INTRODUCTION

Hematuria is defined as the presence of five or more RBCs per high-power (40x) field in a fresh, centrifuged specimen obtained by either manual compression of the bladder catheterisation, or cystocentesis (Reine at al.,2005). Healthy animals can excrete as many as 3 red blood cells per high-power field (Chew, 2011). Hematuria is commonly subdivided according to its type as macroscopic hematuria (i.e., visible, named gross hematuria) and microscopic hematuria (Figure 1, Figure 3) (i.e., nonvisible detected with a microscope), time of micturition (initial, terminal or total), duration (intermittent or persistent) and the clinical form - symptomatic or asymptomatic (Costache, 2005).

Initial hematuria indicates the origin in urethra or prostate (males), total hematuria – in bladder, ureter, and kidneys, and terminal hematuria, bladder or prostate (Mazhari, 2002) (Figure 2).

Gross hematuria is suspected when urine is has an abnormal color, usually red or tea-colored. In evaluating gross hematuria, it is important to confirm the presence of RBCs by microscopy (Massengill, 2008).

Figure 1. Gross hematuria vs. Microhematuria
https://www.drugs.com/health-guide/hematuria.html

Figure 2. Hematuria. Time of micturition
www.kidneyservicechina.com/pkd-symptoms/4325.html
“Dipstick hematuria” and “dipstick microhematuria” is a nondiagnostic screening test offering a positive result due to oxidation of a test-strip reagent (Rao and Jones, 2008). This paper briefly reviews the basic definitions of hematuria, the common causes and the prevalence of this symptom on dogs and cats. There are many causes of hematuria, and is a priority in the medical act for the doctor to discover the origin of hematuria by establishing whether its nature is renal or non-renal (Table 1).

Table 1. Causes of hematuria

<table>
<thead>
<tr>
<th><strong>Intrinsic Renal Disease</strong></th>
<th><strong>Non-Renal Disease</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Glomerulonephropathy</td>
<td>Ureteric (stones, tumor)</td>
</tr>
<tr>
<td>Cystic disease</td>
<td>Bladder</td>
</tr>
<tr>
<td>Renal tumors</td>
<td>- tumors</td>
</tr>
<tr>
<td>Interstitial disease</td>
<td>- stones</td>
</tr>
<tr>
<td>Interstitial nephritis</td>
<td>- Cystitis</td>
</tr>
<tr>
<td>Papillary necrosis</td>
<td>Prostate (carcinoma)</td>
</tr>
<tr>
<td>Analgesics</td>
<td>- Prostatitis</td>
</tr>
<tr>
<td>Stones or crystals</td>
<td></td>
</tr>
<tr>
<td>Acute infection</td>
<td></td>
</tr>
<tr>
<td>Atrioventricular malformation</td>
<td>Urethral lesions</td>
</tr>
</tbody>
</table>

(After: Fine, 2002)

Diagnosis of hematuria can be pronounced easily by using urine strips which evaluates for pyuria, proteinuria, hem positivity, and urinary concentrating defects (Table 2) and using microscopic examination of urine sediment by evaluating for white blood cells and clumps, RBC morphology, crystals, and casts. Crystalluria can be determined by calcium oxalate, calcium phosphate, uric acid, or cystine crystals. Hypercalciuria is the most common cause of crystalluria (Massengill, 2008).

A reagent strip, also called a dipstick, is a narrow strip of plastic with small pads attached to it. Each pad contains reagents for a different reaction, thus allowing for the simultaneous determination of several tests. The colors generated on each reagent pad vary according to the concentration of the analyte present. Colors generated by each pad are visually compared against a range of colors on brand-specific color charts (Bataille et al., 2016).

Urine dipstick is used to test for the peroxidase activity of erythrocytes (Robert, 2007).

Table 2. Substances tested for by urine dipsticks

<table>
<thead>
<tr>
<th>Commonly assessed</th>
<th>Less commonly assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Ketones</td>
<td>Blood Ketones</td>
</tr>
<tr>
<td>Protein Urobilinogen</td>
<td>Protein Urobilinogen</td>
</tr>
<tr>
<td>Glucose Bilirubin</td>
<td>Glucose Bilirubin</td>
</tr>
<tr>
<td>Leukocyte esterase</td>
<td>Leukocyte esterase</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>Specific gravity</td>
</tr>
</tbody>
</table>

(After: Barrat, 2007)

Urine culture is performed in cases that have clinical symptoms or laboratory evidence (pyuria, hematuria, bacteriuria, positive nitrites) of a urinary tract infection (Bataille et al., 2016).

Also in the assessment of patients that express hematuria, complementary tests should be performed such as blood pressure, evaluation of renal functional parameters and proteinuria (Van Der Molen et al., 2012). If the test is positive for hematuria unaccompanied by urine abnormality it is necessary to determine serum creatinine. If it has a high value more tests will be done. The normal values of serum creatinine indicates the need for an ultrasound (Fine, 2002).

