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ACVN NUTRITION NOTES

Featuring Fiber: Understanding Types of Fiber & Clinical Uses

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The American College of Veterinary Nutrition (**acvn.org**) and *Today's Veterinary Practice* are delighted to bring you the **Nutrition Notes** column, which provides the highest-quality, cutting-edge information on companion animal nutrition, written by the ACVN's foremost nutrition specialists.

The primary objectives of the ACVN are to:

- Advance the specialty area of veterinary nutrition
- Increase the competence of those practicing in this field
- Establish requirements for certification in veterinary nutrition
- Encourage continuing education for both specialists and general practitioners
- Promote evidence-based research
- Enhance dissemination of the latest veterinary nutrition knowledge.

The ACVN achieves these objectives in many ways, including designating specialists in animal nutrition, providing continuing education through several media, supporting veterinary nutrition residency programs, and offering a wide array of resources related to veterinary nutrition, such as this column.

Understanding the different types of fiber—and when to implement fiber in a nutrition plan for dogs and cats—can be challenging and complicated. In addition, some cats and dogs that present with gastrointestinal conditions can be managed with diets or supplements that contain particular levels and types of fiber.

Choosing an ideal diet or supplement may involve a trial-and-error process to determine the exact fiber needs of each individual pet. Ongoing communication with clients during this process plays an integral role in successful management.

DEFINING FIBER

The different types of fiber can be defined in 2 ways:

- By fiber solubility
- By fiber fermentability.

Solubility describes how fibers are able to disperse in water (**Table 1**, page 70), while *fermentability* describes the rate at which fibers produce short-chain fatty acids (SCFAs) through the help of microorganisms.

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TABLE 1 Examples of Fiber Sources in Pet Foods[1]

Soluble fibers	Guar gum, pectin, carrageen
Insoluble fibers	Cellulose, lignin
Mixed fiber source	Beet pulp, psyllium

These definitions have some crossover as many soluble fibers also tend to be highly fermentable.

In a clinical setting, however, describing fibers by their solubility in water is the most relevant because solubility:

- Directly affects composition of feces
- Is easier to measure than fermentability, which makes information on solubility more readily available.

FIBER SOLUBILITY

Soluble Fiber

Soluble fibers, such as pectins and gums, are the types of fiber that best absorb water. These fibers are usually also highly *fermentable*, which means that bacteria convert the fibers rapidly to SCFAs, the preferred energy source for cells in the colon.

Adding soluble fiber can promote healthy colonic mucosa and immune function in the lower intestine. However, increasing soluble fiber—whether by supplement or selecting a diet high in soluble fiber—should be done slowly and incrementally to allow adaptation of the intestinal microbiome to the new amount of fermentable material.

Client Communication Tip

Insoluble "woody" fibers are more than fillers.

Insoluble fibers, such as lignin or cellulose, are frequently obtained from "woody plants" that are not generally considered food sources. Rather, these fibers are part of the cell wall that allows plants to maintain their structure. The media sometimes misconstrues this information to mean that wood or cardboard are cheap fillers used in pet food to save money. However, insoluble fibers serve many therapeutic functions and are intentionally used in pet foods to improve gut health and help, not hurt, pets.

Insoluble Fiber

Insoluble fibers, such as cellulose, increase fecal output and, in doing so, stimulate motility in the intestines and increase intestinal transit time. High amounts of insoluble fiber can often be found in veterinary therapeutic diets formulated for canine diabetes, feline hairball control, or weight management.

However, take caution when supplementing with large amounts, as insoluble fiber can mildly alter nutrient digestibility.[2-3] Diets formulated by high-quality pet food companies, though, take this change in digestibility into account and alter the nutrient content of diets accordingly.

Client Communication Tip

What determines whether pet food companies are producing high-quality products?

The World Small Animal Veterinary Association (WSAVA) has created guidelines that help pet owners and veterinarians determine whether companies are producing high-quality products. For example, does a company employ board-certified veterinary nutritionists and PhD-level animal nutrition scientists to properly formulate and test foods? A full list of the guidelines is available at **wsava.org/nutrition-toolkit**.[4]

FIBER ON THE LABEL

The term "high fiber" can be confusing, as fiber is added and analyzed in pet foods in many different ways. Pet food labels are only required to have the *guaranteed analysis*—the maximum or minimum percentage of nutrients on an as-fed, or by weight, basis. This means, for example, that a pet food with maximum 12% crude fiber has no more than 12 grams of crude fiber for every 100 grams of total pet food. However, since the amount is a maximum, it could have any amount less than 12%.

Information in this format is not very helpful to veterinarians or pet owners when comparing

fiber content between diets or estimating the typical amount of fiber in each batch of food. Furthermore, crude fiber on these labels only accounts for a variable portion of insoluble fibers; it does not provide total content of fiber.

