

Chronic Kidney Disease Staging & Nutrition Considerations

Michelle Evason, BSc, DVM, DACVIM (SAIM)

University of Guelph

Michelle Evason Veterinary Internal Medicine & Nutrition Consultations

Rebecca Remillard, PhD, DVM, DACVN

Veterinary Nutritional Consultations



YOU HAVE ASKED ...

What dietary changes should be considered (and when) for a patient diagnosed with chronic kidney disease (CKD) based on blood, urine, and symmetric dimethylarginine (SDMA) results?

THE EXPERTS SAY ...

The advent of the SDMA biomarker (IDEXX.com) has enabled earlier diagnosis of CKD in cats and dogs when performed with serum creatinine,

blood urea nitrogen, and urinalysis.^{1,2}

The International Renal Interest Society (IRIS; iris-kidney.com) offers peer-reviewed resources that allow for specific and practical classification of a patient's CKD stage.³ These guidelines use serum creatinine values and recently updated modifications if SDMA values are known for early CKD stages. Based on IRIS staging of CKD, recommendations for additional diagnostics, therapy (nutrition and drug), and prognosis are provided for each stage. Although it is unclear which therapeutic interventions are most impactful in the early IRIS stages of CKD, there is sufficient evidence

CKD = chronic kidney disease

IRIS = International Renal Interest Society

SDMA = symmetric dimethylarginine

that appropriate changes to a patient's diet can reduce morbidity and may increase longevity.⁴⁻⁶

Nutritional and medical therapy for CKD should be determined and further individualized by:

- ▶ IRIS CKD stage and substage, as well as SDMA values (if known)
- ▶ Consideration of concurrent medical concerns that affect quality of life and that may limit nutritional options (eg, concurrent dermatologic or GI disease, fat intolerance, obesity or muscle loss management, endocrine disease)
- ▶ Assessment of CKD nutrients of concern (ie, protein, phosphorus, sodium, potassium, eicosapentaenoic acid [EPA], docosahexaenoic acid [DHA]) in current diet to determine how these key nutritional factors align with nutrition recommendations for renal disease stage. (Of note, *diet* refers to everything consumed and includes all foods, treats, and water.)
- ▶ Clinician evaluation of owner priorities and capability of ongoing monitoring for eventual CKD progression, as well as taste and texture preferences, to optimize acceptance and diet transition success

Nutrients of concern are defined by nutritionists as key dietary nutrients known to have specific associations (positive or negative, direct or indirect) on clinical outcome. Although all nutrients in diet are important and play a role, in certain medical conditions specific nutrients should be considered, assessed, and potentially adjusted to maximize dietary benefit.

Dietary nutrients of concern in order of importance for all stages of CKD include:

- ▶ **Phosphorus:** CKD has been associated with hyperphosphatemia and hyperparathyroidism and is clinically related to rate of CKD progression^{7,8}
- ▶ **Total Protein (Nitrogen):** Has been associated with uremia, metabolic acidosis, glomerular hyperfiltration and hypertension, proteinuria, and hypoproteinemia
- ▶ **Sodium:** Adjustment may help in managing hypertension, if present.
- ▶ **Potassium:** CKD patients may be hypo-, normo-, or hyperkalemic. Levels of potassium in the diet should be adjusted on an individual basis.
- ▶ **Omega-3 Constituents (EPA and DHA):** These specific fatty acid components (unique to omega-3) are considered renal protective and are associated with increased survival times.^{9,10}

IRIS Stage 1 or 2

There is no published consensus and a scarcity of scientific literature on the proper diet for patients with significantly increased SDMA values within IRIS stage 1 CKD. Despite this, the authors believe consideration of nutrients of concern in the current diet and initiation of owner discussion regarding dietary changes should begin with recognition of this CKD stage.

A review of the current diet is prudent, particularly when patients are fed over-the-

The authors believe consideration of nutrients of concern in the current diet (particularly phosphorous) and initiation of owner discussion regarding dietary changes should begin with recognition of this CKD stage.

counter products, as these can be excessively high in nutrients relative to requirements for animals. This is typically done for palatability and marketing reasons. There are no Association of American Feed Control Officials (AAFCO)¹¹ maximums on protein, sodium, or potassium in pet foods, and the allowed maximum on phosphorous is 5 times the National Research Council's (NRC's) adequate intake values.¹²

The authors suggest that if levels of nutrients of concern in the current diet are excessive—and because chronic renal disease is always progressive (and phosphorous intake appears directly related to the rate of CKD progression)—it is sensible and does not harm the patient to transition to a diet closer to AAFCO minimums. AAFCO minimums are lower limits on the food product and should not be mistaken for minimum animal requirements. It is important to recognize that a patient eating a diet consisting of nutrients of concern at or close to AAFCO lower limits will unlikely benefit from diet transition, further proving the need for assessment of the current diet.

