

Minnesota Urolith Center * UNIVERSITY OF MINNESOTA

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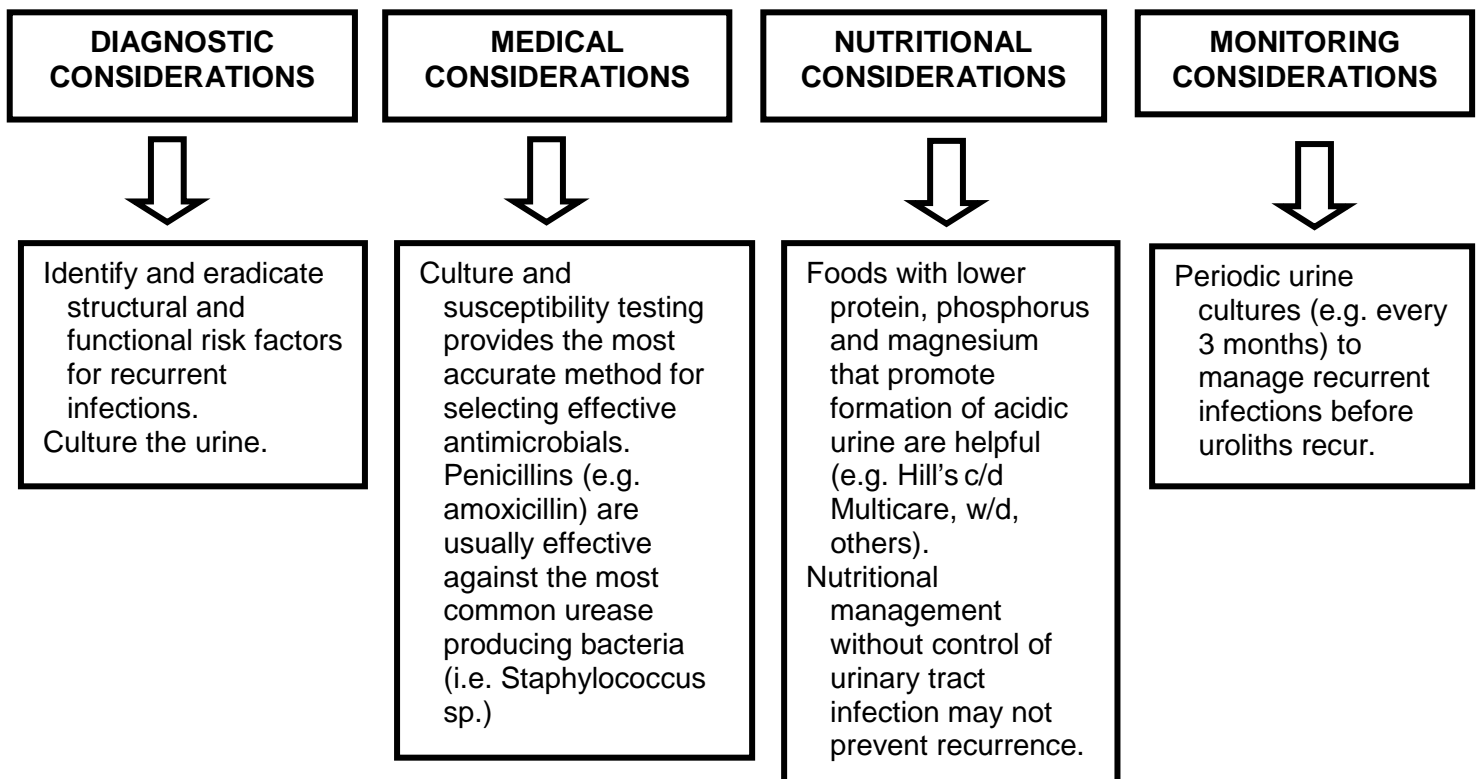
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CANINE STRUVITE UROLITHS

In almost all dogs, struvite (magnesium ammonium phosphate hexahydrate) forms as a consequence of urinary tract infection with bacteria that produce the enzyme urease. Early eradication and prevention of urinary tract infections are the best strategies to prevent infection-induced struvite uroliths.

PREVENTION



** Review manufacturer's therapeutic food literature to determine indications/contraindications. For pets with multiple health concerns, consult a veterinary nutritionist to select an optimal food.

In depth recommendations and references are available on our website: urolithcenter.org under the resources tab.