To estimate the overall fiber in diets, obtain the total dietary fiber (TDF), which includes soluble and insoluble fiber, on an energy basis (grams/Megacalorie [Mcal; 1000 kcal]) from the typical analysis—*not* guaranteed analysis—of the diet. This way, fiber content can be compared among diets of differing calorie or moisture content (**Table 2**). A typical or average nutrient analysis of TDF should be in company product guides or available by contacting the manufacturer.

Owners may be quick to look to the ingredient list to determine soluble or insoluble fiber ingredients, but the total amount of fiber in the diet is not known without the TDF. While TDF is not precise because not all insoluble fibers are measured using crude fiber analysis, a rough estimate of total, insoluble, and soluble fiber can be obtained with the TDF and crude fiber information on an energy basis. However, it is also important to note that individual animals (and their microbes) may respond differently to specific sources of fiber or combinations of specific compounds, so trial and error of diets may still be necessary for personalized care of each cat or dog.

TABLE 2 Example of Comparing Diet Profiles

	DIET A NUTRIENT PROFILE	DIET B NUTRIENT PROFILE
TYPICAL ANALYSIS		
Total dietary fiber (g/Mcal)	54.9	25.1
Crude fiber (g/Mcal)	27.9	4.6
GUARANTEED ANALYSIS		
Maximum crude fiber (%)	11.3	10
Ingredients	Cellulose, psyllium	Beet pulp, psyllium
ROUGH ESTIMATES		
Insoluble fiber (g/Mcal)	27.9	4.6
Soluble fiber (g/Mcal)	27	22.4
Total fiber (g/Mcal)	54.9	25.1

Commentary: In this case, because the guaranteed analysis only appears to show a 1% difference in fiber, a pet owner may be led to think these diets are close in fiber content. When the fiber amounts are compared using the rough estimate and typical analysis, however, Diet A has twice the total fiber of Diet B. In addition, while both provide soluble fibers with psyllium ingredients, Diet A has 6× more insoluble fiber. This is an important consideration when comparing diets and deciding which one will benefit the patient based on the types of fiber present. Calling pet food companies to inquire about fiber content and breakdown of types of fiber can ensure accuracy of fiber content and appropriate use.

Client Communication Tip

Pet food labels are not helpful in comparing dietary fiber.

Let owners know that the pet food label is not helpful in comparing fiber among diets. The best way to compare is to ask companies to provide the TDF on an energy basis to better understand the fiber content of a diet.

CLINICAL INDICATIONS FOR FIBER

Obtaining a full medical and dietary history helps guide diet selection and may suggest an underlying cause of gastrointestinal illness.

A medical history may suggest whether the patient has a large intestinal or small intestinal problem, which may help guide the type or level of fiber needed (**Table 3**, page 72). For example, increased frequency, urgency, and frank blood or mucus in stool suggests a large intestinal problem and trial-and-error management would likely

Client Communication Tip

Obtaining a dietary history is a key component of the appointment.

A full dietary history—that includes all previous diets, treats, chews, table scraps, and food used for medication administration—can help rule out dietary indiscretion in gastrointestinal illness. This history can also elucidate any food items at risk of contamination by bacteria (eg, chews, such as bully sticks, or raw food diets).[5,6] Example diet history forms can be found online at **wsava.org/nutrition-toolkit**.[4]

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TABLE 3 Conditions for Which Fiber May Assist in Nutritional Management

Anal gland or sac disease
Dental disease*
Diabetes
Dietary indiscretion
Enteritis
Exocrine pancreatic insufficiency
Infectious disease/small intestinal bacterial overgrowth
Inflammatory bowel disease
Intestinal neoplasia
Megacolon
Stress colitis
Weight management

** Fiber is used in dental diets to create a matrix that mechanically removes plaque from teeth.*

start with increased insoluble fiber diets. A fecal scoring chart (**Figure**) provides a numeric system for accurately and consistently describing stool.

A history of previous diets may guide what ratio of insoluble or soluble fiber will benefit the patient. A dietary history that includes aspects of the home environment may also guide management; for example, diarrhea that occurs when a family member leaves for business may indicate stress colitis.

A full medical workup, such as diagnostic imaging or a dietary elimination trial, may be necessary for severe or chronic cases in which nutritional management alone cannot alleviate clinical signs.

Client Communication Tip

A formulated pet food or therapeutic diet is the preferred source for fiber.

Commercial pet foods or veterinary therapeutic diets are the best way to provide fiber to dogs and cats because they are formulated to provide the appropriate essential nutrients. For example, canned pumpkin is popular with pet owners as a fiber supplement, but the amount needed to be beneficial may unbalance the total diet (ie, the pumpkin would provide significantly more than 10% of a pet's total calories).

