Coelomic Fluid from a Chicken

Katherine L. Irvine

Department of Pathobiological Sciences, School of Veterinary Medicine, University of Wisconsin-Madison, Madison, WI 53706, USA.

Current address: Animal Health Trust, Lanwades Park, Kentford, Newmarket, UK.

SPECIMEN: Coelomic fluid

SIGNALMENT: 3 year old female game hen

HISTORY AND CLINICAL FINDINGS: 1 week prior to presentation, the owner noted that the patient's abdomen had an orange-sized soft swelling. The patient subsequently became progressively hyporexic to anorexic, and the swelling became larger, flatter, and more diffuse. The patient stopped laying eggs 1 year prior to presentation after going through moulting, and had not laid any eggs since. Previous medical history included a broken jaw, congenital malformation of the keel, mites, lice, and exposure to *Mycoplasma* and Marek's disease. She was rescued from a cock-fighting ring 2 years previously.

On presentation, the patient was quiet, alert and responsive. In addition to abdominal distension, 3-4 small white plaques were noted within the oral cavity.

IMAGING FINDINGS: Coelomic cavity: severe amount of hypoechoic, echogenic fluid; remainder of the coelom diffusely hyperechoic; marked mass effect of abdominal organs, cranially. 400 mL fluid obtained. Multiple round, tubular, hyperechoic structures visible and free floating within the free fluid.

HAEMOGRAM:

WBC obtained indirectly by Unopette method and slide differential count

TEST	UNITS		REFERENCE VALUES*
Total protein	g/dL	5.0	3.3-5.5
PCV	%	30	23-55
Thrombocytes	x 10^3/µL	Present, adequate	n/a
WBC	x 10^3/µL	19.7	9-32
Heterophils	x 10^3/µL	8.9 (45%)	15-50%
Lymphocytes	x 10^3/µL	6.5 (33%)	29-84%
Monocytes	x 10^3/µL	2.8 (14%)	0.1-7%
Eosinophils	x 10^3/µL	0.8 (4%)	0-16%
Basophils	x 10^3/µL	0.8 (4%)	0-8%
Erythrocyte morphology		Moderate polychromasia (6-10 polychromatophilic erythrocytes/hpf).	
Leukocyte morphology		Mild toxic change. Many smudged/lysed cells seen.	

* Johnson-Delaney C.A., Harrison L.R., eds. Exotic Companion Medicine Handbook for Veterinarians. Lake Worth, FL: Wingers Publishing; 1996.

COELOMIC FLUID:

Gross appearance: Yellow, cloudy

RBC and TNCC: Not obtainable by analyser, manual count by haemocytometer not performed