Minnesota Urolith Center

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CANINE STRUVITE UROLITHS

In dogs, struvite (magnesium ammonium phosphate hexahydrate) stones are commonly a consequence of urinary tract infection (UTI) with bacteria that produce urease. This bacterial enzyme is responsible for over-production of urine ammonia and subsequent urine alkalization. Female dogs (85%) are over represented presumably because they are at greater risk for urinary tract infection.¹

Medical Considerations:

- Urinary tract infection by urease-producing bacteria is the underlying cause of most canine struvite stones. Therefore, culture urine prior to antimicrobial administration to accurately classify and effectively manage uroliths.
- In some dogs, struvite formation occurs in the absence of urinary tract infections. However, risk factors (distal renal tubular acidosis, hypoxemia, chronic diuretic use, administration of antacids, and hyperaldosteronism) promoting persistent alkaluria, hyperphosphaturia and hyperammoniauria are rarely detected.

Nutritional Considerations:

- Diets with reduced protein, phosphorus and magnesium that promote formation of acidic urine (i.e. $\text{pH} \leq 6.5$) reduce struvite precipitation and promote struvite dissolution.
- Extreme and prolonged reductions of some risk factors that minimize struvite urolith formation, (e.g. acidic urine), may increase risk for calcium oxalate (CaOx), calcium phosphate carbonate, and calcium phosphate apatite uroliths, especially in breeds at risk (e.g. Bichon Frise, Miniature Schnauzer, Shih Tzu, Lhasa Apso, Miniature Poodle and others).
- High moisture foods (i.e. canned formulations) are more effective because increased water ingestion is associated with decreased urine concentrations of calculogenic minerals and increased crystal evacuation.

Pharmacological Considerations:

- While waiting for urine culture results, consider antimicrobics (e.g. beta-lactam) with high efficacy for eradicating common, urease-producing uropathogens (e.g. staphylococcal sp.).
- Consider dl-methionine (100mg/kg q12 hr) or ammonium chloride to acidify urine and assist urolith dissolution in patients unable to consume therapeutic diets and in dogs whose urine remains alkaline following appropriate therapy.²

Consider These Facts:

Some veterinarians prefer to remove struvite uroliths surgically instead of medical dissolution due to the perception that medical dissolution is less effective, more expensive, associated with prolonged discomfort, and will result in urethral obstruction as uroliths decrease in size. These are more often misperceptions. Medical dissolution with Prescription Diet[®] s/d[®] Canine was 100% effective after just 3 to 6 weeks for sterile struvite uroliths³ and 8 to 12 weeks with antimicrobics for infection-induced struvite uroliths.⁴ Noninvasive medical dissolution is an effective and compassionate choice for dogs without a urethral obstruction.

Although low-protein, dissolution diets are not recommended for immature growing dogs, their short-term use in conjunction with antimicrobics has rapidly dissolved infection-induced struvite uroliths in 9 to 12 days without adverse events.⁵

When feeding Prescription Diet[®] s/d[®] Canine, owner/patient compliance is easily and rapidly determined with a urine specific gravity (USG) (mean = 1.008 ± 0.003) and pH (mean = 6.2 ± 0.7).⁶ If urine is inaccessible, the serum concentration of urea nitrogen is also a reliable marker (mean = 3.5 ± 2.4 mg/dl) of dietary compliance.

The struvitolitic diet is relatively high in fat in order to maintain calorie intake while providing lower quantities of protein to reduce urolith precursors (e.g. phosphorus and urea) important for dissolution. High dietary fat is a risk factor for pancreatitis. Likewise, female Miniature Schnauzers (and other breeds) and dogs with hyperadrenocorticism are also risk factors for pancreatitis and urinary tract infections that include urease-producing uropathogens. Be aware of these associations and know how to respond (e.g. discontinue struvitolitic diet, maintain hydration) to adverse events (vomiting/pancreatitis) if they occur. In these patients, consider low-fat alternatives that also acidify urine (e.g. canned Prescription Diet[®] w/d[®] Canine) to assist correction of both diseases.

