

Dietary management of feline chronic renal failure

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Emma Aitken AVN, DipHE, CVN (small animal), RVN discusses the importance of nutrition and correct diet in managing this common feline disease

Summary

THE kidneys lie in the cranial abdominal cavity, one each side of the midline. They are closely attached to the lumbar muscles by parietal peritoneum and are essential for osmoregulation, excretion of waste, erythropoietin production and the control of blood pressure. Feline chronic renal failure (CRF) is a common, slowly progressing disease that commonly affects cats from seven years of age (Dunn, 2003). Patients presenting with CRF are often anorexic (**Figure 1**), lethargic, polydipsic and polyuric (Dunn, 2003). Vomiting may also occur (Norsworthy, 2011). Elevated urea and phosphate levels and low serum potassium concentrations are most commonly detected on biochemistry and, additionally, low urine specific gravity (Dunn, 2003). Many veterinary diets are available for the management of CRF, and the veterinary nurse must make an informed choice based on current research as to the most suitable diet for his or her patient.

Key words

chronic renal failure, dietary management, anorexia, feline nutrition, kidney

THE goal of managing chronic renal failure (CRF) is to alleviate clinical signs and prevent further deterioration of the condition. Around 20 per cent of renal patients will have systemic hypertension (Syme, 2009), making blood pressure monitoring vital to detect deterioration of the condition. Management by the veterinary surgeon with drugs such as benazepril, which acts as a vasodilator

and promotes the excretion of salt and water (Ramsey, 2007) are indicated in most cases. Phosphate binders are also routinely used to prevent uptake from the gut and, therefore, reduce circulating phosphates. Studies have demonstrated significant reduction in clinical signs in cats fed a specific renal diet – on average, survival increased by 17 months compared to those fed normal cat food (Elliot, 2000).

Water

Water is essential but is often overlooked, especially when considering renal disease (Burkholder, 2000). The kidneys are responsible for fluid regulation. Patients with chronic renal failure are unable to reabsorb fluid from the glomerular filtrate into the circulation, instead fluid is excreted as urine, and polyuria and dehydration are then observed. Dehydration decreases renal perfusion and delivery of oxygen to the nephrons, thus making fluid maintenance paramount.

There is often a perception among clients that their cats don't drink enough; therefore, education and accurate measurement of water intake (approximately 2ml/kg/hour) is essential to maintain hydration. It is important to educate clients about ways to encourage their pets to drink and to supplement water in potentially anorexic cats. Techniques include soaking biscuit diets in water and feeding wet diets (Foster, 1997). It is recognised many cats prefer drinking from running water and so the addition of a water fountain specifically designed for cats may be recommended.

Eicosapentaenoic acid

Eicosapentaenoic acid (EPA) is a polyunsaturated fatty acid found in fish oils (Plantinga, 2011). EPA exerts complex control over many bodily systems, mainly involved in inflammation and immunity, and also act as a messenger in the central nervous system. The amounts and balance of these fatty acids in a cat's diet will affect the body's eicosanoid-controlled functions, with effects on cardiovascular disease, blood pressure, and arthritis (Palmquist, 2009). Studies have demonstrated increased survival times in cats fed diets containing increased amounts of EPA. A retrospective study by Plantinga and Everts (2005) found the median survival time of 175 cats that received conventional diets was seven months, compared with 16 months mean survival time of cats fed a diet designed with increased levels of EPA specifically for renal failure.

Many mammals, including cats, are unable to synthesis EPA naturally and, therefore, dietary intake is considered essential. However, this more recent evidence does suggest additional supplementation may benefit survival time of those patients with CRF.

Protein

A diagnostic indicator of feline CRF is proteinuria. When there is damage to the renal glomeruli, much protein may be lost into the urine, causing hypoproteinaemia. Protein is essential for

sustaining muscle mass, energy and immune function; therefore, signs such as anorexia and weight loss are seen (Moraillon, 1994).

