

The Dalmatian Club of America FIFTEEN YEARS' DATA OF ALMOST 3,000 DALMATIAN URINARY STONES

Study Group on Urinary Stones Research Committee Dalmatian Club of America

Introduction

The most common Dalmatian urinary stones are urates (also classified as "purines") whereas the most common in all other breeds of dogs is struvite (also known as "infection stones"). These two frequent culprits of abnormal canine stone-forming spotlight the need to, first, diagnostically [confirm](#) their presence so that subsequent treatment is not incorrect and misdirected. For example, urates thrive in acidic urine whereas infection stones thrive in alkaline urine and so, one treatment [option](#) of acidifying or alkalinizing the urine could be either beneficial or detrimental depending on the type of abnormal stone or crystals the Dalmatian is forming.

Breeders and fanciers now are reluctantly aware that every one of our beloved breed is born with the potential of **urate** stone-forming because of breed-specific defects of urine production in Dalmatian livers and kidneys. I [join](#) with them in unhappily accepting this deplorable fact which has been known and taught to veterinarians for 81 years. It is especially disturbing considering Dalmatians are the only breed of dog with these inborn defects. Bulldogs, for example, also have a high incidence of urate stone-forming but not for the reasons Dalmatians do. Most breeders now are also aware of being able to minimize and even prevent [overt](#) Dalmatian urate stone-forming by (1) reducing purine-yielding foods in adult Dalmatian diets, (2) by monitoring via dip-sticking to determine and to correct abnormal urinary pH, and (3) by routine repetitive urinalyses to detect the onset of abnormal urinary crystals before they progress into stone formation and the dreaded urinary obstruction.

As recognition of this breed-specific health problem has grown during these years, breeders inevitably ask, ***"If all Dalmatians are born with the defect, how do we know which ones will shift from potential stone-formers to overt ones?"*** The answer is no one knows nor is any kind of data gathering even possible which could lead to plausible suggestions. There simply are overwhelmingly too many factors influencing overt stone-forming to be surveyed in order to come to any sort of statistically significant trends from which to draw even preliminary answers to the question. Yes, it is known that diet and perhaps the quality of local water purification can be two influences to push the potential Dal into overt stone-forming but lurking in the background and complicating any appraisal of a meaningful database of Dalmatians are many other contributing factors, such as:

- how often each Dal is permitted to void,
- how "normally" concentrated its urine is,

- in the case of show entries, how often it leaves its home environment and to where,
- how accurate was the identification of abnormal crystals and stones (reported to be 65 percent in [error](#) according to a published veterinarian survey of U.S. assay methods).

I personally am not convinced that breeding contributes to overt stone-forming being that every Dalmatian, regardless of breed line, is born with the defect. For example, the Study Group has received reports of males as young as six weeks rupturing their bladders due to urinary obstruction. These reports are erratic, thankfully rare but inconclusive in terms of any postulated incidence within those breed lines after tracking back into the sire's and dam's pedigree or with repeat breeding's. The Study Group has reports of adult Dalmatians (who had obstructed) becoming and remaining symptom-free without recurrence of abnormal urinary crystals by shifting diet, by anti-urate drugs and by changing water intake...but tracking littermates of all such overt stone-formers much less littermates of non-overt stone-formers for evaluation and comparison is an impossible task. Some stone-forming sires and dams have produced litters in which no puppies have subsequently been reported with abnormal crystals or urinary obstruction. Other sires and dams without any history of abnormal crystals or stone-forming have produced puppies who ultimately have been reported as stone-formers. As a final example, the Study Group has reports on elderly Dalmatians, previously symptom-free their entire lives, whose owners moved into a new state and shortly thereafter, the Dalmatians obstructed for the first time in their long lives. The influence of local environmental factors cannot be dismissed therefore and would have to be evaluated nationally as one more influence on overt stone-forming in any meaningful explanation. And so, before any breed-wide conclusions can be drawn without jumping to presumptive conclusions or without invalidly projecting observations from a very few Dalmatians onto the entire breed, an exhaustive project of data gathering would necessarily have to be completed. Anecdotal evidence is useful, certainly better than nothing, but is remotely far from the mandatory statistical significance for scientific conclusion.

