenge for scientists is figuring out the safe upper and lower limits — the range that supports good health without tipping into danger.³

That sounds straightforward, but it's actually one of the most complex parts of pet nutrition science.

How Scientists Decide What Pets Need

You might think experts have long known exactly how much calcium, zinc, or copper a dog or cat needs. In truth, the numbers on pet food labels come from decades of evolving research — and a surprising amount of estimation.

Since the 1960s, specific organizations (more on this later) have worked to define safe, balanced nutrient levels. Their goal is to ensure every "complete and balanced" pet food meets your pet's needs at every life stage — from a growing puppy or kitten to a senior companion. Here's how they generally define mineral needs:

- **Minimum Requirement (MR)** — The smallest amount proven to prevent disease.
- **Adequate Intake (AI)** — An educated guess when not enough data exists for a precise number.
- **Recommended Allowance (RA)** — The amount needed for good health, including a safety margin.
- **Safe Upper Limit (SUL)** — The maximum level that won't cause harm.

These numbers are expressed in parts per million or milligrams per kilogram of food, but reaching them in practice is a lot more complicated than it looks.⁴

What Is Bioavailability (and Why It Matters)

Many factors can affect a pet's mineral requirements. These include:

- Breed and size
- Age and life stage
- Activity level
- Health status
- Diet type
- Processing methods

Even within a single bag of food, the natural ingredients can vary. Meat, grains, and vegetables contain minerals in different forms, and not all of them are easily absorbed. This is where bioavailability becomes critical. A mineral might be present in the food but not available to your pet's body in a usable form.

Bioavailability refers to how much of a nutrient your pet's body can actually absorb and use. Two foods might contain the same amount of iron, but if one source is more digestible or interacts less with other ingredients, your pet may get more benefit from it.

Even cooking methods matter. High heat can change the structure of some minerals, while canning or extrusion can alter how they bind with proteins and fats. This is why pet food makers need to carefully test and adjust their recipes to ensure the final product still delivers enough usable minerals.

Regulators and Researchers — Who Sets the Rules?

Three main organizations shape what goes into your pet's bowl:

1. **National Research Council (NRC)** — The NRC publishes detailed "nutrient requirement" reports based on scientific research. Their last comprehensive update for dogs and cats was in 2006, nearly two decades ago. The NRC's work remains the foundation for pet food regulations worldwide, even though much of it is based on older data.
2. **Association of American Feed Control Officials (AAFCO)** — AAFCO uses the NRC's research to create the practical nutrient profiles used by U.S. pet food manufacturers. These profiles list the minimum and maximum levels allowed in commercial diets and ensure foods labeled "complete and balanced" meet pets' needs for growth, reproduction, and maintenance.

AAFCO regularly updates its guidelines based on new studies, but gaps still exist. In many cases, scientists simply don't have enough data to define safe upper limits for every mineral.

3. **European Pet Food Industry Federation (FEDIAF)** — FEDIAF's guidelines serve a similar role in Europe but include two types of maximums:
 - **Nutritional maximums** (to prevent harm to pets)
 - **Legal maximums** (to protect the environment from excess mineral waste)

FEDIAF sometimes sets higher mineral levels than the NRC or AAFCO, especially for house pets that burn fewer calories and thus eat less food. These adjustments help ensure pets still get enough nutrients even when eating smaller portions.

Why It's Hard to Establish 'Safe' Limits

If you've ever read a label saying, "Contains added minerals for optimal health," you might think pet food makers have the science completely figured out. The truth is, mineral research in dogs and cats remains uncertain.

That's because, as mentioned above, each mineral interacts with others in complex ways. These shifts can change depending on the ingredients, processing methods, and even the animal's genetics. These "nutrient-to-nutrient interactions" make defining one-size-fits-all limits nearly impossible.

Much of the research behind current recommendations comes from decades-old studies on lab beagles fed purified diets, which adds to the challenge. Those studies don't reflect today's diverse pets or the wide range of modern foods.

Experts now agree that more studies using current food types, like high-meat, grain-free, raw, and freeze-dried formulas, are urgently needed.⁵

The Path Forward — Smarter Science, Healthier Pets

So how can researchers improve mineral recommendations for modern pets? The study authors suggest using modern, minimally invasive techniques like:

- Stable isotope studies, which track how minerals move through the body without harming animals.
- Factorial modeling, which estimates needs based on how much of a mineral is lost through skin, urine, or hair, and how much should be replaced to stay healthy.

Both methods have pros and cons. Stable isotope testing is precise but expensive. Factorial modeling relies on strong data, which is still limited for many trace minerals. Combining both could give scientists a clearer picture of what dogs and cats truly need.

But as the authors note, even with better science, updating official guidelines takes time. The NRC needs to review and approve any major changes before AAFCO or other regulators can adopt them. Funding, ethical considerations, and regulatory hurdles all slow the process.⁶

Despite these challenges, experts agree that continued research is essential. The way we feed pets today has evolved, so our understanding of their needs should evolve too.

How Pet Foods Are Formulated to Meet Mineral Needs

When a pet food manufacturer designs a recipe, they're not just throwing ingredients together. Each nutrient, including every mineral, needs to be calculated, tested, and balanced to match the intended life stage and feeding purpose. To do this, nutritionists consider:

1. **Ingredient sources** — Every meat, grain, or vegetable adds minerals naturally.
2. **Supplemental additions** — Extra minerals may be added to ensure consistency.
3. **Processing effects** — Heating or extrusion can alter mineral form and availability.
4. **Taste and texture** — A perfectly balanced food is useless if pets won't eat it.
5. **Interaction between nutrients** — Too much of one mineral can block another's absorption.