For patients with IRIS stage 2 CKD, recommendation of a “kidney” or “kidney-friendly” diet may (or may not) be indicated or beneficial for the patient. This is because dietary descriptors such as *renal*, *kidney*, *supportive*, or *protective* are neither nutritionally nor officially defined terms. No nutrient profile is appropriate for all renal patients (or all IRIS stages), and each manufacturer decides independently on the nutrient profile of products intended and marketed for animals with CKD (**Tables 1 & 2**, pages 92 and 93).

Consider This

Veterinary therapeutic diets suggested for managing CKD range 1.7-fold in phosphorous (800-1350 mg/Mcal) for cats and 2.3-fold (480-1100 mg/Mcal) for dogs.

Because CKD is progressive, the authors suggest that nutrients of concern in the current diet be evaluated and IRIS stage 2 CKD patients be transitioned onto a veterinary therapeutic diet with nutrient concentrations closer to NRC maintenance allowance levels. Results of clinical trials support the benefit of feeding a phosphorous-reduced or protein- and phosphorous-reduced diet to cats and dogs with IRIS stages 2 and 3 to minimize uremic episodes and increase longevity.^{4-6,10}

IRIS Stage 3 or 4

For patients with IRIS CKD stages 3 and 4, it can be challenging to determine which dietary components are driving the benefit noted in renal diet trials (eg, phosphorus alone or protein, phosphorus, and calories synergistically).¹³ Amid this uncertainty (and often controversy), there is consensus that there is no renal diet that is best for every feline or canine CKD patient or every IRIS stage or substage. However, there are multiple nutritional options with differing nutrient profiles available. Selection for patients with stages 3 and 4 CKD should be based on individual patient needs for specific nutrients of concern.

Consider This

Not every renal patient requires a low-sodium or potassium renal diet.

The nutritional strategy for later IRIS stages of CKD would ideally adjust nutrients of concern as needed after patient assessment in the following order of importance:

- ▶ Decreased dietary phosphorus before hyperphosphatemia warrants pharmacologic therapy
- ▶ Decreased dietary protein when BUN begins hindering or reducing appetite
- ▶ Adjusted protein amount and quality with hypoproteinemia due to proteinuria to balance between lowest BUN and highest serum protein levels

AAFCO = Association of American Feed Control Officials
BUN = blood urea nitrogen
CKD = chronic kidney disease
DHA = docosahexaenoic acid
EPA = eicosapentaenoic acid
IRIS = International Renal Interest Society
NRC = National Research Council
SDMA = symmetric dimethylarginine

TABLE 1

FELINE RENAL DIETS RELATIVE TO NRC & AAFCO VALUES (SORTED BY PHOSPHOROUS LEVEL)*

	Phos mg/Mcal	Protein g/Mcal	Sodium mg/Mcal	Potassium mg/Mcal
NRC 2006 minimum requirement for adult maintenance**	350	40	160	1300
NRC 2006 recommended allowance for adult maintenance‡	640	50	170	1300
Royal Canin Veterinary Diet Renal Support D (canned)	800	63	900	1900
Hill's Pet Nutrition k/d Feline with Chicken (canned)	850	65	680	2640
Royal Canin Veterinary Diet Renal Support E (canned)	900	66	500	1900
Royal Canin Veterinary Diet Renal Support S (dry)	1000	58	1000	2100
Royal Canin Veterinary Diet Renal Support T (canned)	1000	63	1000	1900
Hill's Pet Nutrition k/d Feline Chicken & Vegetable Stew (canned)	1050	65	530	2310
Hill's Pet Nutrition k/d Feline Vegetable & Tuna Stew (canned)	1070	67	530	2450
Royal Canin Veterinary Diet Renal Support A (dry)	1100	59	900	2300
Nestle Purina Veterinary Diets NF Kidney Function (dry)	1100	66	300	2100
Royal Canin Veterinary Diet Renal Support F (dry)	1100	66	1000	2300
Hill's Pet Nutrition k/d Feline with Ocean Fish (dry)	1130	66	650	2000
Hill's Pet Nutrition k/d Feline with Ocean Fish (canned)	1170	66	500	2410
Nestle Purina Veterinary Diets NF Kidney Function (canned)	1200	72	400	2500
Hill's Pet Nutrition g/d (canned)	1230	82	760	1710
AAFCO 2016 minimum for adult maintenance	1250	65	500	1500
Rayne Clinical Nutrition Adult Health RSS (canned)	1260	125	1680	1830
Hill's Pet Nutrition k/d Feline with Chicken (dry)	1290	66	520	1630
Hill's Pet Nutrition g/d (dry)	1350	79	720	1840

*Values obtained from company websites at time of publication

**Minimum requirement is minimum amount of a bioavailable nutrient.

‡Recommended allowance is minimum requirement plus a bioavailability factor when applicable.