I know some breeders claim ***"I have never had a stone-former in my line."*** I sincerely and fervently wish this were so but what they really should be saying is ***"I have never produced an overt stone-former"*** - or - ***"I have never produced a Dalmatian who has shown abnormal urate crystals."*** Until every puppy of every litter tests with no abnormal urinary crystals, until those puppies grow up to become adults and, regardless wherever they live and whatever they're fed and whatever they drink, ***continue*** to test without abnormal urinary crystals, an unequivocal statement ***"I have never produced a stone-former"*** is open to question.

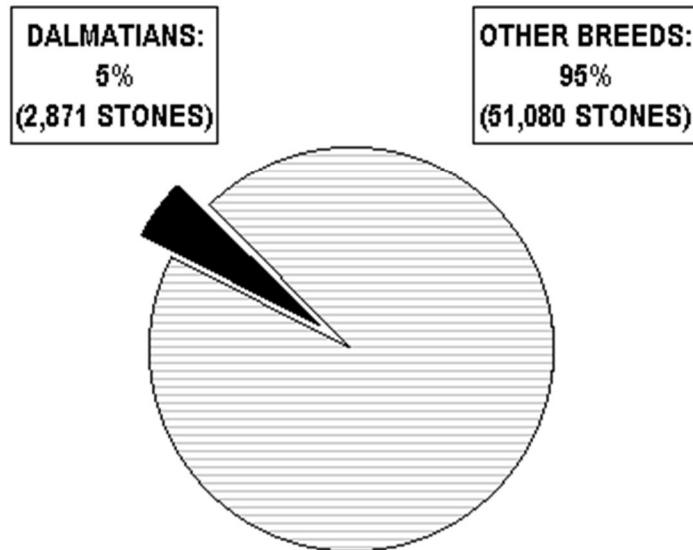
Perhaps in some future Dalmatian Utopia these insurmountable discouragements will be overcome but until then, no meaningful conclusions can even be suspected why some Dalmatians become overt stone-formers and others do not. What we ***do*** have are the two U.S. veterinary centers who specialize in canine stone-

forming and from them, invaluable statistics thoughtfully and cooperatively made available to the DCA Study Group on Dalmatian stone-forming. In 1993, the Urinary Stone Analysis Laboratory of the U. of California at Davis, and its chief, Gerald V. Ling, DVM, published an article in the ***Journal of the American Veterinary Medicine Association*** on a retrospective statistical analysis of 275 Dalmatian cases of stone-forming. A bulletin was immediately issued to all regional DCA clubs with the pagination of that article.

We now have, through the courtesy of Carl A. Osborne, DVM, PhD, chief of the Minnesota Urolith Center of the U. of Minnesota Veterinary School in St. Paul, the latest of their retrospective data on almost 3,000 Dalmatian stones over the past fifteen years. The purpose of this article is to brief the Dalmatian community on this latest statistical compilation and to see if there were any changes in Dalmatian trends during the past eleven years since Dr. Osborne published two 1986 volumes of a veterinary teaching text on stone-forming. The following graphic data must be qualified: readers should remember that the numbers, while statistically significant, are those only of stones sent to Dr. Osborne's Minnesota Urolith Center or only of stone-forming Dalmatians treated there. If the reader projects the data into breed wide Dalmatian conclusions, they should remember none of the data includes Dalmatians who were what Dr. Osborne terms "silent stone formers" without symptoms or those whose stones were sent elsewhere for assay. The graphic data provide invaluable information but within the confines of confirmed stone-forming Dalmatians only.