**MATERIALS AND METHODS**

This study was conducted in the Clinic of Faculty of Veterinary Medicine in the period between 1.10.2016 – 1.02.2017. In order to establish the prevalence of hematuria in dogs and cats, fresh midstream urine samples (5-10 mL) were obtained from animals with urologic signs.
We evaluated 71 samples, 27 from feline and 18 from canine, 40 being males and 25 females, with age range between 4.5 months and 17 years. The urine samples were first evaluated macroscopically, and its color and clarity were recorded; than we used IDEXX UA dipstick for detecting the blood in IDEXX VetLab UA Analyzer and Clinical Refractometer RHCN-200ATC for measuring the urine specific gravity. The change in the color were noted an compared with standard provided. After the macroscopic evaluation the samples were prepared for urine sediment examination by centrifugation for 10 minutes at 6000x in a Grant Bio PCV-2400 Combined Centrifuge. The supernatant fluid was decanted and a drop of sediment was transferred to a glass slide and a coverslip was placed on the specimen. The slides were examined at 400 magnification for red blood cells. Hematuria was considered to be present at five or more RBCs per high-power (40x) field.

**RESULTS AND DISCUSSIONS**

In the study prevalence of hematuria on dogs and cats, we have taken in consideration parametres that influence the result and conclusion, such as species, age and gender. In regard of hematuria prevalence survey considering species, our result was that 65 animals participated, and felines obtained a percentage of 42% and canine 28%. Giving this result and from the diagnosis established, the felines are more prone to express hematuria, being liable to develop FUS (feline urological syndrome), urinary lithiasis and cystitis (Figure 4). In case of hematuria prevalence based on gender we recorded a significant proportion of males which have registered a percentage of 62% followed by 38% females. Based on the diagnosis discovered the percentage 62% males with hematuria is slightly predictable being well known the frequency of urological pathology in males due to anatomical features of lower urinary tract (Figure 5).

The males who participated in this survey most were diagnosed with urinary lithiasis and FUS. Females who manifested hematuria were diagnosed with cystitis, microlithiasis and just one case with glomerulonephritis and FUS.

Hematuria was encountered in different ages of the subjects, in a prevalence of 32% of animales cu age range between 6-10 years, 31% with 1-5 years, and also 31% over 10 years, and 6% less than a year (Figure 6). Other studies have concluded that risk-factors for stone formation, are age, gender and breed, together with influences such as geographical location, presence of UTI and dietary history (Syme, 2012). Cystine urolithiasis occurs preponderantly (98%) in male dogs and are not common in very young dogs but tend to occur in middle-age (Syme, 2012).
The prevalence of cystine calculi is highly dependent on geographical location, with a higher reported prevalence in dogs in Europe than dogs from the USA (Syme, 2012).

Table 3 summarizes the main causes in appearance of urine strips errors (Fine, 2002).

Table 3. Reasons in appearance of urine strips errors*

<table>
<thead>
<tr>
<th>Reasons blood shows on dipstick urinalysis but not on microscopic exam (false positive)</th>
<th>Reasons blood doesn’t show on dipstick urinalysis but is present on microscopic exam (false negative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>Captopril Vitamin C</td>
</tr>
<tr>
<td>Dehydration</td>
<td>Acidic urine (pH &lt;1.5)</td>
</tr>
<tr>
<td>Hemoglobin (part of red blood cell) Myoglobin (break down product of red blood cell)</td>
<td>Concentrated urine Protein in the urine dipstick exposed to air</td>
</tr>
</tbody>
</table>

(After: O’Brien et al., 2014).

The protocol in the diagnosis of hematuria includes first testing with urinary strip and if it is positive urine should be sent for urinalysis. If the patient has more than five RBCs/hpf, microscopic hematuria is present. The American Urologic Association declares “evaluation should be based solely on findings from microscopic examination of urine sediment and not on a dipstick reading.” (O’Brien et al., 2014).

From a total of 51 urinary dipstick who tested positive, we discovered on the examination of urine sediment that 46 samples confirms the presence of more five red blood cells (RBCs)/high power field, and 5 samples offered a false - positive (Figure 8).

Positive dipstick for hematuria with negative microscopy are often due to false negative microscopy. With bright field microscopy, negative results may occur as a result of spontaneous lysis of red cells or by failure to detect ‘ghost’ forms (Choi, 2003).

It is been noted that microscopic hematuria is present when more than five red blood cells (RBCs)/high power field are found (Fine, 2002). Dipstick testing is the initial test for detecting hematuria. It is very sensitive and will pick up one to two RBCs/hpf (Fine, 2002). Dipstick testing will register positive in a urine that has microscopic hematuria allowed to stand for too long (i.e., with hemolyzed RBCs) in spite of few or no red cells being seen on the film. In some cases, dipstick tests provides a false negative or false positive (Choi, 2003).
hematuria and 24% to microscopic hematuria, and 28% of the samples showed no hematuria (Figure 9).

