

NUTRITIONAL MANAGEMENT: CONCURRENT RENAL AND HEPATIC DISEASE IN A DOG



CASE: BULMA

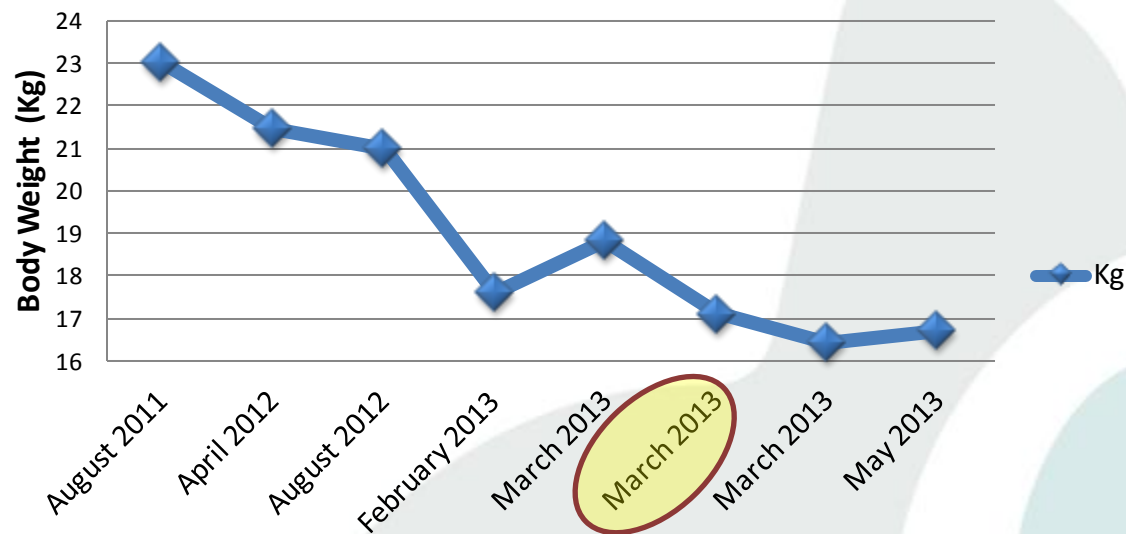
- Specie: Canine
- Breed: Golden Retriever
- Sex: Female
- Spayed: No
- Age: 13 years old



