Renal Insufficiency

1) Species differences
   a) Renal failure in the dog begins when the creatinine is above normal (2.2-2.5).
   b) Renal failure in the cat does not start until the creatinine is 5.0-5.5.
   c) Renal insufficiency in the cat is the stage between normal and failure: Creatinine = 2.2/2.5 – 5.0-5.5.

2) IRIS Classification (International Renal Interest Society): Stages of Chronic Kidney Disease
   a) I: Creatinine up to 1.6.
   b) II: Creatinine 1.6-2.8.
      i) a: 1.6-2.4 (“Normal”)
      ii) b: 2.4-2.8 (“Abnormal”)
   c) III: Creatinine 2.8-5.0
   d) IV: Creatinine > 5.0

3) Stages of Kidney Disease
   a) Renal Insults
      i) Usually no clinical or laboratory abnormalities.
      ii) Possibly transient signs of acute renal disease
   b) Renal Insufficiency
      i) 75-85% loss of renal function.
      ii) Clinical signs
         (1) PU/PD, gradual WL, decreased appetite
         (2) Early signs may elude detection by owner.
         (3) Signs become more obvious as the creatinine elevates.
      iii) Laboratory findings
         (1) Creatinine: 2.2/2.5 – 5.0/5.5; USG may be normal in early stage; phosphorus normal in early stage; PCV low normal to mild anemia.
   c) Failure
      i) Greater than 85% loss of renal function.
      ii) Clinical signs
         (1) Anorexia, WL, dehydration, renal breath, oral ulcers
         (2) Signs become more severe as the creatinine elevated.
      iii) Laboratory findings
         (1) Creatinine > 5.0/5.5; abnormal USG, phosphorus, TCO2, PCV.

4) I much prefer creatinine over BUN
   a) The BUN is influenced by many non-renal factors
      i) High protein diet: increase BUN
      ii) GI bleeding: increase BUN
      iii) Increased protein catabolism: increase BUN
         (1) Corticosteroids, burns, fever, tetracycline
      iv) Dehydration: increase BUN
      v) Prerenal renal failure: increase BUN
      vi) Polyuria: decrease BUN
      vii) Severe liver disease: decrease BUN
   b) ** Creatinine is lowered when there is significant weight loss. This can be very significant in geriatric cats.

5) Urine specific gravity
   a) The cat has a much greater ability to concentrate urine than the dog.
   b) As a rule, the USG becomes abnormally low before the creatinine rises, but many cats in renal failure have USG above 1.030.
   c) Do not rule out renal disease because the USG is normal.

6) Further diagnostics
   a) All of these cats should have a urine culture.
      i) 22% positive: J Fel Med Surg April 07, p.124.
      ii) 13% of cats with ”quite sediment” are likely to have a positive urine culture.
   b) Ultrasound and possibly biopsy should be performed if:
      i) The cat is less than 10 years of age.
      ii) One or both kidneys are enlarged.
      iii) One or both kidneys are painful.
   c) Sizing kidneys
      i) Palpation
ii) Radiographs: Normal is 2.0-2.5 X the length of the body of L2.
iii) Ultrasound: 38-42 mm in a young cat.
d) Urine culture – by cystocentesis.
e) Ultrasound
f) Biopsy
i) Indicated when the cat is < 10 years of age or the kidneys are enlarged.
ii) Technique
   (1) Confine the biopsy to the renal cortex.
   (2) Direct the needle in a longitudinal plane.
   (3) Consider a fine needle biopsy using a 22 gauge disposable needle.

7) Presentations: How to find RI cats.
a) Cats presented for PU/PD.
b) The result after treating a renal failure cat with 3-6 days of hospitalization (IV fluids, etc.)
c) Geriatric profiles: The number one source for finding these cats – if you do them.

8) Home Treatment
a) Expectations: to add 1-3 years of life to the cat.
b) Treatment threshold principle: Be sure the client can pill the cat.
i) Norsworthy’s pilling technique: https://dl.dropboxusercontent.com/u/69563616/Pilling%20Demo.AVI

