

# RSS is a better predictor for struvite dissolution than urine pH

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## Introduction

RSS (Relative Super Saturation) is a method to assess the risks of forming urinary crystals based on the level of saturation of poorly soluble salts such as calcium oxalate or struvite. It is the most widely used method in humans and has been validated for dog and cat urine (1).

Recent work at our laboratory as well as the WALTHAM Centre for Pet Nutrition, suggests that urinary pH alone does not allow us to evaluate the risk of forming crystals in the urinary tract of dogs and cats.

An *in vitro* method was developed in our research center (2) to measure the struvite dissolution potential of cat urine (Figure 1). The initial protocol that was performed compared several urine samples with different RSS and pH values.

The aim of this subsequent study was to directly compare the effects of pH and RSS on the dissolution potential of urine.

## Materials and methods

Four pooled urine samples with different values of RSS and pH were obtained from cats fed commercial complete dry expanded diets designed for struvite dissolution.

Urinary volume, pH, specific gravity and the concentrations of 10 solutes (Ca, Mg, Na, K, NH<sub>4</sub><sup>+</sup>, phosphate, citrate, sulfate, oxalate, uric acid) were measured on each pooled urine sample. Based on those data, the urinary relative supersaturation (RSS) for struvite (MAP) was calculated using the software SUPERSAT™.

Four groups of stones were selected to ensure homogeneous weight and shape for comparison of

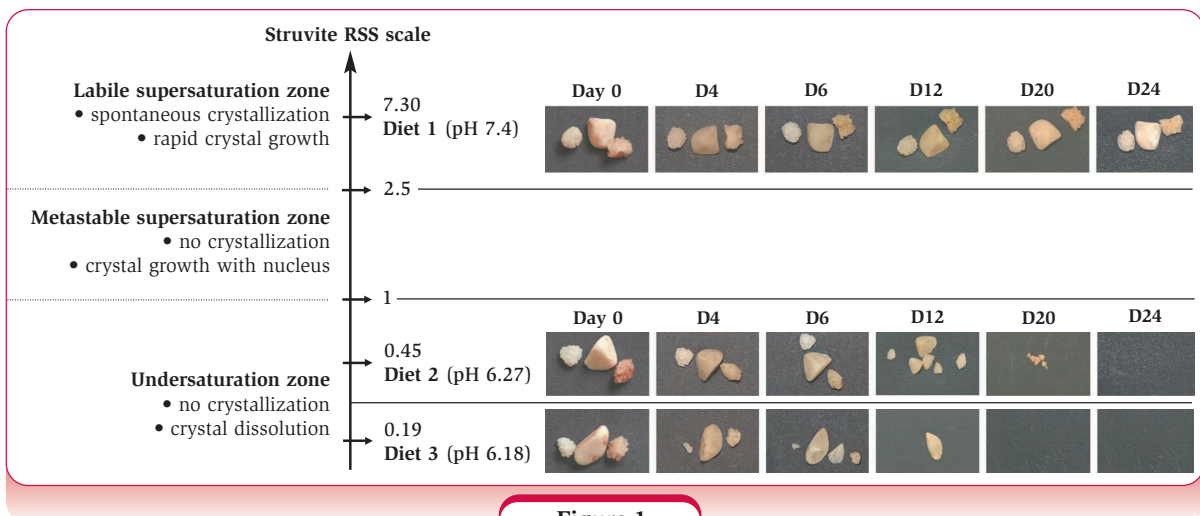


Figure 1.

The *in vitro* dissolution of struvite stones demonstrated different dissolution kinetics depending on the urinary pH and RSS.

urine A and B (RSS comparison) and comparison of urine C and D (pH comparison) (Table 1).

### Results

When comparing diets inducing the same urinary pH; the lower the struvite RSS, the quicker is the rate of dissolution. With diet B, the complete dissolution process took 50% more time compared to diet A (Figure 2).