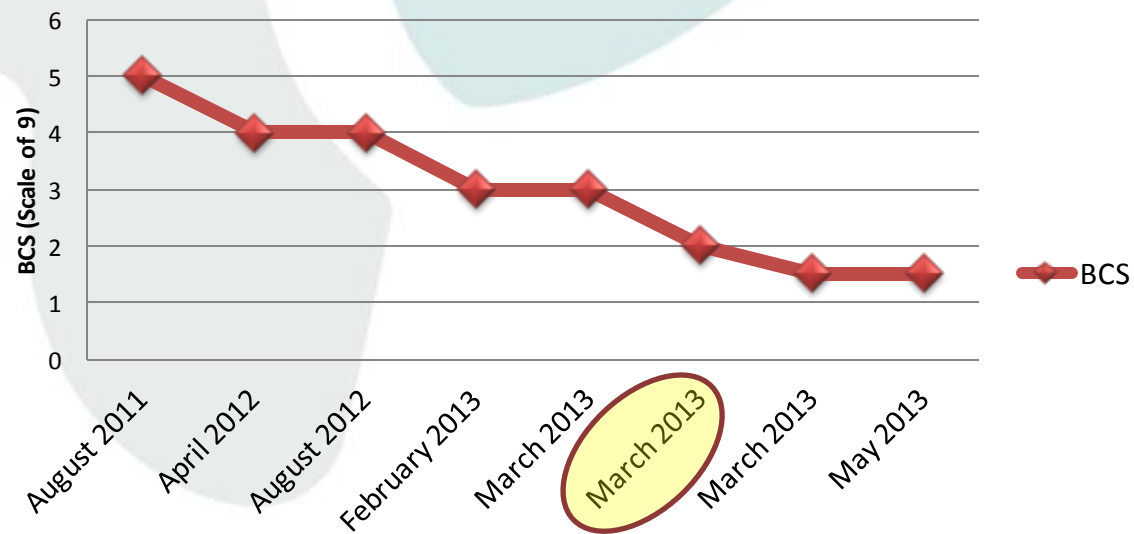
MEDICAL HISTORY

DATE	CLINICAL SIGNS	ANALYTIC FINDINGS	DIAGNOSE	DIET	BODY WEIGHT	BCS	MM
AUGUST 2011	- Weight loss - Diarrhoea	- ↑ Hepatic enzymes	- Chronic hepatitis vs Hepatic Congestion	Maintenance diet	23 Kg	5/9	3/3
APRIL 2012	- Heart murmur	- Anemia - ↑ Hepatic enzymes	- Mild anemia - Chronic hepatitis	Maintenance diet	21.45 Kg	?	?
AUGUST 2012	- Hyporexia		Recommendation hepatic biopsy	Maintenance diet	21 Kg	4/9	2/3
FEBRUARY 2013	- Vomits - Weight loss - Mammary nodules - Adrenal mass	- Proteinuria - Azotemia - ↓ Urinary density	- CKD: IRIS III - Probable left adrenal tumour.	Renal diet (K/d Hill's).	17.6 Kg	3/9	2/3
14 MARCH 2013		- Azotemia (Creat= 2.27; urea= 121.7	- CKD: IRIS III	Renal diet (K/d Hill's).	18.8 Kg	?	2/3
26 MARCH 2013	- Apathy - Anorexia	- Anemia - Azotemia (Urea= 108 Creat= 1.8 mg/dl)	- CKD: IRIS III	Renal diet (K/d Hill's).	17.1 Kg	2/9	1/3

Body Weight



BCS



DIET HISTORY

- Previously: Maintenance dry food + “treats”.
- At the time of diagnosis:
 - Hill’s Prescription diet K/d dry: 200 g 2 times/day
 - Hill’s Prescription diet K/d wet: 100 g 2 times/day
 - Raw apple : 25 g 3 times/week
- One week before consulting:
 - Hill’s Prescription diet K/d wet: 278 g/day
 - Roast beef: 50 g/day
 - Raw apple: 5 g/day



DIET EVALUATION

- Kcal diet two months before:

- Hill's Prescription diet **K/d dry**: 3940 Kcal/Kg

- 200 g 2 times/day = 400 g/day = **1576 Kcal/day**

- Hill's Prescription diet **K/d wet**: 1390 Kcal/Kg

- 100 g 2 times/day = 200 g/day = **278 Kcal/day**

- Raw apple**: 52 Kcal/100 g

- 25 g 3 times/week = 75 g/week = 10.7 g/day = **5.6 Kcal/day**

TOTAL= 1860 Kcal/d



[c3827] Hill's Prescription Diet k/d canine (EUROPE) dry	400.000 g.	400 g	1575.60 kcal
[c3826] Hill's Prescription Diet k/d canine (EUROPE) canned	200.000 g.	200 g	278.50 kcal
[n9003] Apples, raw, with skin	10.700 g.	11 g	5.57 kcal
Totals:	610.700 g.		1859.67 kcal

3.045 kcal/gram w/o added water; 29.43 % moisture w/o added water; 4315.32 kcal/kg DM

11.8% ME
Protein

40.7% ME Fat

47.5% ME Carbohydrate



P= 0.549g/Mcal (0.4-0.677g/Mcal)

Na= 0.463 g/Mcal (0.175-0.8 g/Mcal)

Prot= 33.677 g/Mcal (28-37 g/Mcal)

K= 1.67 g/Mcal (0.83-2 g/Mcal)

- Kcal diet one week before:

- Hill's Prescription diet **K/d wet**: 139 Kcal/100g

278 g/day= **386 Kcal/day**

- Beef steak** cocked roasted: 218 Kcal/100g

50 g/day = **109 Kcal/day**

- Raw apple**: 52 Kcal/100 g

25 g 3 times/week =75 g/week = 10.7 g/day = **5.6 Kcal/day**

TOTAL= 501 Kcal/d



[c3826] Hill's Prescription Diet k/d canine (EUROPE) canned	278.000 g.	278 g	387.12 kcal
[n13439] Beef, tenderloin, steak, separable lean and fat, trimmed to 0" fat, all grades, cooked, broiled	50.000 g.	50 g	109.03 kcal
[n9003] Apples, raw, with skin	10.700 g.	11 g	5.57 kcal
Totals:	338.700 g.		501.71 kcal