Total protein: 6.0 g/dL

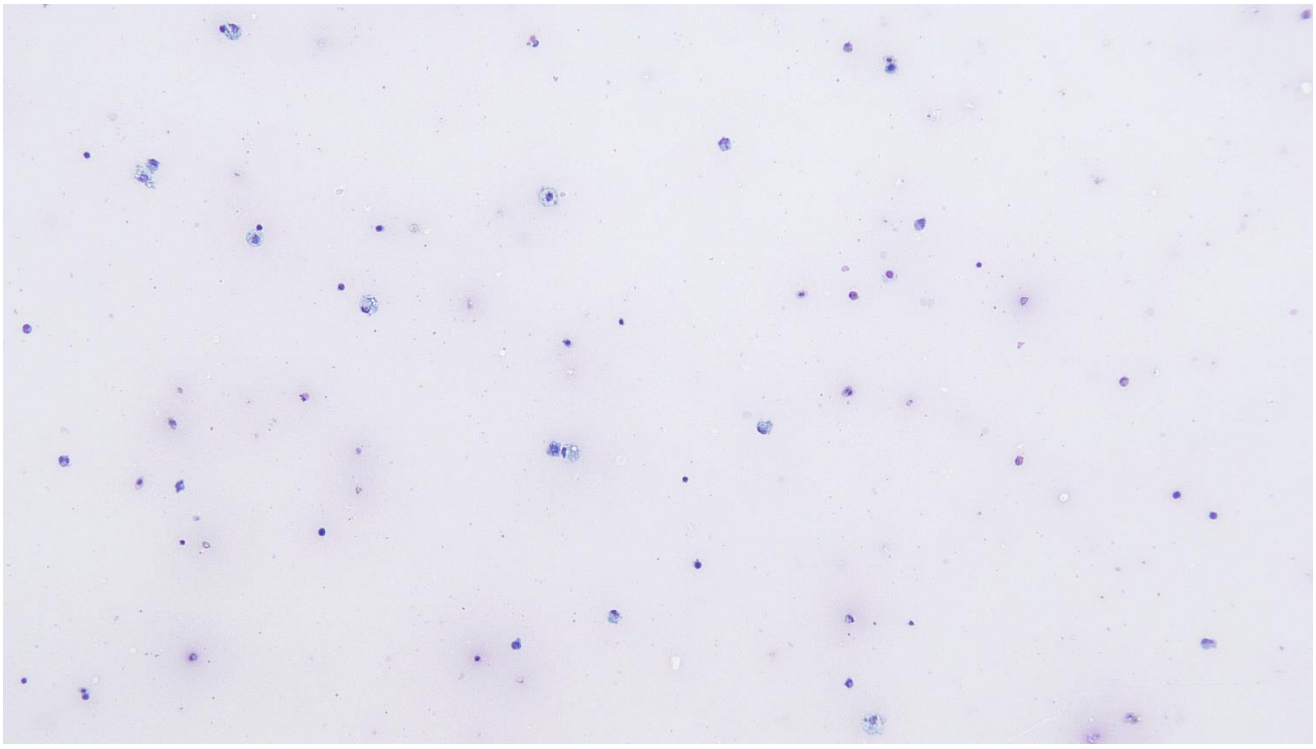

Figure 1: Direct smear of coelomic fluid, 10x objective, automated Wrights-Giemsa stain