c) Steps of Treatment
i) Renal diet
ii) Traditional Renal Diets
   (1) Reduced protein (controversial)
   (2) Reduced phosphorus
   (3) Non acidifying
   (4) Low sodium
iii) New thinking; Credit to Deb Zoran, DVM, PhD (Nutrition), DACVIM
   (1) Emaciation in old cats is usually due to protein depravation.
   (2) Older cats do not digest protein well; most 12 yrs. only digest 75%.
   (3) Low protein diets are likely contributing to muscle loss in older cats.
   (4) Some feel we should be feeding high protein diets to older cats, even ones in renal insufficiency.
      (a) Change to a traditional renal diet if the BUN increases significantly.
      (b) High protein diets may increase the need for phosphate buffers (high protein diets are high in phosphorus),
          the need to monitor blood pressure more closely (renal diets are low in sodium), the need for potassium
          supplementation (renal diets are supplemented with extra potassium), and alkalization of urine (high protein
          diets are strongly acidifying). Monitoring should include creatinine, BUN, phosphorus, potassium, TCO2 or
          HCO3, and blood pressure determination.
      (c) High protein diets are contraindicated in cats with a history of calcium oxalate urolithiasis because they are
          so strongly acidifying.
   (5) See handout for clients at end of this handout.
   (6) For determining carb level: https://secure.balanceit.com/tools/_gaconverter/
   (7) Journal Feline Medicine and Surgery, August 2013
      (a) “Animals, including cats, can adapt to low protein intake and maintain nitrogen balance while depleting
          LBM (lean body mass). Current AAFCO and NRC standards for protein adequacy may not provide
          adequate protein to support LBM. The minimum daily protein requirement for adult cats appears to be 5.2
          g/kg body weight, well in excess of current AAFCO and NRC requirements.”
iv) Benazepril
   (1) AJVR, 3/01: Shown to slow progressive deterioration of the kidneys in cats.
   (2) Actions (per Novartis)
      (a) Inhibits the Renin-Angiotensin-Aldosterone System
      (b) Vasodilation of the glomerular efferent arteriole
      (c) Reduces glomerular pressure (relieves glomerular hypertension)
      (d) Decreases protein loss
      (e) Increases glomerular filtration leading to increased clearance of creatinine and urea.
   (3) Dose: Up to 5 kg: 2.5 mg/q24h; Over 5 kg: 5 mg/q24h
   (4) Watch for development of hyperkalemia (very unlikely)
v) Potassium orally: 2-4 mEq/d or 500-1000 mg/d
   (1) Indication: Cats with renal insufficiency with serum K levels in the low half of the normal range or lower.
   (2) The cycle:
      (a) Renal failure causes polyuria.
      (b) Potassium is lost in increasing amounts resulting in hypokalemia.
      (c) Hypokalemia is harmful to the kidneys of the cat.
Acidosis causes a shift of potassium from within the cells (where it works) to the blood.

This results in muscle weakness in spite of improving potassium blood levels.

DiBartola in JAVMA, 3/1/93

“Chronic renal disease initiates a self-perpetuating cycle of declining renal function and increasing potassium depletion.”


“Potassium depletion leads to functional and morphologic abnormalities in the kidneys characterized by decreased GFR and defective renal concentrating ability.”

DiBartola in JAVMA, 3/1/93

“Dietary potassium supplementation may stabilize or improve renal function and should be a part of chronic renal disease management.”

(3) Potassium tastes badly so administration can be a problem.

(4) You must find a method that is hassle-free or it will not be done long-term.

(5) Options

(a) Tumil-K: powder (good in canned food); tablets; gel
(b) Generic potassium gluconate (RenaCare)
(c) Compounded chewables
(d) Renal K powder; excellent palatability
(e) Pill Pockets: very well accepted by many cats but rejected by others.

vi) Subcutaneous fluids: by the owner or your technician

(1) 150 ml 2X per week; increase based on creatinine level and creatinine trend
(2) Use 18 gauge needles; 20 ga Terumo needles are > 50% slower.
(3) Potassium can be added to SQ fluids

(a) KCl up to 35 mEq per liter (more causes SQ inflammation)
(b) I recommend it if fluids are given 3X per week or more due to increased loss of potassium due to the amount of fluid being given.
(c) I consider it a replacement of this lost potassium and not a replacement for oral potassium.

vii) Hypotensive agents

(1) About 20% of cats with renal insufficiency are hypertensive
(2) Amlodipine (Norvasc) is clearly the drug of choice; 0.625 mg/cat initial dose; adjust to response with BP checks every 48 hrs..
(3) ACE-inhibitors will lower blood pressure but not greatly; can be used with amlodipine for resistant cases.