Proteins are built from amino acids and the kidneys are responsible for the excretion of protein by-products such as urea. Most of these amino acids can be synthesised by the cat, but some are essential and can only be taken from the diet. These essential amino acids include arginine, taurine, methionine and cysteine. Cats with impaired renal function will have elevated blood serum levels of urea due to accumulation in the bloodstream (Allen, 2000). Most renal diets will contain reduced dietary protein, but it will be replaced by protein of a high biological factor. The higher the biological factor of the protein, the more efficient it is at replenishing or maintaining tissue protein and, thus, less urea is produced.

It is widely recognised the reduction in dietary protein reduces palatability of renal diets. With patients that are already inappetent due to chronic nausea, this only decreases appetite. Steps to increase food intake include the following:

- provision of anti-emetics;
- hand feeding;
- warming food;
- placement of feeding tubes; and
- adding flavour enhancers, such as tuna water (not brine), or low-sodium stock.

Calcium and phosphorus

Cats with CRF have a decreased ability to excrete phosphorus, which leads to hyperphosphataemia. High levels of circulating phosphorus lead to a fall in calcium levels which, in turn, leads to stimulation of the parathyroid gland to increase production of parathyroid hormone (PTH) (Cunningham, 1997). Increased PTH causes release of calcium via bone mineralisation. High levels of calcium and phosphorus may also cause calcification of soft tissues, such as the heart, lungs and kidneys, causing further complications. In human research, a link between hyperphosphataemia and cardiac disease has been found (Gutierrez, 2010) and so perhaps it is not inconceivable for this to also exist in cats. A reduction in dietary phosphorus is important to prevent secondary renal hyperthyroidism and slow disease progression (Dunn, 2003).

Ross and others (1982) demonstrated that a reduction in dietary phosphorus slowed the progression of renal disease in cats with surgically induced renal failure. More recent studies, such as ones performed by Plantinga and Everts (2005), demonstrate a slowing in the progression of renal disease by reducing dietary phosphorus. The results of this study, however, need to be

scrutinised, due to its qualitative nature. The results depended on differing opinions and examinations by different veterinary surgeons, meaning interpretation of the diagnosis and progression of the disease may have been affected by opinion and experience.

Sodium

Sodium is an essential nutrient responsible for regulation of blood pressure. The kidneys are responsible for monitoring sodium and blood pressure levels. When a fall in sodium is detected, production of rennin is initiated which, in turn, generates aldosterone, decreasing the excretion of sodium in the urine. Cats with a reduced glomerular filtration rate reportedly have a high prevalence of hypertension (Mishina, 1998). In a study on the prevalence of hypertension in cats, Syme (2002) found 28 per cent of cats with naturally occurring renal disease were hypertensive. With dietary levels of high sodium intake contributing to hypertension (Allen, 2000) it is recommended diets designed for use in CRF patients should have reduced sodium chloride levels. This prevalence of hypertension in renal patients makes regular monitoring essential ([Figure 2](#)).

Metabolic acidosis

Metabolic acidosis contributes to the destruction of nephrons (Burkholder, 2000). When nephrons are destroyed, the remaining ones produce hydrogen ions. Increased concentrations of hydrogen ions promote inflammation of renal tissue and, ultimately, destroy functional nephrons. Chronic acidosis can also disrupt electrolyte homeostasis.

Dietary intake of sulphur-containing amino acids found in proteins, such as methionine and cysteine, also contribute to acid load (Burkholder, 2000), with animal proteins tending to be more acidifying than plant proteins. As feline renal diets are already lower in dietary protein, the incidence of metabolic acidosis should be reduced; however, the importance of this is again highlighted.

Veterinary nurse's role

Compliance

Compliance is potentially an issue with both the client and the patient (Plantinga, 2005). With the management of CRF so heavily reliant on dietary changes, and with the possible effects of azotaemia, cats with CRF are often reluctant to eat. Historically, the range of renal diets was limited, but there are now many more on the market now and it is easier to find one that both the owner, and more importantly the patient, accept. For dietary management of CRF to be successful, owner compliance is important. Clients may have concerns about feeding an exclusive diet due to the lack of variety. Discussion and reassurance about the patient's needs and education on the animal's nutritional requirements will help make this transmission smoother.