Manufacturers also build in "safety margins," or small overages, to account for natural variation in ingredients or potential loss during processing. This precision helps ensure that your dog or cat gets enough nutrients, no matter which batch of food you buy.

The Misinformation Challenge

In recent years, social media has exploded with opinions about "natural," "raw," and "homemade" diets for pets. While many of these diets can offer benefits, misinformation about mineral needs has also spread.

The study authors warn that "strong opinions about pet health as related to mineral nutrition have been shared and robustly communicated without adequate scientific research to support the hypotheses."⁷

This has led to confusion, and sometimes fear, among pet owners. Some may worry that commercial foods contain "too many additives," while others assume that homemade diets are automatically healthier.

But studies consistently show that improperly balanced homemade diets are one of the most common causes of mineral deficiencies and toxicities in pets. The safest approach is to work with a veterinary nutritionist or choose a commercial food that meets AAFCO standards for your pet's life stage.

Reading Pet Food Labels Like a Pro

When you pick up a bag or can of pet food, the label can look like a chemistry lesson. But with a little guidance, you can spot signs of a nutritionally balanced formula. Look for these key terms:

- **"Complete and Balanced"** — This means the food meets the AAFCO nutrient profiles for your pet's life stage.
- **"All Life Stages"** — The food meets both adult and growth standards (safe for puppies, kittens, and nursing mothers).
- **Guaranteed Analysis** — Lists minimum percentages of protein and fat, plus maximum moisture and fiber. Some include minerals like calcium, phosphorus, and zinc.
- **AAFCO Statement** — Should read something like "This food is formulated to meet the nutritional levels established by the AAFCO Dog (or Cat) Food Nutrient Profiles."

If you feed a homemade diet, ask your veterinarian to review it. Even small imbalances, like too much phosphorus from meat without enough calcium from bone or supplements, can cause long-term health problems.

Signs Your Pet Might Be Missing Minerals

Because mineral imbalances develop slowly, symptoms can be easy to miss. Keep an eye out for these warning signs:

- Dull coat, flaky skin, or slow wound healing
- Weakness, fatigue, or pale gums
- Lameness or fragile bones
- Hair color fading or unusual hair loss
- Weight gain or sluggishness
- Neurological issues or muscle tremors

If you notice these symptoms, your veterinarian can run blood or urine tests to check mineral levels and recommend dietary adjustments.

Can You Give Too Many Supplements?

It's tempting to "top off" your pet's diet with extra vitamins and minerals, especially if you want to go the extra mile for their health. But supplementation can backfire if your pet's food is already complete and balanced.

Remember — More is not better when it comes to minerals. Unless your veterinarian recommends a specific supplement for a medical condition, extra minerals can do more harm than good.

How Long Until the Guidelines Catch Up?

The study authors believe a new NRC report is long overdue. Since 2006, researchers have learned a lot about how modern diets, ingredients, and processing affect mineral bioavailability. Yet those findings haven't been fully incorporated into official pet food guidelines.⁸

Ideally, the process would become more dynamic, allowing for continual updates as new data emerge, similar to how human nutrition guidelines are revised regularly. But that will require significant funding, collaboration, and time.

Until then, veterinarians, pet food companies, and owners should rely on a mix of existing science, common sense, and careful observation to keep pets healthy.

What You Can Do as a Pet Parent

You don't need a Ph.D. in nutrition to make sure your dog or cat gets the right minerals. Here's how you can help safeguard their health:

1. **Choose foods that meet AAFCO standards** — Look for "complete and balanced" on the label for your pet's specific life stage.
2. **Avoid adding extra supplements unless advised** — Your vet can test mineral levels and recommend safe options if needed.

- 3. **Rotate trusted brands occasionally** — High-quality brands that meet AAFCO profiles may use different ingredient sources, helping even out natural mineral variations.
- 4. **Be cautious with homemade diets** — If you prefer to cook for your pet, consult a board-certified veterinary nutritionist to design a balanced recipe.
- 5. **Watch for subtle changes** — A dull coat, brittle nails, or unusual fatigue may indicate a mineral imbalance. Early testing can prevent long-term harm.
- 6. **Stay informed** — As research evolves, guidelines will too. Following reputable veterinary sources keeps you up to date on what's best for your pet.

A Final Word — The Small Nutrients That Make a Big Difference

It's easy to overlook minerals — they don't get the spotlight like protein or fat — but they're the foundation of your pet's health. Getting them right can mean stronger bones, brighter eyes, and more playful energy. Getting them wrong, even slightly, can set the stage for silent, slow-developing problems.

The good news is that decades of nutritional science have made pet foods safer and more balanced than ever before. Still, there's room to grow. As researchers continue refining their understanding of mineral needs, pet parents like you can play a vital role by choosing wisely, asking questions, and partnering with veterinarians to keep your pets thriving.

Sources and References

^{1,2,3,4,5,6,8} [J Anim Sci. 2024 Jun 8;102:skae132](#)
⁷ [American Society of Animal Science, June 20, 2024](#)