1.481 kcal/gram w/o added water; 69.42 % moisture w/o added water; 4843.93 kcal/kg DM

20.5% ME Protein

47.2% ME Fat

32.3% ME Carbohydrate



Prot= 52.476 g/Mcal (28-37 g/Mcal)

Na= 0.333g/Mcal (0.18-0.8 g/Mcal)

P= 0.601 g/Mcal (0.4-0.67 g/Mcal)

K= 0.972 g/Mcal (0.83-2 g/Mcal)

DIET PLAN

ENERGY REQUIREMENTS

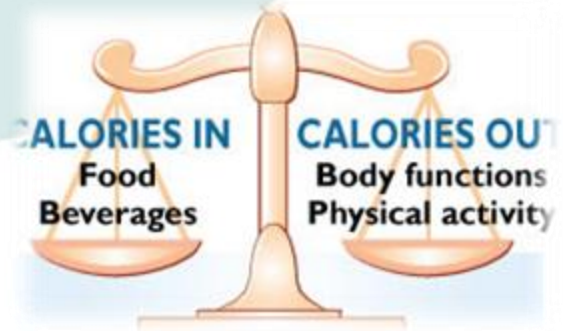
- Intact female dog; 17 Kg BCS= 2/9.
Lost 3-4 Kg in 3 months.

$$\text{MER}_{(\text{active geriatric dog, NRC 2006})} = 105 \times (\text{BW})^{0.75} = 879 \text{ Kcal/day}$$



DECIDE CALORIES

- Diet formulated to provide: **1010 Kcal/day** → 20% more than her MER.
- We distributed the calories in this way:
 - 90% diet: **909 Kcal/d.**
 - 10% “Treats”: **101 Kcal/d.**



CALORIC DISTRIBUTION

PROTEIN= 12-16% ME

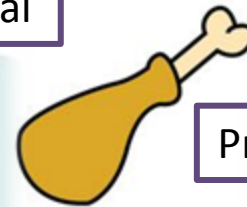
CARBOHYDRATE= 44-58% ME

FAT= 30-40% ME

NUTRITIONAL STRATEGIES TO MANAGE CHRONIC RENAL DISEASE



P= 0.4-0.6 g/Mcal



Prot= 28-37 g/Mcal



Na= 0.2-0.8 g/Mcal



K= 0.9-2 g/Mcal

1. Phosphorus restriction

Brown et al. 1991

2. Low/Moderate levels of high quality Protein

Adams et al. 1993

3. Low/Moderate levels of Sodium

Buranakarl et al. 2004,

4. Use hydrosoluble vitamins as supplement (output poliuria > input)

Buranakarl et al. 2004,

Vitamin levels > 200%

5. Add long chain fatty acids $\omega 3$.

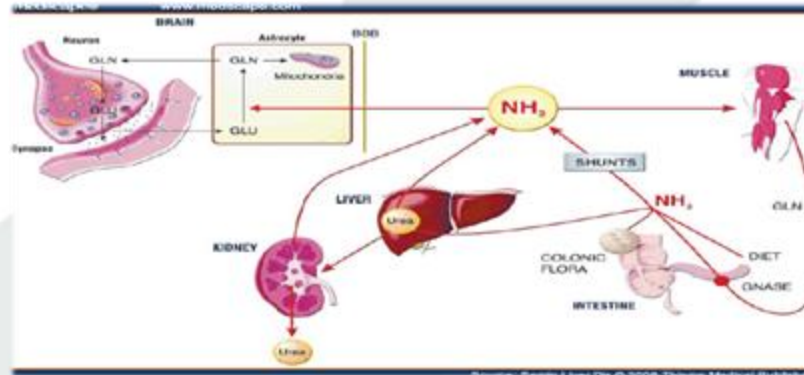
Brown et al. 1998 and 2000, Brown et al. 2008