Dissolution kinetics for the urines C and D were identical despite differences in urinary pH (6.3 for urine C and 6.5 for urine D) (Figure 3).

### Conclusion

When the RSS is < 1 (undersaturation zone), urine dissolves struvite stones efficiently and the lower the RSS, the quicker the dissolution kinetic. The results of this study also showed that pH alone does not allow the prediction of the dissolution kinetics of urine and that RSS is clearly a better predictor. ☺

Figure 2.

Cumulative stone weight loss obtained during the *in vitro* dissolution process with urine generated from diet A and B.

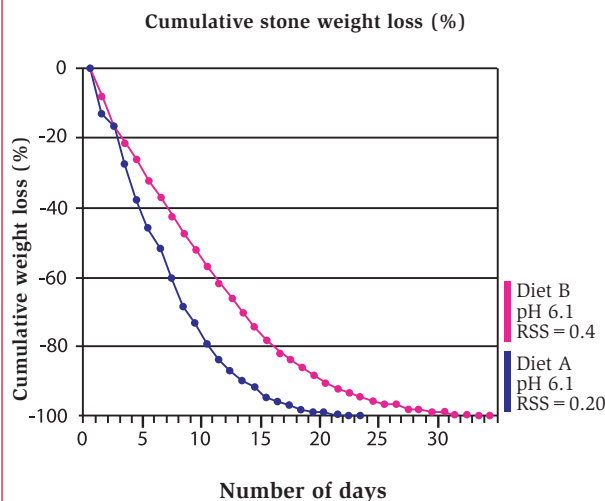


Table 1.

Characteristics of the urines A, B, C and D and the respective struvite stones

	Visual aspect of struvite stones selected	Weight of struvite stones (mg)	Urinary pH	Struvite RSS
Urine A	See A on photo	230.4	6.1	0.2
Urine B	See B on photo	230.2	6.1	0.4
Urine C	See C on photo	103.4	6.3	0.45
Urine D	See D on photo	100.3	6.5	0.45

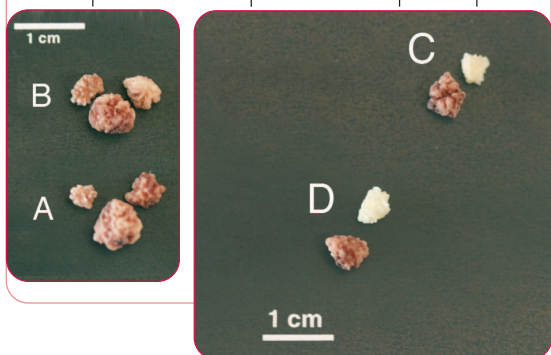
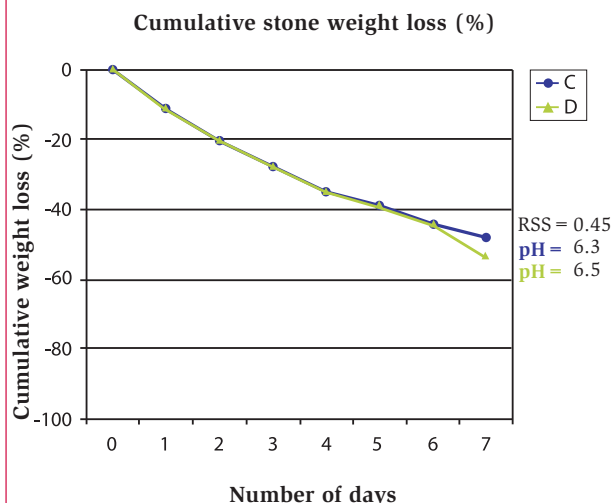


Figure 3.

Cumulative stone weight loss obtained during the *in vitro* dissolution process with urine C and D.



## REFERENCES

1. Robertson WG, et al., *J Nutr* 2002; 132: 1637-1641.

2. Tournier C, et al., Abstract European Veterinary Conference Voorjaarsdagen 2007, pp. 253.