Chart No. 1 - Dalmatians vs. Other Stone-Forming Dog Breeds

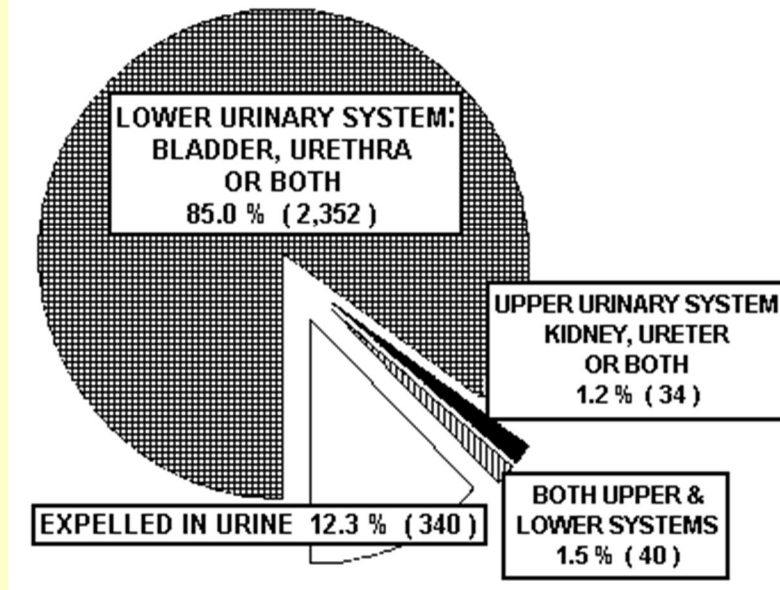
**53,951 URINARY STONES
FIFTEEN YEARS (1981 TO MID-1996)
MINNESOTA UROLITH CENTER**



Three percent of all urinary stones reported by Dr. Osborne's Center in 1986 were from Dalmatians. The current data shows an increase to 5 percent but does not necessarily mean the health problem has ominously increased within our breed. Teaching information during the past five years from the DCA Study Group on Urinary Stones to the Dalmatian community has urged abnormal urinary crystals or stones to be assayed by the Minnesota or California centers because of the reported 65 percent error by local, provincial testings. Therefore, it is entirely possible this increase in the Dalmatian component mostly reflects more stones being supplied for assay and not an increase in overt stone-forming in our breed.

Chart No. 2 - Site of Dalmatian Stones in Their Urinary System

**2,766 DALMATIAN STONES
FIFTEEN YEARS (1981 TO MID-1996)
MINNESOTA UROLITH CENTER**



Some definitions, first - the "urethra" is the single tube carrying urine from the bladder to the outside; the "ureters" are bilateral tubes carrying urine from each of the kidneys to the bladder. The lower urinary system (bladder, urethra or both) remains the most prevalent location of stones as it was in Dr. Osborne's 1986 textbook statistics (then grouped for all stone-forming breeds, Dalmatians included). By adding in data on expelled stones, the sum means 97.3 percent of Dalmatian stones are anatomically located in the lower system where many can be treated non-surgically, easily and less expensively as compared to stones in the upper urinary system.

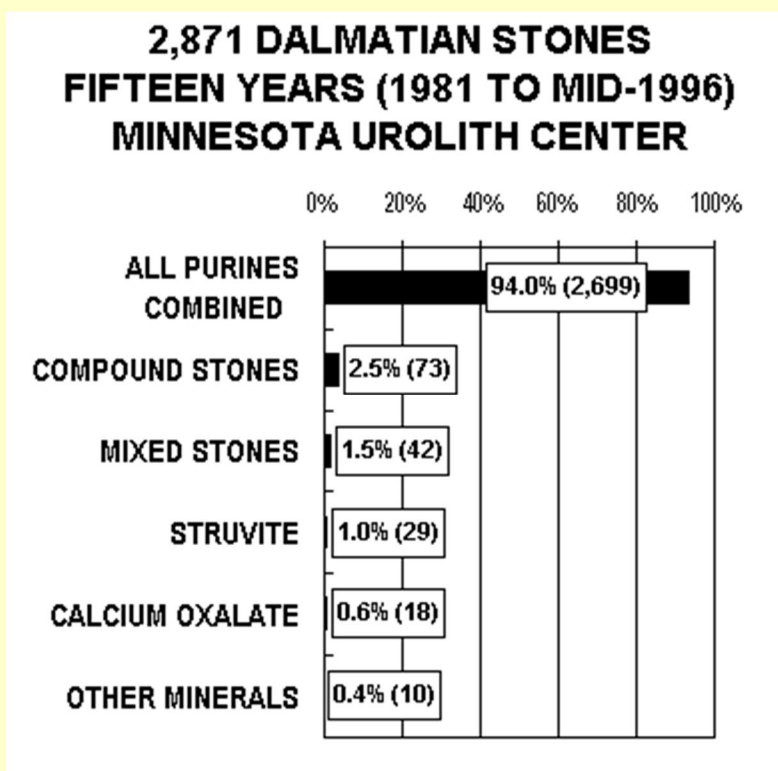
The newly reported category of 12.3 percent Dalmatian stones "passed" provides hope. The most common type of Dalmatian stone, urates, architecturally tend to be rounded and smooth which facilitates their moving down the urinary system as compared to other types of stones which can be barbed and lodge more unlovingly. On a positive note, many urate stones are reported as frequently being expelled and "passed." On a negative note, large urate stones can be moved easily by the urinary stream to jam within the penis at the narrowing of cartilage, the "os penis," thereby creating the dreaded urinary obstruction in males. If the Dalmatian is obstructed, the smooth urate stones are equally capable of being similarly and successfully moved to be "back flushed" into the bladder thereby re-opening the urinary flow. A non-surgical attempt via diet and anti-urate medication to dissolve urate stones thereby