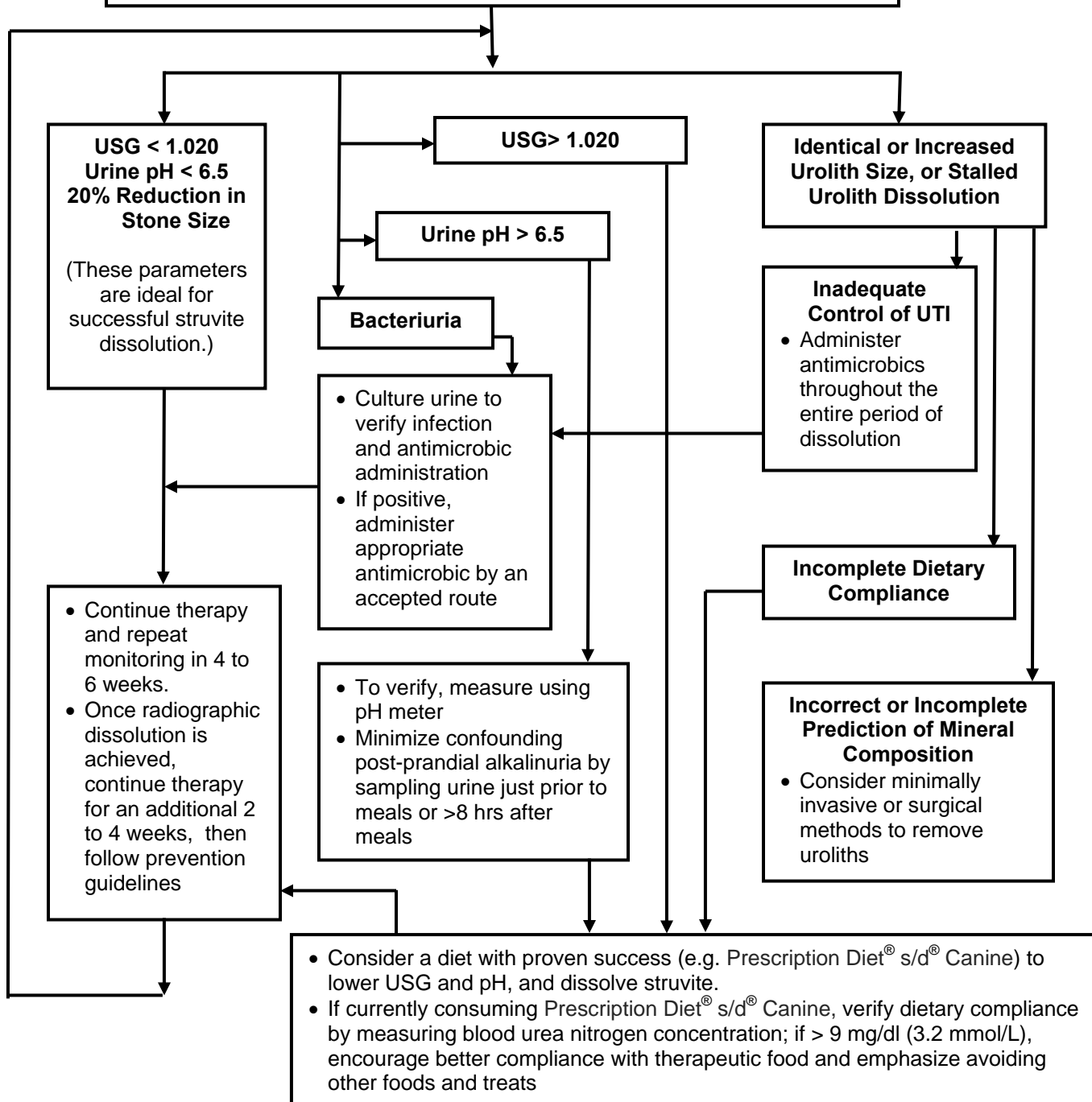
Twenty-six percent of canine nephroliths are composed of struvite.⁷ As with bladder stones, struvite nephroliths can be dissolved medically. Dissolution times are typically longer due to reduced kidney function, reduced urine production, and reduced nephrolith dwell time in therapeutically undersaturated urine.

MEDICAL DISSOLUTION OF STRUVITE UROLITHS IN DOGS

Therapy: Struvitolytic Diet

Appropriate antimicrobics for infection-induced uroliths

Monitor: Urinalysis and medical imaging every 4 to 6 weeks.