In assessing gross hematuria, it is important to verify the presence of RBCs by microscopy. After centrifugation of the urine, the finding of red urinary sediment with a positive strip test for hemoglobin suggests hematuria, whereas red supernatant with negative dipstick testing for hemoglobin is indicative of myoglobinuria, hemoglobinuria, or other causes of discolored urine (Veerreddy, 2013).

The overwhelming result in which macrohematuria is triple to microscopic hematuria is probably due to the fact that most of the diagnosis established implies an advanced pathological disorder in which bleeding is a common sign.

Concerning the micturition moment, terminal hematuria records a higher proportion, being an element suggesting the involvement of the lower urinary tract.

CONCLUSIONS

Hematuria is a common finding of urological pathology as we discovered in our study. Hematuria in dogs and cats has a wide differential diagnosis, with different therapeutic approaches compared to human patients.

It is important that in the first evaluation of the animals the clinician takes account of the risk factors of every species.

Knowing that felines with male gender are prone to develop urological disorders that express macroscopic hematuria such as FUS, urolithiasis and cystitis, can help the clinician to pursue a reduced number of methods of investigation offering a fast diagnosis.

More often than not, owners, demand an immediate diagnosis, particularly when there is microscopic hematuria due to the impact of blood in the urine that alarms them.

A simple and practical approach to the animal who presents hematuria should consists in a fewer invasive studies, a less costly evaluation, and an accurate diagnosis.

Our results suggest that asymptomatic microscopic hematuria in dogs and cats is rarely associated with clinically significant disease of the urinary tract, but it is mandatory to keep under observations the animals.

Gross hematuria is more commonly and is associated with urinary tract disease, such that a thorough evaluation for determination of the bleeding origin is justified and recommended.

REFERENCES


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LEVELS OF PERSISTENT ORGANOCHLORINE COMPOUNDS IN SEWAGE SLUDGE FROM WASTEWATER TREATMENT PLANTS

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Abstract

The use of sewage sludge as fertilizer in agricultural soils is considered an economical way to use the high amounts produced by wastewater treatment plants. Besides the benefit, meaning high content of organic matter and nutrients, sewage sludge can have a negative impact on environment because it can contain persistent organic pollutants or heavy metals. The aim of this study is to establish the level of polychlorinated biphenyls (PCBs) and organochlorine insecticides in sewage sludge collected from 10 wastewater treatment plants. The PCB IUPAC no. 28, 52, 101, 118, 138, 153, 180 and ten organochlorines were extracted with organic solvents, purified with copper and silicagel and analysed by gas chromatography/time of flight mass spectrometry. The concentration of total PCBs ranged from 3ng/g to 59.2ng/g dry weight, levels below the upper limit for land application according to Romanian legislation law for agricultural use. The predominant congeners found in sewage sludge were PCB 28, PCB 52 and PCB 138. PCB homologue profiles are dominated by Tri-CBs and Tetra-CBs. The contamination of sewage sludge samples with organochlorine insecticides refers only to the presence of DDE and dieldrin. The other insecticides (aldrin, HCH, ppDDT and ppDDD) are undetectable.

Key words: organochlorine insecticides, PCBs, sewage sludge.

INTRODUCTION

Sewage sludge is a by-product of the waste water treatment processes. It contains nutrients and organic matter that can improve soil productivity, so it is widely used as soil amendments. Land application of treated sewage sludge has been adopted worldwide as a sustainable and economical option for sewage management. Besides the benefit, sewage sludge can have a negative impact on environment because it can contain persistent organic pollutants or heavy metals. Thus, sewage sludge can be a source of polychlorinated biphenyls.

Polychlorinated biphenyls (PCBs) and organochlorine insecticides (OCLs) constitute two classes of compounds which are of prime concern due to their extreme persistence in the environment and potential for biomagnification. They also could be responsible for a series of negative effects on life and environment even at low concentrations (Jones et al., 1991).

PCBs have an unusual high chemical stability, high electrical resistance, low volatility and resistance to degradation in the presence of high temperatures, so they have numerous industrial applications. Thus, PCBs were used as dielectric fluids in capacitors and transformers, as hydraulic fluids in mining equipment, as heat transfer fluids or vacuum pumps; they were also used as plasticizers and additives, as lubricating and cutting oils (Jones et al., 1991).

Because of their lipophilic nature, PCBs and OCLs preferentially partition on sludge during wastewater treatment. It seems that these organic pollutants enter the wastewater stream by direct or indirect release from household or industry or by atmospheric deposition on surface and then runoff into the wastewater treatment system (Blanchard et al., 2001).

In 1973 it was thought that PCBs are 210 compounds that differ in number and position of chlorine atoms (Jones et al., 1991). Later, the scientists considered the theoretical existence of 209 isomers of PCBs, of which about 150...