reducing their size so they can pass may well be worth the effort, time and veterinary expense.

Renal surgery of the upper system (kidneys, ureters or both) is major, drastic surgery requiring skilled experienced surgeons. It may be prohibitively expensive whereas bladder surgery is no more complicated, if unavoidable, than an appendix removal in humans. In 1986, stones in the upper system of all breeds was 3 percent. These fifteen-year data show the upper system was confirmed in only 1.2% of Dalmatians and in both upper and lower systems in 1.5 percent of Dals. Please note the data does not identify which type of stones were lodged in the upper system of these Dalmatians.

The total of 97.3 percent of stones in the lower system is an eloquent explanation why indiscriminately calling the health problem "Dalmatian *kidney* stones" is misleading and unnecessarily threatening. The Study Group suggests it more properly be termed "Dalmatian *urinary* stones."

Chart No. 3 - Purines vs. Other Minerals in Dalmatian Stones



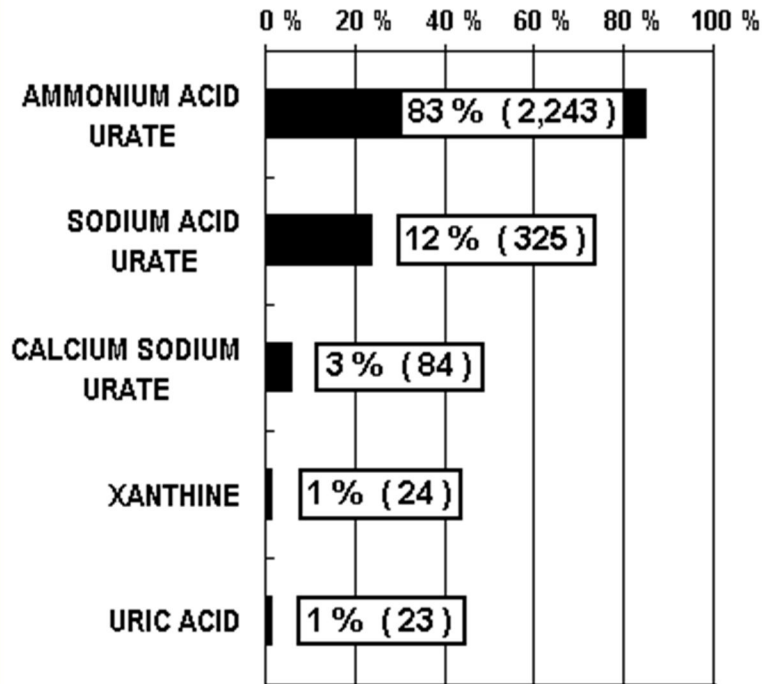
"Purine" stones include the most common mineral found in Dalmatian stones, the "urates" of which there are several forms. It is the urates which are automatically prognosed by many veterinarians to be Dalmatian stones. The purine group also includes "xanthine." This purine is a side effect of uninterrupted overdosage with the

anti-urate drug, allopurinol (see discussion under Chart No. 4). Unlike the other purines, xanthine stones cannot be dissolved and must be removed surgically.