6. Achieve adequate levels of potassium.

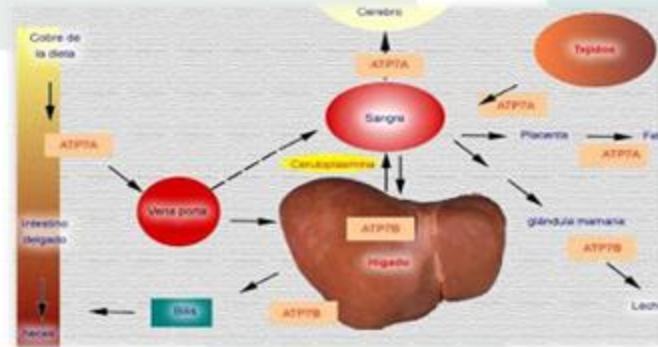
Dow et al. 1989, Cowgill 2008

NUTRITIONAL STRATEGIES TO MANAGE HEPATIC DISEASE

1. If there is protein intolerance (Hepatic encephalopathy or Urate bladder stones) = modify the protein of the diet.



2. If there is accumulation of copper in the liver = reduce the copper of the diet.



- Bulma doesn't have any of these problems, so **we don't modify the diet in this aspect.**

COMMERCIAL DIETS

- Advance Veterinary Diet Renal canine dry
- Advance Veterinary Diet Renal canine wet
- Nestle Purina Veterinary Diet NF canine dry
- Nestle Purina Veterinary Diet NF canine wet
- Royal Canin Veterinary Diet Renal canine dry
- Royal Canin Veterinary Diet Renal canine wet

➤ Maybe some of these diets could be more tasty to Bulma.



HOMEMADE DIET



- Formulated by a Computer Software individualized for Bulma diseases.
- Animal requirement: FEDIAF Adult Dog.
- The diet was made to provide 906 Kcal/d, with a caloric distribution of: 15.7% ME protein; 39.0% ME lipids and 45.3% ME carbohydrates.
- Ingredients (tastier to Bulma) :
 - Chicken thigh without skin (meat only): high quality protein source, high digestible.
 - White rice unenriched: carbohydrate source, high digestible, low in phosphorous.
 - Sunflower oil: source of essential fatty acids ω_6
 - Fish oil: source of fatty acids ω_3
- Supplements (two options):
 1. Combination of Human supplements.
 2. Special supplement for dogs and cats (BalanceIT[®])



HOMEMADE DIET



- Recipe by day:

TOTAL Amount cooked	Type of Ingredient	Cooking method	Amount/Morning	Amount/Evening
100 g	Chicken tight without skin (meat only)	Boiled	50 g	50 g
350 g	White rice unenriched	boiled	175 g	175 g
30 ml	Sunflower oil	Raw	15 ml	15 ml
3 ml	Fish oil (GOMEGA Vetplus [®])	Raw	3 ml	0 ml

- Supplements by day (two options):

- Combination of Human supplements (owner's choice):

- Calcium Carbonate (Mastical 1250 mg[®], 500 mg of elementary calcium)- source of **calcium**. The supplement shouldn't contain Vitamin D. : 1 tablet.
- Salt (Sal Dieta Sofar[®]) source of **sodium, potassium, iodine** and **chlorine**. : 2.5 grams (1/2 teaspoon)
- Multivitamin (Multicentrum adultos [®]) – source of **vitamins** and **minerals** : 2.5 tablets.
- Choline (**Colina** 350 mg Cápsulas vegetales Solgar[®]) : 1 capsule
- Zinc- (**Zinc** quelado Solgar[®]) : 3/4 tablet.
- Cobalamin- (Vitamina B12 comprimidos Solgar[®]) : 1 tablet once a week. Source of **Cobalamin**.