HOW TO GET STARTED

Which Fiber to Look for in Diets

Each pet must be considered individually when considering the amounts of each of types of fibers in the various commercially available diets; not all pets with the same condition respond similarly to nutritional management. For example, low fat, highly digestible diets (ie, low insoluble fiber) are commonly recommended for intestinal disease;[1] however, one study in cats demonstrated that dietary fat content did not affect clinical outcome.[7]

In general, diseases affecting the large intestine (ie, colitis, anal gland or sac disease) may best be managed by trying diets higher in insoluble fibers, while diseases affecting the small intestine (ie, chronic enteritis, exocrine pancreatic insufficiency) may benefit from the addition of soluble fibers. If it is unclear which type of fiber may be helpful, a moderate mixed fiber diet can be used for an initial trial. In addition, contacting a board-certified veterinary nutritionist (a listing can be found at acvn.org) to formulate a balanced, home-cooked diet could also be elected by owners who would like more control over fiber sources and content.

Full Nutrient Profiles

Unless the patient has a proven food allergy (diagnosed through a dietary elimination trial), the overall nutrient profile should determine the diet rather than ingredients. For further consideration, diets high in fiber may have a lower caloric density; therefore, energy needs may also need to be taken into account. An underweight diabetic dog, for example, may have difficulty consuming enough low calorie, high fiber food to maintain weight. In this example, consideration of the fat and calorie content, as well as the fiber content, is of importance.

Supplementation

Fiber can be supplemented outside the diet, but there is limited guidance for standardized dosages. One study found benefits in dogs with a median dosage of 2 tablespoons per day of a common human psyllium supplement, although there was a range of 0.25 to 6 tablespoons per day.[8]

Fecal Scoring Chart

PURINA PRO PLAN VETERINARY DIETS

SCORE	SPECIMEN EXAMPLE	CHARACTERISTICS
1		• Very hard and dry • Often expelled as individual pellets • Requires much effort to expel from body • Leaves no residue on ground when picked up
2		• Firm, but not hard, pliable • Segmented in appearance • Little or no residue on ground when picked up
3		• Log shaped, moist surface • Little or no segmentation • Leaves residue on ground, but holds form when picked up
4		• Very moist and soggy • Log shaped • Leaves residue on ground and loses form when picked up
5		• Very moist, but has a distinct shape • Present in piles rather than logs • Leaves residue on ground and loses form when picked up
6		• Has texture, but no defined shape • Present as piles or spots • Leaves residue on ground when picked up
7		• Watery • No texture • Present in flat puddles

FIGURE. Fecal scoring chart. *Reprinted with permission from Purina (purina.com)*

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More Client Communication Tips

Clinical Management with Fiber.

- When adding insoluble fiber, tell dog owners in advance that the increased fecal bulk may mean that they will need to schedule more walks during the day to avoid accidents.
- For clients that really want to provide treats, they can use a portion of their pets' daily kibble as treats until stool has reached desired consistency.
- Because gut bacteria take time to adapt during diet changes, encourage clients to transition between diets slowly (7–10 days).
- Let clients know that mild loose stool is expected with any diet change.
- Setting expectations is crucial, and it is helpful to tell clients that dietary management alone may not be successful.
- Home-cooked diets are commonly sought by clients who suspect a gastrointestinal issue in their pets. Recommend a consult with a board-certified veterinary nutritionist (**ACVN.org**) to ensure the diet is formulated properly without any deficiencies.

If supplemented, fiber should always be given gradually over a few days until the stool reaches the desired composition. Use fecal charts (**Figure**), which allow clients to objectively chart their pets' stool production and quality and provide more objective feedback.

Prebiotics and probiotics are also commonly used supplements: **Prebiotics** are fermentable carbohydrates—also called oligosaccharides—and, because of their ability to foster beneficial ("the good") bacteria in the intestinal tract, are considered beneficial for pets. There are many commercially available prebiotic supplements to help cultivate healthy gut bacteria. Meanwhile, **probiotics** are not actually a source of fiber, but are ingested microorganisms (the "good" bacteria themselves) that are associated with benefits for humans and animals. It is important to note that quality control can vary and only products that are independently tested should be used.[9]

Glossary

Megacalorie (Mcal) 1000 kcal

SCFA short-chain fatty acids

TDF total dietary fiber

WSAVA World Small Animal Veterinary Association

IN SUMMARY

Fiber can be an integral part of nutritional management for many disease conditions in dogs and cats. Understanding the different types of fiber and how to determine the fiber content of commercial diets for cats and dogs can guide optimal diet selection. Because each animal (and their gastrointestinal microbes) may react differently, trial and error is often necessary to determine the exact fiber needs of each individual pet. Ongoing communication with clients during this process plays an integral role in successful management. TVP

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