Knowing that Dalmatians do not metabolize purine-yielding foods properly, it is not surprising that purine stones represent a whopping 94 percent of all Dalmatian stones assayed by Minnesota over the 15-year period. A comparison of this stone - most common in Dalmatians - to struvite, the most common one in all other breeds of dogs, is dramatic. In 1986, Dr. Osborne's textbooks published a world survey of 1,700 stones from all stone-forming breeds which showed struvite ("infection stones") to represent 63 percent whereas urate stones were identified from only 6 percent of all breeds. In comparison, this graph shows the exact opposite of those all-breed statistics - Dalmatians can indeed form the "infection stones" but only 1 percent of Dalmatian stones were found to be struvite as compared to 94 percent of Dalmatian stones confirmed as purines. Remembering that Dalmatians are the only breed of dog with their type of urate stone-forming defect, their reversal of the most frequently-found stone is not surprising. However, it does not justify presuming any stone-forming Dalmatian is producing urates despite their overwhelming preponderance. Identifying which abnormal crystal or stone is being formed should not be avoided and still must routinely be done before correct and successful treatment can be assured. Your overt Dalmatian, for example, may just be forming struvite or calcium oxalate stones.

Chart No. 4 - Breakdown of Types of Dalmatian Purine Stones

2,699 DALMATIAN STONES
FIFTEEN YEARS (1981 TO MID - 1996)
MINNESOTA UROLITH CENTER



Overdose of the anti-urate drug, allopurinol, has been reported to induce the laying down of xanthine, a purine, around existing stones. Xanthine cannot be dissolved with diet or drugs.

A monstrous 99 percent of Dalmatian purine stones - not surprisingly because of the breed's defect - were the urates. Of those, 83 percent of stone-forming Dalmatians produced ammonium acid urate, a form of urates happily very responsive to non-surgical treatment with anti-urate diet and anti-urate medication. In 1986, only 80 percent of Dalmatian stones were reported as urates, of which 76 percent were ammonium acid urate. This increase, like Chart No. 1, may be a result of more Dalmatian specimens being sent to Minnesota for assay. We may not know why some Dalmatians become overt stone-formers but with this preponderance of those forming urates, we do know methods by which urates can be detected early in their onset in order to be minimized and ultimate stone-forming avoided:

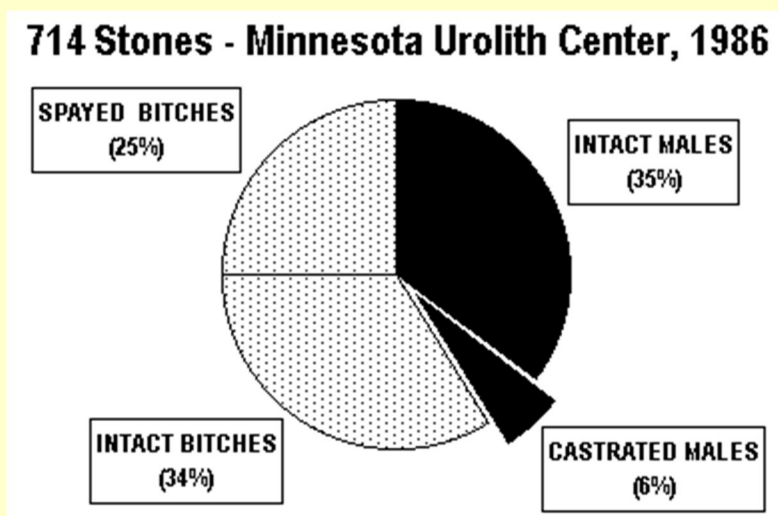
- (1) dip sticking to detect as soon as possible an abnormally acidic urine in which urates thrive,
- (2) urinalysis to confirm as soon as possible the presence of abnormal urate crystals,
- (3) diet formulations with low amounts of purine-yielding foods,

including home cooked recipes, (4) the anti-urate drug, allopurinol, in short periods of high dosage to dissolve existing urates or in long-term low dosage for prevention, and (5) the use of distilled water to guarantee fluid intake which does not influence abnormal urinary crystals or stones.