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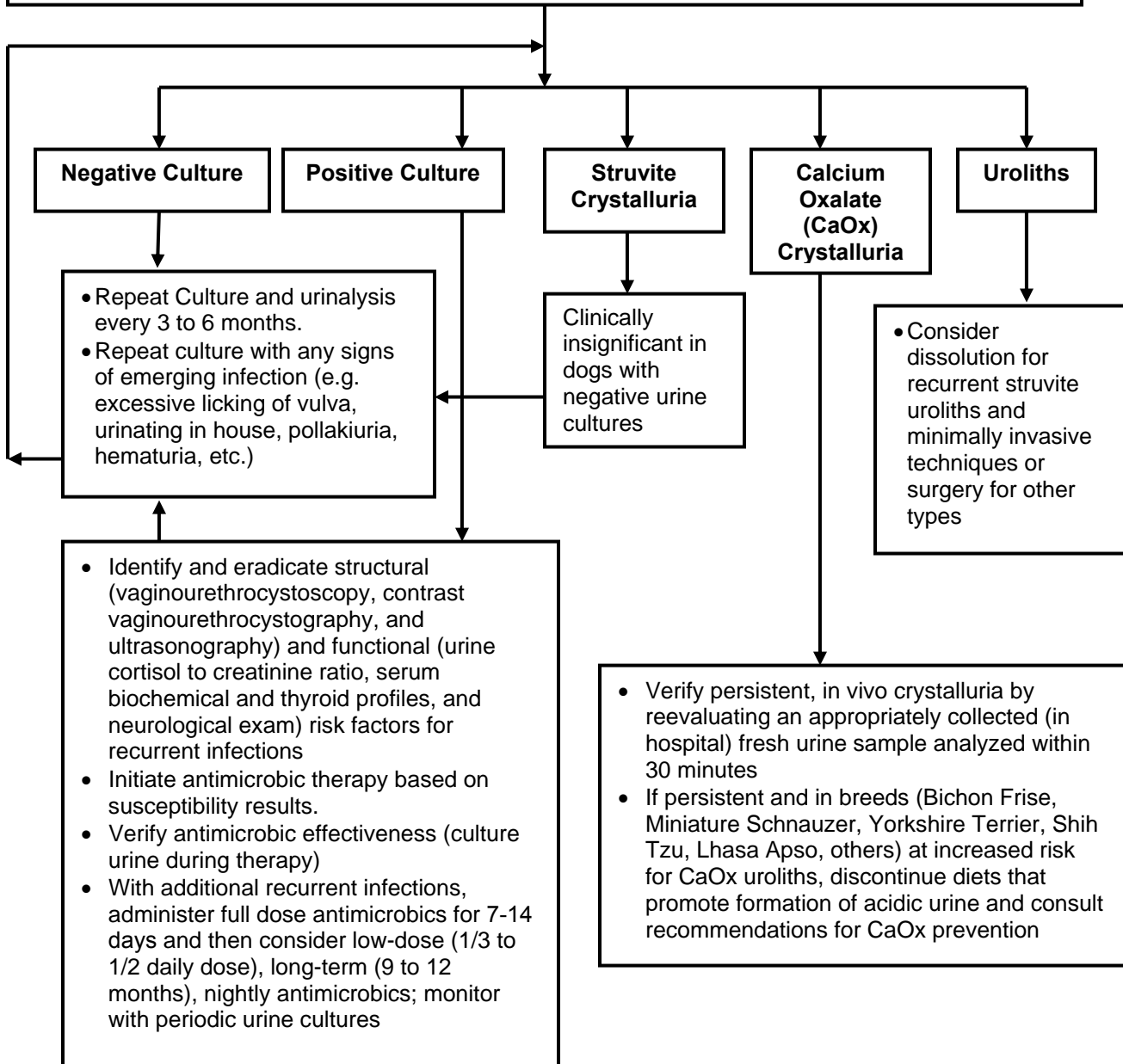
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2. Bartges JW, et. al. Evaluation of d.l-methionine and antimicrobial agents for medical dissolution of spontaneously occurring infection-induced struvite uroliths in dogs, Proceedings of the 2010 ACVIM Forum.
3. Bartges JW, et. al. Recurrent sterile struvite urolithiasis in three related English Cocker spaniels. JAAHA. 1992;28:459.
4. Osborne CA, et. al. Medical dissolution of canine struvite uroliths. VCNA. 1986;16:349.
5. Lulich JP, et. al. Non-surgical correction of infection-induced struvite uroliths and a vesicourachal diverticulum in an immature dog. J Sml An Pract 1989;30:613.
6. Abdullahi SU, et.al. Evaluation of a calculolytic diet in female dogs with induced struvite urolithiasis. JAVMA. 1984;45:1508.
7. Osborne CA, et. al. Analysis of 451,891 canine uroliths, feline uroliths, and feline urethral plugs from 1981 to 2007. VCNA 2009: 39:183.

PREVENTION OF INFECTION-INDUCED STRUVITE UROLITHS IN DOGS

Therapy: Control of urinary tract infection and appropriate antimicrobial administration is essential to prevent recurrence.

Diets with reduced protein, phosphorus and magnesium that promote formation of acidic urine are helpful, but cannot be used as a substitute for appropriate control of urinary tract infections.

