


UNIVERSITY OF COPENHAGEN  
FACULTY OF LIFE SCIENCES

Department of Small Animal Clinical Sciences

## Cystein Urolithiasis in English Bulldog – a case

Charlotte Reinhard Bjornvad  
Assistant professor, DVM, PhD



Department of Small Animal Clinical Sciences, Frederiksberg Campus  
Dias 1


UNIVERSITY OF COPENHAGEN  
FACULTY OF LIFE SCIENCES

### Presentation of patient

- Alfred
- English Bulldog
- Intact male
- 3 y 10 mth

### Clinical presentation:

- Pollakisuria and hematuria for one day
- Inappetence today





Department of Small Animal Clinical Sciences, Frederiksberg Campus  
Dias 2

UNIVERSITY OF COPENHAGEN  
FACULTY OF LIFE SCIENCES

### Clinical examination and pathology

- TPR normal, increased resistance on abdominal palpation
- CBC and hemogram normal
- Urine Analysis:
  - Specific gravity 1.038
  - Protein +1
  - pH 6,0
  - Cystine crystals
- X-ray:
  - multiple uroliths in the bladder
- Ultrasound:
  - possible uroliths and a thickened bladder wall





Department of Small Animal Clinical Sciences, Frederiksberg Campus  
Dias 3

UNIVERSITY OF COPENHAGEN  
FACULTY OF LIFE SCIENCES

### Cystine urolithiasis - pathogenesis

- Cystine is a sulphur-containing, non-essential amino acid. It is a stable form of the sulphur-rich amino acid cysteine.
- The solubility of cystine is pH dependant (increased solubility with increasing pH)
- Cystinuria is caused by abnormal (low) reabsorption of cystine and sometimes other amino acids in the proximal renal tubule



Cystine stones. Nelson RW, Couto CG. Small Animal Internal Medicine, Mosby, 2003


NC(CSNC(C(=O)O)C(=O)O)C(=O)O

Cystine molecule

Department of Small Animal Clinical Sciences, Frederiksberg Campus  
Dias 4

UNIVERSITY OF COPENHAGEN  
FACULTY OF LIFE SCIENCES

### Cystine urolithiasis in dogs



- 1-3% of stones obtained in dogs in the United States
- 8,5 – 39% in Europe
- Mean age for clinical symptoms  $4.8 \pm 2.5$  years
- Male dogs are primarily affected (98%)
- Breeds that are predisposed for development of cystinuria are, Newfoundland (autosomal recessive), English bulldog and Dachshound
- Associated with the transporter genes SLC3A1 and SLC7A9 in English bulldog (Harnevik et al.)
- Increasing age may cause a decreased urolith formation (>5 years)





Department of Small Animal Clinical Sciences, Frederiksberg Campus  
Dias 5

UNIVERSITY OF COPENHAGEN  
FACULTY OF LIFE SCIENCES

### Treatment – recommendations

(Osborne CA et al. Vet Clin North Amer 1999)

- Increase diuresis to decrease urine specific gravity – canned food rather than dry food
- Restrict dietary protein intake
- Cystine binding agent
  - D-Penicillamine (15 mg/kg BW BID)
  - (N-(2-mercaptopropionyl)-glycine (2-MPG), 15-20 mg/kg BW BID for dissolution, 5-10 mg/kg BW BID for prevention)
- Alkalize urine – pH 7.5
  - Sodium bicarbonate
  - Potassium Citrate (40-75 mg/kg BW BID)

Department of Small Animal Clinical Sciences, Frederiksberg Campus  
Dias 6

UNIVERSITY OF COPENHAGEN FACULTY OF LIFE SCIENCES


Protein restricted diet for dogs: How low should we go?

Average protein content on DM basis:

Prescription diet c/d : 25%

Prescription diet k/d: 14.5%

Prescription diet u/d: 10.4%



Department of Small Animal Clinical Sciences, Frederiksberg Campus  
Dias 7

UNIVERSITY OF COPENHAGEN FACULTY OF LIFE SCIENCES

Effects of dietary fat and L-carnitine on plasma and whole blood taurine concentrations and cardiac function in healthy dogs fed protein-restricted diets.

Sanderson SL, Gross KL, Ogburn PN, Calvert C, Jacobs G, Lowry SR, Bird KA, Koehler LA, Swanson LL.

**CONCLUSIONS AND CLINICAL RELEVANCE:** Results revealed that dogs fed protein-restricted diets can develop decreased taurine concentrations; therefore, protein-restricted diets should be supplemented with taurine. Dietary methionine and cystine concentrations at or above AAFCO recommended minimum requirements did not prevent decreased taurine concentrations. **The possibility exists that AAFCO recommended minimum requirements are not adequate for dogs consuming protein-restricted diets.** Our results also revealed that, similar to cats, dogs can develop DCM secondary to taurine deficiency, and taurine supplementation can result in substantial improvement in cardiac function.


Am J Vet Res. 2001 Oct;62(10):1616-23.

Department of Small Animal Clinical Sciences, Frederiksberg Campus  
Dias 8

UNIVERSITY OF COPENHAGEN FACULTY OF LIFE SCIENCES

Treatment plan and follow up for Alfred:

- Prescription diet k/d canned
- 2-MGP 15 mg/kg BW BID until stone dissolution
- Potassium chloride 50 mg/kg BID



**14 days later:**  
Urine specific gravity 1.027  
pH 7.5

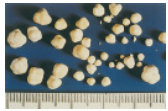
**8 weeks later:**  
Uroliths had dissolved

**Preventive strategy:**  
Prescription diet k/d  
2-MGP 5 mg/kg BW BID  
Potassium chloride discontinued but started again on lower dose because urinary pH decreased to 6.5 without it

Department of Small Animal Clinical Sciences, Frederiksberg Campus  
Dias 9

UNIVERSITY OF COPENHAGEN FACULTY OF LIFE SCIENCES

Evaluation




Is a protein content of 10.4% safe for longterm feeding ?

Is Potassium Citrate superior to Sodium bicarbonate ? (Jaeger P et al. N Eng J Med, 1986)

Department of Small Animal Clinical Sciences, Frederiksberg Campus  
Dias 10

UNIVERSITY OF COPENHAGEN FACULTY OF LIFE SCIENCES

Thank you



Department of Small Animal Clinical Sciences, Frederiksberg Campus  
Dias 11