Such early detection and the prompt starting of known preventative methods can often minimize and reverse the ongoing growth of urate stones in the urine thereby aborting the dreaded urinary obstruction.

Note the 1 percent of xanthine which shows up as a mineral in the stones for the first time in these new data. It was only in 1991 that the report of xanthine as a side effect of allopurinol overdosage was first published in the veterinary literature. Dalmatian stones consisting of a center core of urates surrounded by outer layers of xanthine due to allopurinol overdosage are extremely difficult to assay and require advanced laboratory procedures like "high pressure liquid chromatography" available at the two U.S. centers but rarely if ever for local, provincial assay. Remembering the 65 percent error around the country in assaying any urinary stone, it is quite possible that xanthine stones have existed for many years but have never been identified. More importantly, it is then possible that some previous failures attributed to non-surgical but unsuccessful treatment with allopurinol of urate stone-forming in Dalmatians may have been because of overdosage and the laying down of non-dissolvable xanthine. Allopurinol still is reported to be the anti-urate drug-of-choice but its dosage for long-term use to be knowledgeably prescribed.

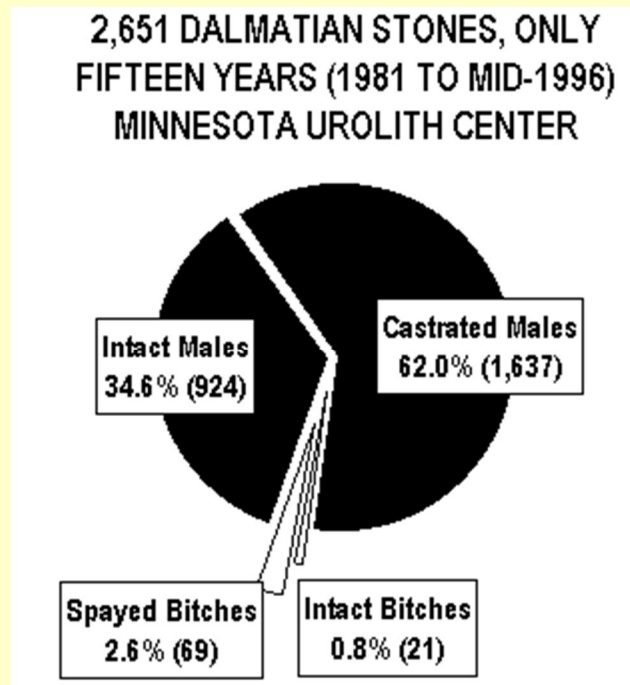
Chart No. 5 - Gender of Stone-Forming Dogs: All Breeds, All Minerals



This chart of all breeds is included only as a comparison to the next, Chart No. 6, representing only Dalmatian data. Note that because all minerals are combined for this data, the chart includes that for struvite ("infection") stones, the most common one for all stone-forming breeds of dogs except for Dalmatians. The preponderance of