Monitor: Urine culture and urinalysis in 1 month and then every 3 to 6 months. Consider medical imaging every 6 months or sooner in patients with recurrent urinary signs.

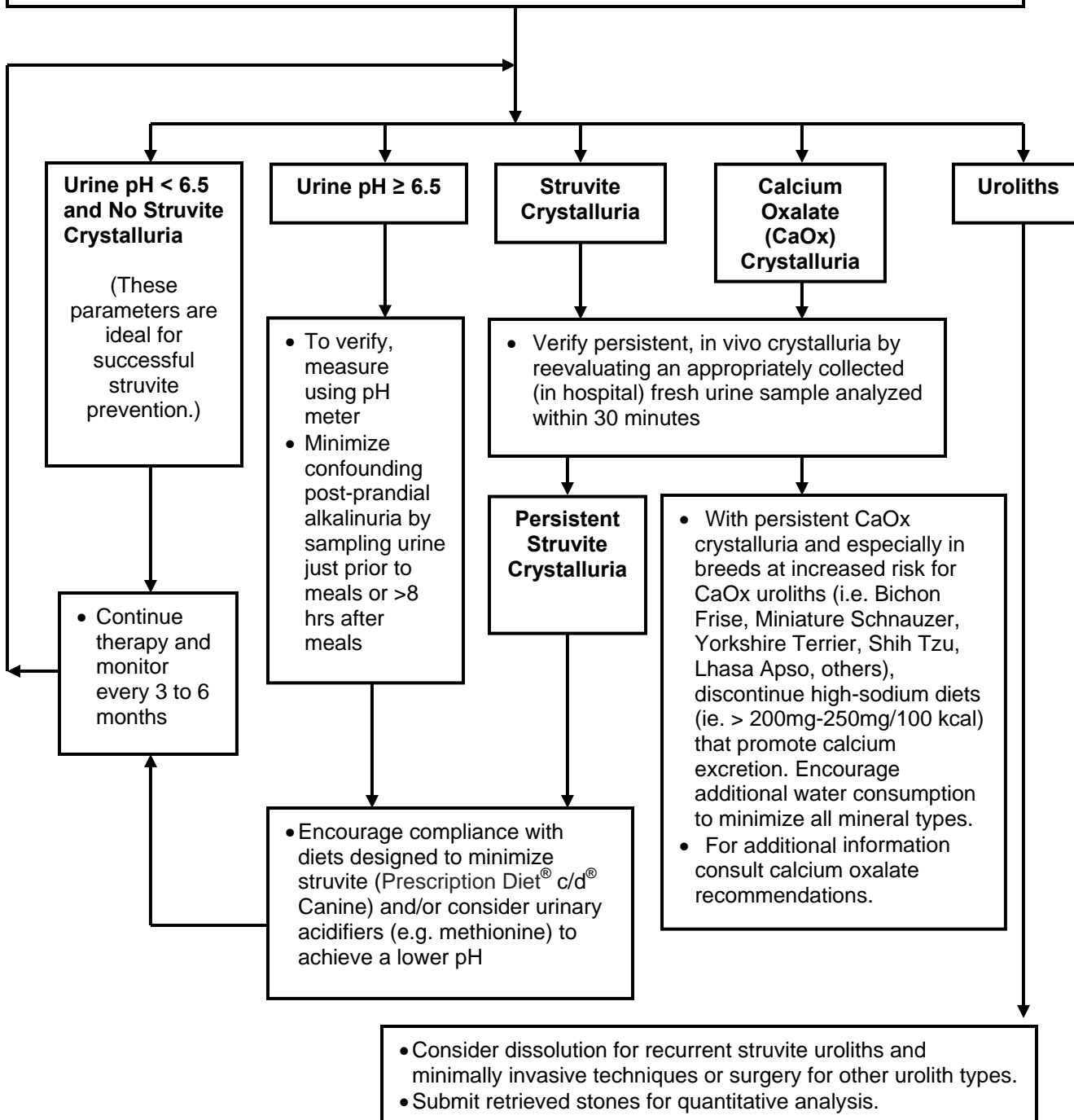


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PREVENTION OF STERILE STRUVITE UROLITHS IN DOGS

Therapy: Long-term use of diets specially formulated with reduced levels of protein, phosphorus and magnesium that promote formation of acidic urine are essential to prevent these potentially highly recurrent uroliths.

Monitor: Urinalysis and medical imaging in 1 month and then every 3 to 6 months; or sooner in patients with recurrent urinary signs.



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