(a) Asymptomatic cats

   (i) ACE-i for one month to see if that is all that is needed.
   (ii) If not, add amlodipine

(b) Retinal Detachment or Encephalopathy

   (i) Nitroglycerin ointment (1/4 inch BID to pinna); only efficacious for 48 hours +
   (ii) Amlodipine +
   (iii) Benazepril

(c) Retinal hemorrhage only

   (i) Amlodipine +
   (ii) Benazepril

(4) Check the blood pressure every 2-3 days until the systolic pressure is < 150 (ideal) or < 160 (OK).
(5) My preferred BP machine: HDO sold by DVM Solutions; www.dvmsolutions.com

viii) Drugs to increase food intake

(1) Famotidine; corrects gastric hyperacidity
(2) Cyproheptadine
(3) Mirtazapine: 15 mg tablet: 1/8 tablet (2 mg) q48h (q24h if renal function normal)
   (a) Has marked GI and cardiac stimulant effects if overdosed (definitely at 15 mg/dose)
(4) Fortiflora (Purina): sold for diarrhea control but some cats eat much better with it in their food.
(5) Benazepril (main “side effect” is appetite stimulation and weight gain).
(6) Vitamin B12 injections: 250-2000 mg q3-14d.

ix) Phosphate binder: PRN (usually not needed but more likely if high protein diet is fed)
   (a) Ca carbonate: Epakitin
      (i) Very palatable.
      (ii) Use with caution if serum calcium is elevated.
      (iii) Available on the Internet.
   (b) Aluminum hydroxide
      (i) ConSeal-AIH by Bock Vet Pharma; 200 mg chewable tablets
         1. Satisfaction guarantee, including the cat eating the product.
         2. Not available on the Internet.
      (ii) Medical Grade Powder
         1. LETCO Medical; 1821 Reliable Parkway, Chicago, IL 60686-0001; www.letcomedical.com. They require setting up a credit account to ship, and the account manager is Beth Raymond (734) 743-6066. The cost for a 500 gram container is $55 with shipping (Feb 2012).  
         2. Mix in canned food or “shake in a baggy” with dry food. Dose: ¼ teaspoon per cat BID in food. Dose can be increased 2-4X if needed to reduce phosphorus to < 5.0. Tasteless but there will be a limit as to how much you can add to food without reducing palatability of food. Can be placed in water or other liquid and syringed orally.

x) Darbepoietin (Aranesp)
   (1) Indicated when PCV < 20%.
   (2) Dose: 6.25 mcg/cat; begin q1-2w; maintenance q2-6w; very expensive but given less frequently than Epogen so the cost to treat is about the same. Less chance of cat developing antibodies.

xi) Summary
   (1) Level One
      (a) Creatinine abnormal but up to 4.0
      (b) Renal diet + benazepril; potassium if cat is hypokalemic; phosphate binder if cat is hyperphosphatemic; appetite stimulant if needed.
   (2) Level Two
      (a) Creatinine ~ 4.0-6.0 or increasing creatinine values over time
      (b) Add SQ fluids to above

d) Rechecks
   i) Most vital tests: creatinine, BUN (esp. very thin cats), phosphorus, potassium, PCV, Acid-Base, blood pressure.
   ii) First should be 2 weeks after all recommendations are being performed
      (1) May take 4-6 weeks based on time to convert diet.
      (2) Primarily to check compliance as there should be no change in the creatinine level.
      (3) Also, to check for hyperkalemia and hyperphosphatemia.
      (4) Check blood pressure – first and with owner present.
   iii) Every 3 months thereafter.
   iv) I perform my rechecks in-house using the VetScan by Abaxis (the “Cat Friendly” Machine)
      (1) Takes less than 15 minutes of run time to get results.
      (2) Runs on whole blood.
      (3) I go to another exam while it is running.
      (4) This approach allows changes in the treatment protocol without having the client return.
      (5) No phone call is needed the next day when you have forgotten the details of the case or when you have to leave a message.

e) Compliance
   i) Differentiate insufficiency from failure
   ii) Have a plan and make it understandable
   iii) Make do-able recommendations
   iv) Plan rechecks (to check cat and owner compliance)
   v) Give the client a reasonable goal
Changing Dietary Recommendations for Older Cats

It has long been known that cats have some fundamental nutritional differences from dogs. Dogs are omnivores, meaning that they can eat and properly digest both meat and plant material. However, cats are obligate carnivores; they require some meat in their diets for proper nutrition. More recently, we have begun to appreciate that cats need very little carbohydrates. Most current and past diets have included far more carbohydrates than the cat can properly digest.

It has been recently discovered that aging cats lose their ability to efficiently digest protein. Most 12 year old cats are only digesting about 75% of the protein they ingest. The percentage goes down further as the cat moves through its geriatric years.

To confound the problem even more, most cat foods have substantial amounts of protein that are not digestible to any cat. Cat food manufacturers are required by law to list “Crude Protein,” also known as “Total Protein” on the labels of their pet foods. However, that is not the same as “Digestible Protein.” An extreme example is chicken feathers. They are 98% crude protein but 0% digestible. They could be put in cat food cheaply, increase the crude protein amount substantially, but reduce the digestible protein to a very low amount. The required crude protein amount on the label would make this look like a very nutritious food; obviously, it would not be nutritious at all.