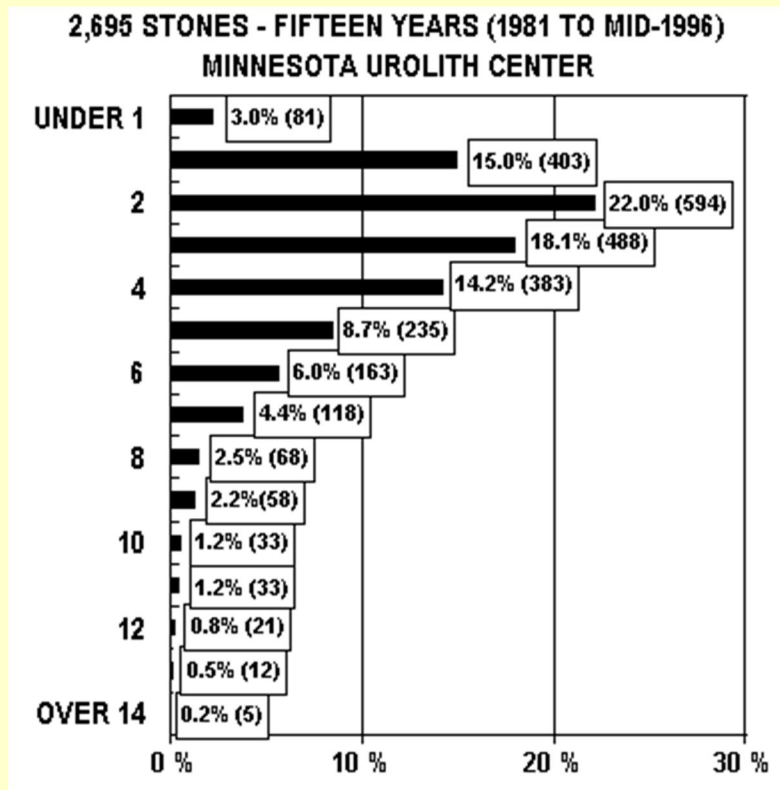
almost 60 percent bitches perhaps may be a result of those struvite data because bitches are allegedly more prone than males to urinary tract infections. While on the subject of infection stones, it may be of interest to know that - of the bacterial species known to frequently cause urinary tract infections - *E. coli* is reported to be the most prevalent but it has not been incriminated as a stone-forming bacterium. The others, *Proteus* and *Staphylococcus* have been incriminated as stone-formers, such as "coagulase-positive *Staphylococcus*," for which Ampicillin has been reported to be the antibiotic-of-choice.

Chart No. 6 - Gender of Stone-Forming Dalmatians with Purine Stones



Compared to Chart No. 5, a gender shift to almost 97 percent male Dalmatians may be explained because stone-forming symptoms and most certainly urinary obstruction in males is immediately visible to the observer as a result of their urinary anatomy. Bitches uneventfully pass many stones including urates without detectable symptoms because their urinary anatomy permit passing of large stones more easily than males. Many female stone-formers therefore remain undetected and unreported but these data nonetheless dispel the misconception that bitches do not become stone-formers.

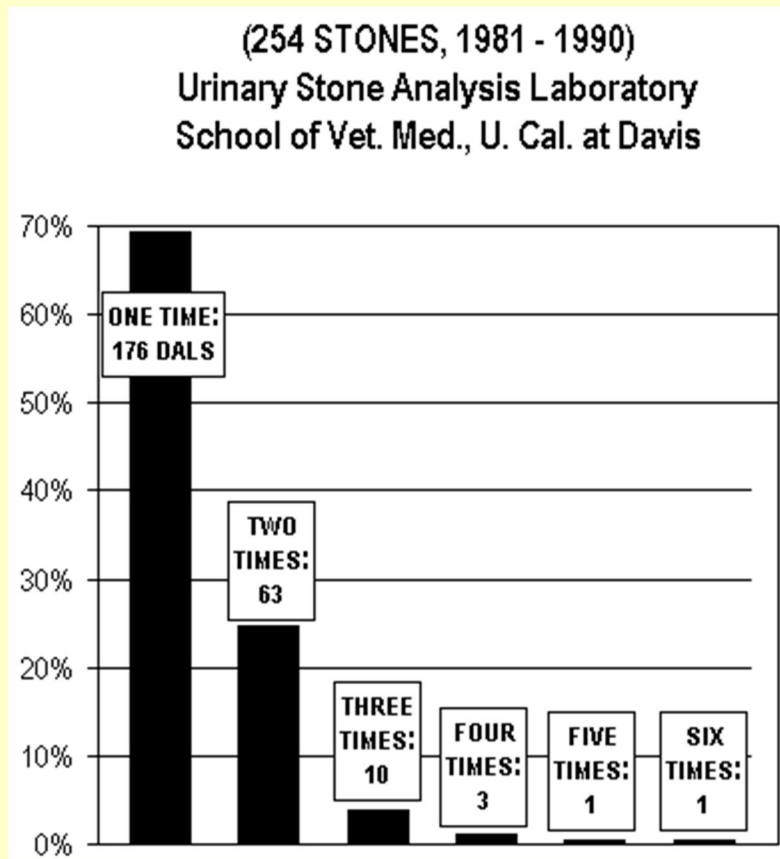
Chart No. 7 - Age of Stone-Forming Dalmatians



