ROYAL CANIN

VETERINARY EXCLUSIVE

Relative Supersaturation (RSS)

2016 Edition

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What does RSS mean?

Urine is a complex medium that contains a number of calculogenic ions. The interactions of those ions, the urine pH and urine volume influence the spontaneous formation of crystals and uroliths. For this reason, focusing only on urine pH as a means of controlling urolithiasis is not effective (Smith 1998, Van Hoek 2009). Relative Supersaturation (RSS) has been the gold standard for urine assessment in humans for three decades. Waltham scientists worked in conjunction with W.D. Robertson, the originator of the human RSS methodology, to adapt this method for the evaluation of dog and cat urine.

Relative Supersaturation is the method Royal Canin uses to assess the diet-specific risk of crystal or urolith formation in the urine produced by cats and dogs.

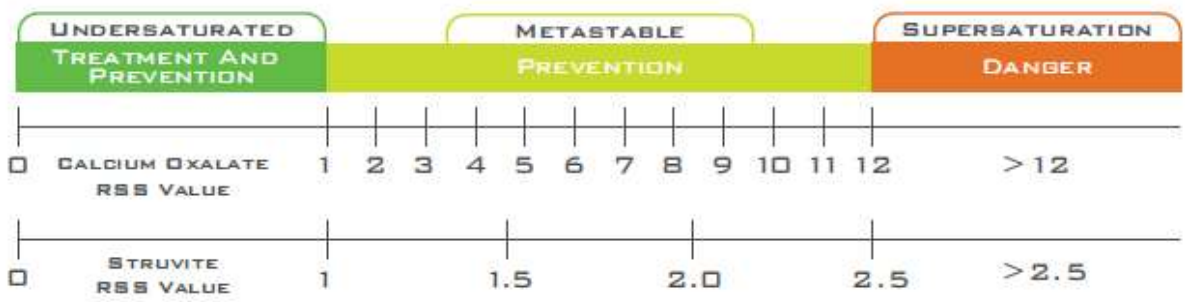
This method involves the following steps:

1. The formula of interest is fed to a panel of cats or dogs during a determined adaptation period.
2. The total urine produced is then collected for a set number of days in a row while the cats or dogs are still fed the formula.
3. The urine volume, pH and ionic composition (e.g. sodium, potassium, calcium, chloride, phosphate, citrate, ammonium, sulphate, uric acid, oxalate and magnesium) are measured.
4. The **Solute Activity** is calculated. This is the concentration of the constituents that are free and available to form uroliths.
5. The **Activity Product** is then calculated by multiplying all the Solute Activities relevant to a given urolith. This represents the number of potential interactions or complexes between these constituents.
6. The activity product is then divided by a known **constant thermodynamic solubility product** for a given urolith to determine the **RSS.**

The RSS can be used to define three different **zones of urine saturation**:

- **Undersaturated**
- **Metastable**
- **Supersaturated**

Each of the RSS zones has different implications for the risk of urolith formation. The implications for struvite and calcium oxalate urolith formation are shown in the charts below.



Interpretation of the Zones of Urine Saturation

Urine Produced is:	Risk of Struvite Formation	Risk of calcium oxalate (CaOx) Formation:
Undersaturated (Treatment And Prevention)	• New Struvite uroliths will not form • Existing struvite uroliths will dissolve *	• New calcium oxalate uroliths will not form • Existing calcium oxalate uroliths will not grow
Metastable (Prevention)	• New struvite uroliths will not form • Any existing struvite uroliths will not dissolve and may grow	• New calcium oxalate uroliths will not form • Any existing calcium oxalate uroliths may grow
Supersaturation (Danger zone)	• New struvite uroliths may form • Any existing struvite uroliths will grow	• New calcium oxalate uroliths may form • Any existing calcium oxalate uroliths will grow

*Dissolution of canine struvite uroliths may be complicated by the presence of a urinary tract infection since most canine struvite uroliths are infection induced, and by the presence of other minerals in the urolith.

What is the difference between the Urinary SO or Multifunction Urinary formulas and the other S/O® Index formulas?

Urinary SO and Multifunction Urinary formulas	S/O® Index Formulas
• Struvite RSS lower in undersaturated zone than S/O® INDEX formulas. • Calcium Oxalate RSS lower in metastable zone than S/O® INDEX formulas. • RSS determined using stone-forming breeds. • Clinical data to support efficacy for struvite dissolution. • Formulated to help create urine dilution.	• Struvite RSS in undersaturated zone. • Calcium Oxalate RSS in metastable zone.
Positioning	
• First choice for rapid struvite stone dissolution. • First choice for CaOx and sterile struvite prevention in medium to high risk patients such as patients with a history of stones or crystals. • Best choices for cats with Idiopathic Cystitis.	• Good choice for CaOx and sterile struvite prevention in lower risk patients. • Good choice for CaOx and sterile struvite prevention in medium or high risk patients when their nutritional needs are not met by the Urinary SO or Multifunction Urinary formulas.

Why do we use RSS?

RSS is a more reliable and comprehensive methodology for assessing urine parameters and the risk of urolith formation when compared to other methods (Hurley 2003). RSS is the best predictor of urinary dissolution dynamics (VanHoek 2009). This technology and it's validation in dogs and cats has allowed for thorough investigation of urolithiasis management in these species and enabled Waltham, and now Royal Canin, to develop veterinary diets clinically proven to manage both struvite and calcium oxalate.

References

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