- Special supplement for dogs and cats (BalanceIT[®]):

Balanceit Canine-K- 10 grams (3 3/10 blue scoop)

HOMEMADE DIET



SUMMARY OF INGREDIENTS & AMOUNTS COMPARED TO SELECTED REQUIREMENT

Pet: BULMA FERNANDEZ FLORES, 13 yr, canine, Intact, weighing 17 kg

[m14] Rice, white, long-grain, regular, cooked (BalanceIT.com)	350.000 g.	350 g	454.32 kcal
estimated yield from 124.1 g (approx. 124 1/8 g) of raw/unprepared/dry Rice...			
[n5099] Chicken, broilers or fryers, thigh, meat only, cooked, stewed	100.000 g.	100 g	195.06 kcal
[n4506] Oil, sunflower, linoleic, (approx. 65%)	27.000 g.	6 tsp	238.68 kcal
[m1290] Multicentrum adultos (España)	3.425 g.	2 1/2 tablet	0.00 kcal
[m1808] Sal Dieta (Sofar)	2.500 g.	2 1/2 g	0.00 kcal
[m1649] Omega	2.025 g.	1 1/2 pump (where 1 pump = 1.5 mL)	18.23 kcal
[m1872] Mastical 1250 (500 mg Ca)	1.000 g.	1 comprimido	0.00 kcal
[m1289] Colina 350 mg cápsulas vegetales (Solgar)	1.000 g.	1 capsula	0.00 kcal
[m1291] Zinc quelado comprimidos (Solgar)	0.750 g.	1 tableta	0.00 kcal
[m1618] Solgar vitamina B12 comprimidos 100ug (españa)	0.143 g.	1 comprimido	0.00 kcal
Totals:	487.843 g.		906.28 kcal

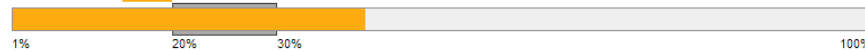
1.858 kcal/gram w/o added water; 62.55 % moisture w/o added water; 4960.15 kcal/kg DM; 19.29 LA+AA:EPA+DHA ratio

Total calories fed: 906.3 kcal/day OR 86% of the calculated requirement

Protein calories: 15.7%



Fat calories: 39%



Carbohydrate calories: 45.3%



Calculated Energy Requirement Range 36% 906.284 kcal Min kcal/day (50% MER):527 Max kcal/day (150% MER):1582

Nutrients	Show All	% of Requirement	Amount (per Meal)	Requirement Range
[203] Protein		84.4%	37.974 g	(45 to [no max] g)
[511] Arginine		194.5%	2.529 g	(1.3 to [no max] g)
[512] Histidine		189.6%	1.099 g	(0.58 to [no max] g)
[503] Isoleucine		165.6%	1.905 g	(1.15 to [no max] g)
[504] Leucine		142.8%	2.927 g	(2.05 to [no max] g)
[505] Lysine		258.8%	2.717 g	(1.05 to [no max] g)
[1001013] Methionine-cystine		101.4%	1.572 g	(1.55 to [no max] g)
[1001017] Phenylalanine-tyrosine		131.4%	2.929 g	(2.23 to [no max] g)
[502] Threonine		118.2%	1.535 g	(1.3 to [no max] g)
[501] Tryptophan		102.8%	0.442 g	(0.43 to [no max] g)
[510] Valine		135.2%	2.002 g	(1.48 to [no max] g)
[204] Total lipid (fat)		319.3%	43.910 g	(13.75 to [no max] g)
[618] 18:2 undifferentiated		663.6%	21.898 g	(3.3 to [no max] g)
[205] Carbohydrate, by difference		100.0%	108.790 g	(0 to [no max] g)
[421] Choline, total		594.1%	488.235 mg	(296.224 to [no max] mcg)
[435] Folate, DFE		2075.6%	934.034 mcg_DFE	(45 to [no max] mcg_DFE)
[406] Niacin		2422.1%	66.608 mg	(2.75 to [no max] mg)
[410] Pantothenic acid		926.4%	23.159 mg	(2.5 to [no max] mg)
[405] Riboflavin		341.2%	5.118 mg	(1.5 to [no max] mg)
[404] Thiamin		814.4%	4.561 mg	(0.56 to [no max] mg)
[320] Vitamin A, RAE		594.1%	2227.779 mcg_RAE	(375 to 30000 mcg_RAE)
[418] Vitamin B-12		416.2%	0.023 mg	(0.006 to [no max] mg)
[415] Vitamin B-6		1607.3%	6.108 mg	(0.38 to [no max] mg)
[323] Vitamin E (alpha-tocopherol)		600.8%	54.069 IU, Vit E	(9 to [no max] IU, Vit E)
[301] Calcium, Ca		83.9%	1.049 g	(1.25 to 6.25 g)
[1000000] Chloride		363.2%	1.380 g	(0.38 to 5.6 g)
[312] Copper, Cu		96.2%	1.731 mg	(1.8 to 7.1 mg)
[1000001] Iodine		145.4%	0.378 mg	(0.26 to 2.8 mg)
[303] Iron, Fe		222.2%	19.994 mg	(9 to 355 mg)
[304] Magnesium, Mg		206.7%	0.372 g	(0.18 to [no max] g)
[315] Manganese, Mn		511.2%	7.362 mg	(1.44 to 42.6 mg)
[305] Phosphorus, P		67.5%	0.675 g	(1 to 4 g)
[306] Potassium, K		93.6%	1.170 g	(1.25 to [no max] g)
[317] Selenium, Se		174.1%	0.131 mg	(0.075 to 0.142 mg)
[307] Sodium, Na		183.6%	0.459 g	(0.25 to 4.5 g)
[309] Zinc, Zn		193.6%	34.846 mg	(18 to 71 mg)
[1000021] Ca:P ratio		100.0%	1.554 n/a	(0 to [no max] n/a)
[328] Vitamin D (D2 + D3)		445.8%	557.221 IU, Vit D	(125 to 568 IU, Vit D)