TABLE 2
CANINE RENAL DIETS RELATIVE TO NRC & AAFCO VALUES (SORTED BY PHOSPHOROUS LEVEL)*

	Phos mg/Mcal	Protein g/Mcal	Sodium mg/Mcal	Potassium mg/Mcal
NRC 2006 minimum requirement for adult maintenance**	300	20	75	1000
Hill's Pet Nutrition k/d (canned)	480	32	400	810
Royal Canin Veterinary Diet Renal Support A (dry)	500	35	900	1600
Rayne Clinical Nutrition Restrict – CKD (canned)	530	43	570	2030
Hill's Pet Nutrition k/d Canine Beef & Vegetable Stew (wet)	590	35	390	1960
Royal Canin Veterinary Diet Renal Support S (dry)	700	31	900	1500
Royal Canin Veterinary Diet Renal Support E (canned)	700	33	400	1300
Hill's Pet Nutrition k/d Canine Chicken & Vegetable Stew (canned)	710	35	400	1920
NRC 2006 recommended allowance for adult maintenance‡	750	25	200	1000
Hill's Pet Nutrition k/d Canine with Chicken (dry)	750	33	420	2040
Hill's Pet Nutrition k/d Canine with Lamb (dry)	750	36	370	1720
Nestle Purina Veterinary Diets NF Kidney Function (dry)	800	33	1000	1800
Royal Canin Veterinary Diet Renal Support F (dry)	800	34	900	1500
Royal Canin Veterinary Diet Renal Support T (canned)	800	36	500	1100
Nestle Purina Veterinary Diets NF Kidney Function (canned)	800	39	400	2300
Royal Canin Veterinary Diet Renal Support D (canned)	800	42	1200	1800
AAFCO 2016 minimum for adult maintenance	1000	45	200	1500
Hill's Pet Nutrition g/d (canned)	1050	49	570	1910
Hill's Pet Nutrition g/d (dry)	1100	46	500	1790

*Values obtained from company websites at time of publication

**Minimum requirement is minimum amount of a bioavailable nutrient.

‡Recommended allowance is minimum requirement plus a bioavailability factor when applicable.

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- ▶ Decreased sodium if arterial blood pressure warrants use of pharmacologic therapy
- ▶ Adjusted potassium only as needed based on patient serum levels
- ▶ EPA and DHA (50-100 mg/kg) only if altered palatability due to EPA/DHA intake does not decrease overall food intake

None of the commonly available renal-labelled diets contain less than the NRC recommended daily allowance of protein (cats, 50 g/Mcal; dogs, 25 g/Mcal; see **Tables 1 & 2**, pages 92 and 93); however, these products differ substantially in protein, phosphorus, sodium, potassium content, and ingredient composition (ie, flavor, texture, water content). This allows clinicians to select the best possible diet(s) for each patient based on IRIS stage/substaging, potential concurrent disease processes, and owner desires and constraints.

Older patients frequently have concurrent obesity, osteoarthritis, sarcopenia, diabetes, hypo- or hyperthyroidism, pancreatitis, or urolithiasis.^{14,15} Consideration of concurrent disease(s) should affect diet selection (eg, lower-fat renal product for a patient with concurrent pancreatitis, novel or hydrolyzed protein diet if concurrent dermatologic or GI adverse food reaction).

Hydration is another dietary consideration in CKD patients. Feeding a wet or canned diet (≈75% water) will provide water intake at or slightly above maintenance fluid requirements when the patient consumes sufficient calories to maintain body weight.

Successful diet transition can be more challenging (especially for cats) as CKD progresses. Some specialists advise transitioning patients with CKD to kidney-labelled products at IRIS stages 1 or 2 when appetite is unaffected.¹⁶ In a study of 128 cats with IRIS stages 1 to 3, 93.7% were successfully transitioned to renal food

For further reading on proteinuria, the author recommends **Laboratory Evaluation in Dogs & Cats with Chronic Kidney Disease** by Gregory F. Grauer, DVM, MS, DACVIM, at cliniciansbrief.com/article/laboratory-evaluation-dogs-cats-chronic-kidney-disease

and continued eating it until the last study assessment.¹⁷

Conclusion

CKD is progressive in dogs and cats. Adjustment of specific dietary CKD nutrients of concern can decrease morbidity and extend longevity. There is rationale for discussing diet and contemplating nutritional changes in patients with all IRIS CKD stages. *When* to suggest that change has been debated, particularly with earlier IRIS stages, but because SDMA is an IRIS-accepted predictor of renal damage, and because of the benefits of appropriate diet in managing CKD, suggestion of dietary review and transition (if needed) during stage 1 is advisable. For IRIS stage 2 or higher, thoughtful consideration of the patient's nutritional needs and specific CKD stage, substage, and other factors are needed when selecting diet. This necessitates attention to the dietary levels of key nutrients of concern for CKD in products marketed as kidney, renal or kidney supportive or renal friendly.

Of note, products marketed for renal disease are not deficient in protein, phosphorous, or sodium, according to the NRC's adequate intake values; rather, they more closely approximate animal requirements without being excessive. Thus, these products are safe for long-term feeding when guided by veterinary recommendations. ■

CKD = chronic kidney disease

DHA = docosahexaenoic acid

EPA = eicosapentaenoic acid

IRIS = International Renal Interest Society

NRC = National Research Council

SDMA = symmetric dimethylarginine

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