CASE STUDY OF THE MONTH . PRESENTATION

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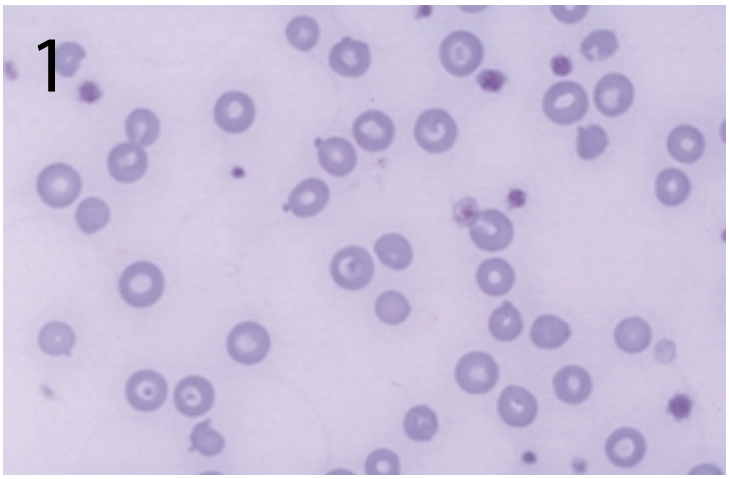
A 4-year-old, spayed female Jack Russell terrier was referred to the emergency clinic for treatment and evaluation of possible immune-mediated hemolytic anemia. The dog was found that afternoon recumbent in a puddle of urine. It had been previously healthy. The owner reported that the neighbor's pigs and goats had been recently poisoned with strychnine.

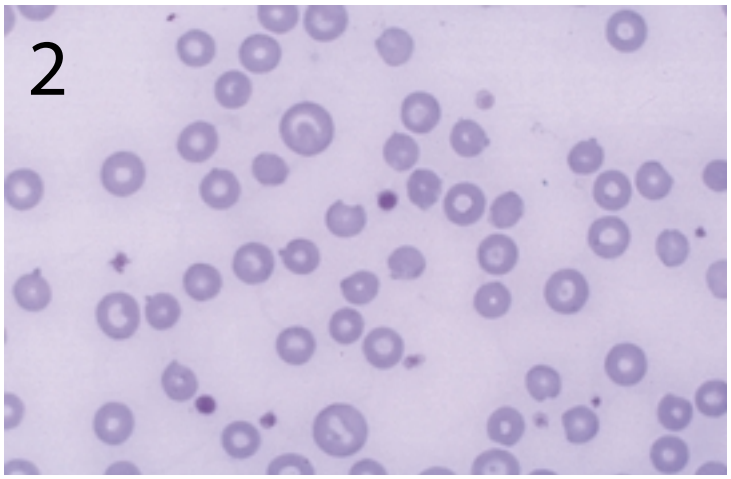
On presentation, the dog was quiet and depressed but responsive, with a normal hydration status. Temperature and heart rate were normal; respiratory rate was slightly elevated. Mucous membranes and conjunctiva were pale and slightly icteric. Moderate splenomegaly was noted on abdominal palpation. The referring veterinarian had administered 15 mg prednisone IM several hours earlier.

Results of the hemogram are below. Photomicrographs of the blood film stained with Wright's–Giemsa (*Figures 1 and 2*) are presented for initial evaluation.

Erythrocyte Parameters	**Result**	**Reference Range**
RBC	2.10 M/µl	5.6–8.0 M/µl
HGB	5.5 g/dl	14–19 g/dl
HCT	15.5%	40–55%
MCV	73.8 fl	65–75 fl
MCH	26.2 pg	22–26 pg
MCHC	35.5 g/dl	33–36 g/dl
RDW	18.3%	11–14%
Reticulocyte count	159,600/µl	7000–65,000/µl
Leukocyte Parameters	**Result**	**Reference Range**
WBC	38,300/µl	6000–13,000/µl
Bands	2681/µl	Rare
Neutrophils	31,789/µl	3000–10,500/µl
Lymphocytes	766/µl	1000–4000/µl
Monocytes	2681/µl	150–1200/µl
Eosinophils	383/µl	0–1500/µl
Basophils	0/µl	0–50/µl
Other Parameters	**Result**	**Reference Range**
Platelets	389,000/µl	150,000–400,000/µl
Plasma protein	6.9 g/dl	6.0–8.0 g/dl
Plasma fibrinogen	400 mg/dl	200–400 mg/dl
Icterus index	5	0

HCT = hematocrit; HGB = hemoglobin; MCH = mean corpuscular hemoglobin; MCHC = mean corpuscular hemoglobin concentration; MCV = mean corpuscular volume; RBC = red blood cell; RDW = red blood cell distribution width; WBC = white blood cell.





ASK YOURSELF ...

- **What are the notable findings on the hemogram and blood film?**
- **What are the differential diagnoses?**

ONION TOXICITY

Regenerative anemia, mature neutrophilia with a regenerative left shift, and icteric plasma are the predominant hematologic changes. Regenerative anemia is usually due to increased destruction of erythrocytes or blood loss. The apparent acute onset, lack of historical blood loss, increased plasma bilirubin concentration (icterus), and normal plasma total protein concentration would support increased erythrocyte destruction. The neutrophilia is probably corticosteroid-induced (decreased egression to tissues, demargination of the storage pool) and a result of hypoxic tissue insult secondary to anemia.[1] Hepatobiliary pathology is the other cause of icterus and would require measurement of liver enzymes for further evaluation.

Heinz Bodies in Hiding

A 0.5% new methylene blue stains Heinz bodies readily, making them easier to detect, as shown in *Figure 3*. Compare with *Figure 4*. The morphologic abnormality of the erythrocytes is the presence of Heinz bodies, which can be seen as a bulge on the cell (arrows). Heinz bodies are aggregates of precipitated denatured hemoglobin that are formed by oxidative injury and attach to the internal surface of the membrane. The Heinz body predisposes the erythrocyte to premature removal from the circulation by the monocyte-macrophage system (primarily splenic "pitting"). Although healthy cats can have up to 5% to 10% Heinz bodies, their presence in dogs is abnormal.

Differential diagnoses include onion toxicity, acetaminophen toxicity, benzocaine exposure (local anesthetic), possibly naphthalene toxicity (mothball ingestion), and ingestion of zinc-containing substances or objects (e.g., skin ointments, pennies).[2] The dog in this case was fed chicken soup with onions and dehydrated onions 6 days previously and some pork tenderloin heavily seasoned with onion powder 5 days previously. Onion bulbs contain the oxidant n-propyl disulfide.[3] Neutrophilia by an unknown mechanism has also been reported in association with onion toxicity.[4] The presumptive diagnosis was onion toxicity with secondary Heinz body hemolytic anemia. The dog was given a transfusion of packed red blood cells and discharged 2 days later.

See Aids & Resources, back page, for references, further reading, and contacts.

DID YOU ANSWER ...

- **Regenerative anemia, mature neutrophilia with a regenerative left shift, and icteric plasma are the predominant hematologic changes**
- **Onion toxicity, acetaminophen toxicity, benzocaine exposure, possibly naphthalene toxicity, and ingestion of zinc-containing substances or objects**