Ongoing monitoring

Veterinary nurses are generally approachable and clients are likely to discuss concerns surrounding diet or progression of the disease with us. Regular telephone calls to discuss nutritional intake, administration of medication and clinical signs are an important part of management. Often it is during these conversations that small problems, such as difficulties with administering medicines and inappetence come to light.

Alongside telephone contact, clinics for patients with chronic illness offer a great opportunity to physically assess a patient. Many routine observations may be made by the veterinary nurse and reported to the veterinary surgeon. Observations include:

- body condition scoring;
- blood biochemistry;
- blood pressure monitoring; and
- urine: protein creatinine ratio.

Collecting information from owners on how much a patient is eating and drinking and, most importantly, how much the patient is urinating, is essential. Clients often worry their cats are not drinking or urinating enough so accurate calculations are essential. Measurement of urine output using non-absorbent litter or collection devices are ideal ways clients can measure this at home ([Figure 3](#)). Normal urine output should be around 50ml/kg/24 hours.

Early detection of renal disease is essential to ensure maximum renal function. Senior clinics are becoming more popular and should be a permanent fixture in the nurse's calendar ([Figure 4](#)).

Summary

Correct management of CRF with nutrition is important and may contribute to increased life expectancy and quality in cats. A diet with reduced protein of a high biological factor, controlled intake of sodium, calcium and phosphorus, and supplementation of EPA contribute to management of clinical signs and increased life expectancy.

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Questions

1 The kidney is NOT responsible for which action?

A] Control of blood pressure

B] Osmoregulation

C] Production of erythropoietin

D] Production of thyroxin

2 An increase in serum phosphorus levels may lead to an increase in the production of

A] Parathyroid hormone

B] Oestrogen

C] Thyroxin

D] Erythropoietin

3 Metabolic acidosis in the feline patient is alleviated by the reduction of dietary

A] Calcium

B] Phosphorus

C] Protein

D] Sodium

4 Urea is a by-product of

A] Calcium

B] Phosphorus

C] Protein

D] Sodium

5 Eicosapentaenoic acid is found in

A] Fish oils

B] Plant oils

C] Chicken

D] Synthesised by the body

6 Normal urine output for cats and dogs is

A] 10ml/kg/24hrs

B] 20ml/kg/24hrs

C] 30ml/kg/24hrs

D] 50ml/kg/24hrs

7 Damage to what causes protein loss

A] Renal pelvis

B] Renal glomeruli

C] Loop of Henle

D] Convoluted tubules

8 Renal diets include amendments to protein by way of

A] Reduction and replacement with a higher biological factor

B] Increase and replacement with a higher biological factor

C] Reduction and replacement with a lower biological factor

D] Increase and replacement with a lower biological factor

9 What nutrient is responsible for regulation of blood pressure

A] Potassium

B] Sodium

C] Protein

D] EPA

10 Successful nutritional management of chronic renal failure relies on

A] Increased protein, reduced EPA, increased sodium, reduced phosphorus

B] Reduced protein, increased phosphorus, EPA supplementation

C] Reduced protein, controlled phosphorus, calcium and sodium, plus EPA supplementation

D] Increased protein, controlled phosphorus, calcium and sodium, plus EPA

ANSWERS CRF: 1D, 2A, 3D, 4C, 5A, 6D, 7B, 8A, 9B, 10C



Figure 1. Typical appearance of a cat with chronic renal failure – note the poor body condition with muscle atrophy, especially over the hindlimbs.

Photo: SARAH CANEY, VET PROFESSIONALS



Figure 2 (above). The use of indirect blood pressure measurements are essential in the ongoing monitoring of renal disease.



Figure 3 (right). Examples of products that may be used by clients to monitor urine output in CRF cats.



Figure 4. Educating clients about the importance of monitoring renal function in senior pets is vital to ensure early detection of renal disease.