Some cat foods are labeled “Highly Digestible.” This is a legal term that means that the included protein is about 80-90% or more digestible. Most prescription foods and premium brand foods will qualify as “highly digestible.” Foods without this statement on the label often contain protein sources that are only 50-60% digestible.

To make matters worse, veterinarians often recommend “kidney diets” and “senior diets” for older cats. These have reduced protein levels because of a widespread belief that excess protein is hard on the kidneys; consequently, restricting protein will make the kidneys last longer. This has been controversial for about two decades, and over the next few years it will likely be rejected by most veterinarians.

So what does all of this mean? It means that most cats over 12 years of age are getting far more carbohydrates than they need. More importantly, they are usually protein deprived. They simply are not getting the quantity or quality of protein that they need.

Where does protein deprivation lead? A protein deprived cat loses weight, especially muscle mass along the spine and over the hips, making these structures easily felt and seen. For many years we have accepted weight loss in old cats as simply a consequence of aging. Now we know that our misguided feeding habits have likely caused or contributed to this to happening.

What do we do now? It is time for a fundamental change in the way we feed older cats. Simply stated: We need to be feeding more protein and less carbohydrates.

A few years ago there was a change in the way we fed diabetic cats. The change was from high fiber diets (high carbohydrates) to low carbohydrate and high protein diets. This followed the Atkins Diet approach for humans. Therefore, the newer diabetic cat foods are actually ideal for older cats. Purina’s prescription diet DM is our first choice for older cats whether or not they have kidney disease. It is available as a dry food, a traditional canned food, and the new “Savory Select.” All are excellent, but the traditional canned and “Savory Select” versions are lower in carbohydrates and higher in protein than the dry form. Our second choice is Purina’s EN, a food designed for cats with stomach and intestinal problems. It is a bit higher in carbohydrates and a bit lower in protein than DM, but it is still an excellent choice.
What about younger cats? A low carbohydrate and high protein diet is also an excellent choice for kittens and younger adults. Essentially, a food like this is good for cats of all ages. Currently, the only cats that should not be fed a diet like this are those that have had calcium oxalate kidney or bladder stones.

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<th>Data taken from product catalogs or from company technical support.</th>
<th>DM Dry</th>
<th>DM Can</th>
<th>DM Savory Select</th>
<th>EN Dry</th>
<th>EN Can</th>
<th>k/d Dry</th>
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To download: https://dl.dropboxusercontent.com/u/69563616/Renal%20Insufficiency%20Diet%20Chg%20Handout.doc

To determine carbohydrate level in a food: https://secure.balanceit.com/tools/_gaconverter/

More Extensive Comparisons
Not part of the client handout.

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<td>Seafood Feast</td>
<td>57%</td>
<td>2.6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ocean Whitefish &amp; Tuna Feast</td>
<td>60%</td>
<td>2.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Savory Salmon Feast</td>
<td>52%</td>
<td>4.7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fancy Feast FLAKED Varieties</th>
<th>Protein</th>
<th>Carbohydrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken &amp; Tuna Feast</td>
<td>62%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Fish &amp; Shrimp Feast</td>
<td>63%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Salmon &amp; Ocean Whitefish Feast</td>
<td>61%</td>
<td>5.4%</td>
</tr>
<tr>
<td>Trout Feast</td>
<td>61%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Tuna Feast</td>
<td>62%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Tuna &amp; Mackerel Feast</td>
<td>65%</td>
<td>6.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fancy Feast CHUNKY Varieties</th>
<th>Protein</th>
<th>Carbohydrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken Feast</td>
<td>57%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Turkey Feast</td>
<td>56%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Chopped Grilled Feast</td>
<td>55%</td>
<td>5.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fancy Feast DELIGHTS WITH CHEDDAR Varieties</th>
<th>Protein</th>
<th>Carbohydrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic Salmon &amp; Cheddar Cheese Feast</td>
<td>51%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Classic Turkey &amp; Cheddar Cheese Feast</td>
<td>49%</td>
<td>5.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fancy Feast KITTEN Varieties</th>
<th>Protein</th>
<th>Carbohydrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey Feast</td>
<td>52%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Ocean Whitefish Feast</td>
<td>55%</td>
<td>4.3%</td>
</tr>
</tbody>
</table>

To Download: https://dl.dropboxusercontent.com/u/69563616/Fancy%20Feast%20CHO%20DM.doc