Calcium and cooper were lower than the allowances of FEDIAF for Adult Dogs, but it was above the Adult Dogs recommendation by NRC 2006, so we didn't considered necessary to supplement them.

The protein, the phosphorous and the potassium were under the FEDIAF recommendation because we wanted to maintain these nutrients in this range due to Bulma's Renal disease.

HOMEMADE DIET

NRC 2006, Requirements

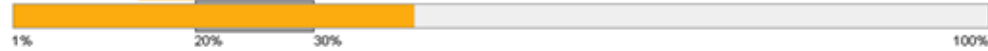


Total calories fed: 906.3 kcal/day OR 0% of the calculated requirement

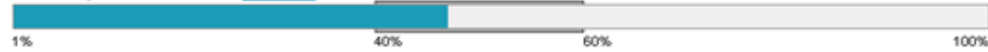
Protein calories: 15.7%



Fat calories: 39%



Carbohydrate calories: 45.3%



15.7% ME Protein 39.0% ME Fat 45.3% ME Carbohydrate

Calculated Energy Requirement Range 0% 906.284 kcal Min kcal/day (50% MER):0 Max kcal/day (150% MER):0

Nutrients <input type="button" value="Show All"/>	% of Requirement	Amount (per Mcal)	Requirement Range
[203] Protein	151.9%	37.974 g	(25 to [no max] g)
[511] Arginine	287.4%	2.529 g	(0.88 to [no max] g)
[512] Histidine	229.1%	1.100 g	(0.48 to [no max] g)
[503] Isoleucine	200.5%	1.904 g	(0.95 to [no max] g)
[504] Leucine	172.2%	2.927 g	(1.7 to [no max] g)
[505] Lysine	308.8%	2.717 g	(0.88 to [no max] g)
[506] Methionine	121.3%	1.007 g	(0.83 to [no max] g)
[1001013] Methionine-cystine	96.5%	1.572 g	(1.63 to [no max] g)
[508] Phenylalanine	146.1%	1.651 g	(1.13 to [no max] g)
[1001017] Phenylalanine-tyrosine	158.4%	2.930 g	(1.85 to [no max] g)
[502] Threonine	142.2%	1.536 g	(1.08 to [no max] g)
[501] Tryptophan	126.3%	0.442 g	(0.35 to [no max] g)
[510] Valine	162.7%	2.002 g	(1.23 to [no max] g)
[204] Total lipid (fat)	318.2%	43.910 g	(13.8 to 77.5 g)
[618] 18:2 undifferentiated	782.1%	21.898 g	(2.8 to 16.3 g)
[205] Carbohydrate, by difference	100.0%	108.790 g	(0 to [no max] g)
[421] Choline, total	110.3%	468.235 mg	(424.337 to [no max] mg)
[435] Folate, DFE	1383.8%	934.034 mcg_DFE	(67.5 to [no max] mcg_DFE)
[406] Niacin	1567.3%	66.608 mg	(4.25 to [no max] mg)
[410] Pantothenic acid	617.6%	23.159 mg	(3.75 to 5000 mg)
[405] Riboflavin	393.7%	5.118 mg	(1.3 to 375 mg)
[404] Thiamin	814.5%	4.561 mg	(0.56 to 450 mg)
[320] Vitamin A, RAE	587.8%	2227.779 mcg_RAE	(379 to 16000 mcg_RAE)
[418] Vitamin B-12	261.6%	22.891 mcg	(8.75 to [no max] mcg)
[415] Vitamin B-6	1628.8%	6.108 mg	(0.375 to 125 mg)
[324] Vitamin D	409.7%	557.221 IU, Vit D	(136 to 800 IU, Vit D)