In 1986, Dr. Osborne's textbooks showed three years to be the most prevalent age for all breeds to show stone-forming symptoms. These current data shift to a range of one-to-four years as the most prevalent Dalmatian ages. Younger Dalmatians now significantly showing up may be a result of an increased awareness to the health problem and more frequent observation of their urinating. Remember the prevalence of those ages merely means when stones were sent to the Minnesota Center for assay or when the dogs entered there as patients. We do not know how many of these data represent the first onset of stone-forming.

The entire graph shows Dalmatian stone-forming can occur at any age - in any puppy, in any adult and in older senior citizens. I am not struck by the dwindling data after four years-of-age so much as the mere presence of old Dalmatians in the data. Years or even a lifetime of no overt stone-forming symptoms clearly does not justify complacency.

Chart No. 8 - Repetitive Stone-Forming by the Same Dalmatian



These data are not from Minnesota but from the California ten-year database published in 1993. They logically follow Chart No. 7 showing age of stone-formers and are included to amplify those data for you. Not surprisingly, the graph shows the majority of Dalmatians formed stones in a once-or-twice pattern of recurrence. Thereafter, any Dalmatian forming stones for a third-to-sixth time drops off precipitously. Several possible explanations come to mind:

- Repetitive stone-formers may have been euthanized the more frequently they recurred;
- Owners became more conscientious (and thereby more successful) in following an anti-stone regimen;
- New knowledge for successful treatment became available as years went on;
- Stones were not returned for assay as they recurred.

Summary & Conclusions

1. Every Dalmatian is born with the breed-specific potential of urate stone-forming because of defects in urine production in the Dalmatian liver and

- kidney. It is not known why some Dalmatians become overt stone-formers as compared to others including littermates.
2. Improper diet containing potent purine-yielding foods or large amounts of them have been incriminated in Dalmatian urate stone-forming. Environmental factors such as quality of local water purification systems may be an added, significant influence.
 3. The vast majority of Dalmatian urinary stones reveal urates as their most prevalent mineral as compared to struvite ("infection stones") in all other breeds. This underscores the necessity to first identify what kind of abnormal urinary crystal or stone the Dalmatian is forming before effective and appropriate treatment can be dependable.
 4. Architecturally, urates are smooth-walled so that treatment directed to dissolving them for passing or to reopen blocked urinary flow by non-surgical "back-flushing" carries hope for a high degree of success.
 5. Male Dalmatians are susceptible to the dreaded urinary obstruction but bitches have definitely been confirmed as stone-forming too.
 6. Early detection of abnormal urinary crystals may be invaluable to abort the progression into stones and their dreaded urinary obstruction. The earliest sign can be an abnormal urinary pH easily monitored by Dalmatian owners using dipsticks. The simple, inexpensive but confirming **diagnosis** is a standard urinalysis to detect if abnormal urinary crystals are present and continue to be present over repetitive testings. A published veterinary survey revealed a 65 percent error in identifying abnormal urinary crystals and stones throughout the U.S. Accordingly, the DCA Study Group on Urinary Stones currently is working up a wallchart of abnormal urinary crystals, planning on its distribution to their veterinarians by Dalmatian owners.
 7. Overzealous and overly protective owners of Dalmatians **without** symptoms of abnormal urinary crystals or stones need not feel compelled to adhere to the extremes of diet and water intake urged for known stone-formers. The absence of symptoms, however, should be periodically confirmed by ongoing urinalyses.

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This article was published originally in the Spring 1997 issue of the SPOTTER, official publication of the Dalmatian Club of America, Inc.

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