[323] Vitamin E (alpha-tocopherol)	720.9%	54.069 IU, Vit E	(7.5 to 250 IU, Vit E)
[430] Vitamin K (phyloquinone)	21.5%	0.088 mg	(0.41 to [no max] mg)
[301] Calcium, Ca	104.9%	1.049 g	(1 to [no max] g)
[1000000] Chloride	460.0%	1.380 g	(0.3 to 5.875 g)
[312] Copper, Cu	115.4%	1.731 mg	(1.5 to [no max] mg)
[1000001] Iodine	171.8%	0.378 mg	(0.22 to 1 mg)

HOMEMADE DIET



- **Treats:**

- **maximum 100 Kcal/day** (10% of the total calories per day).
- They can be combined and the owner can vary them every day.
- Avoid toxics for dogs: chocolate, garlic, onion, raisin, grapes, Macadamia Nuts.



- **Avoid high sodium, high protein and high phosphorous extras (legumes, nuts, some meats and fish, cheese, etc).**



- Some examples of treats that Bulma could eat :

- ½ medium size apple= 38 Kcal.
- 10 g White bread= 26 Kcal.
- 100 g watermelon= 30 Kcal.
- 100 g melon= 34 Kcal.



FOLLOW UP

📅 **February 2013** : Start with homemade diet. Bulma eats it well during 1 month, but it isn't enough to improve her Body Condition.



DATE	CLINICAL SIGNS	ANALYTIC FINDINGS	DIAGNOSE	DIET	BODY WEIGHT	BCS	MM
29 MARCH 2013	-Poliuria -Polidypsya - Cardiac Murmur: V/V.		Renal and hepatic disease stable.	HOMEMADE DIET	16.4 Kg		
MAY 2013	-Apathy - Muscular spasm - Incapability to stand up - Weakness	- Anemia - Azotemia (Urea= 104 Creat= 3.1)	- Descompensation of CKD - HOSPITALIZATION + FLUIDOTHERAPY	HOMEMADE DIET	16.7 Kg	1-2/9	1/3
JUNE 2013	-Poliuria -Polidypsya - Cardiac Buf: V/V. - Vomits - Weight loss		EUTHANASIA			1/9	1/3



DISCUSSION

- Geriatric dog with heart murmur and diarrhoea who lost 7 Kg in 2 years approximately, diagnosed with Chronic Kidney disease.
- Provisional diagnosis with Chronic Hepatic disease, but without biopsy we cannot confirm the diagnosis.
- Probable adrenal tumour (not confirmed).
- Mammary tumours (not removed or biopsied).
- The homemade diet was initially accepted, but then Bulma began to eat less amount of food and rejected also this diet.
- Our hypothesis:
 - The fast and fatal evolution of Bulma could be due to the evolution of any of these diseases or a hidden metastasis .
 - The feeding tube could have helped improve her Body condition, quality and quantity of life.

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THANKS FOR YOUR ATTENTION

QUESTIONS?