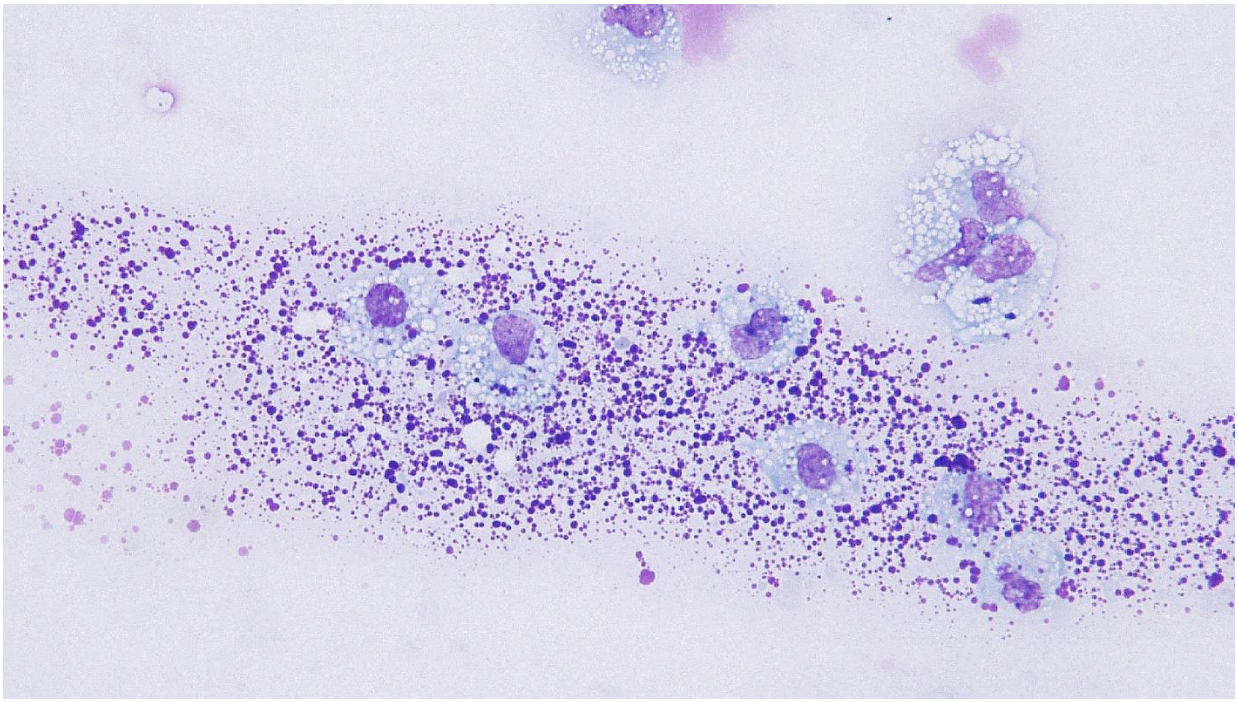

Figure 2: Direct smear of coelomic fluid, feathered edge, 50x objective, automated Wrights-Giemsa stain

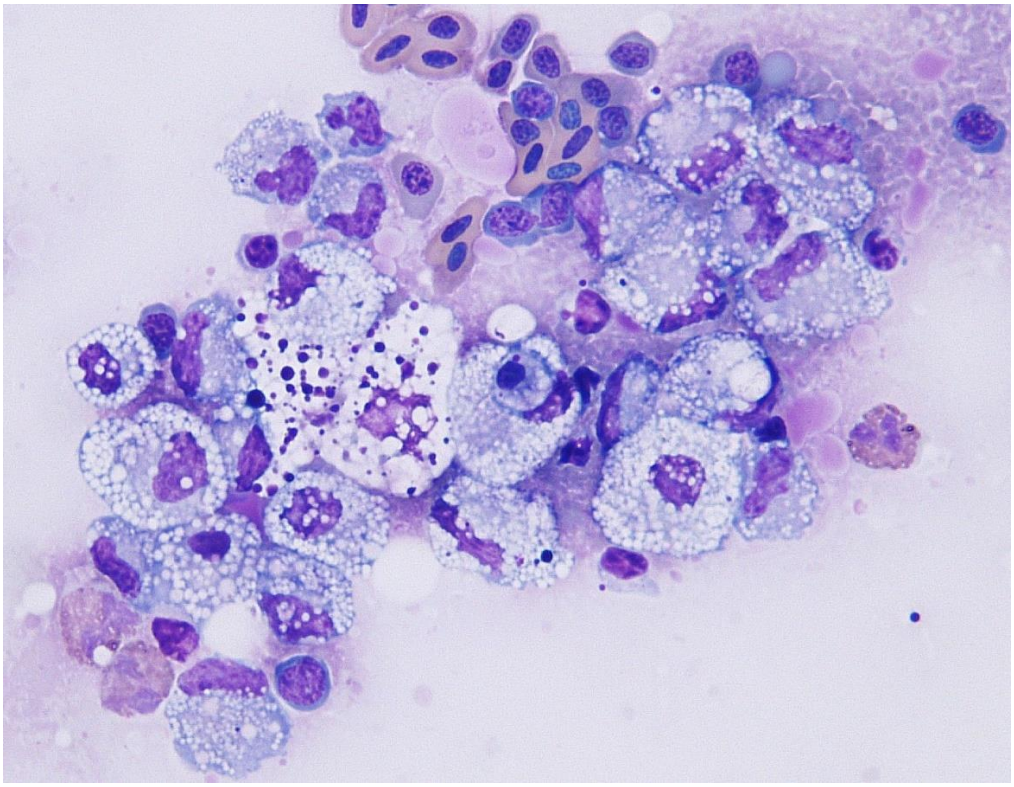

Figure 3: Cytocentrifuged preparation of coelomic fluid, 50x objective, automated Wrights-Giemsa stain

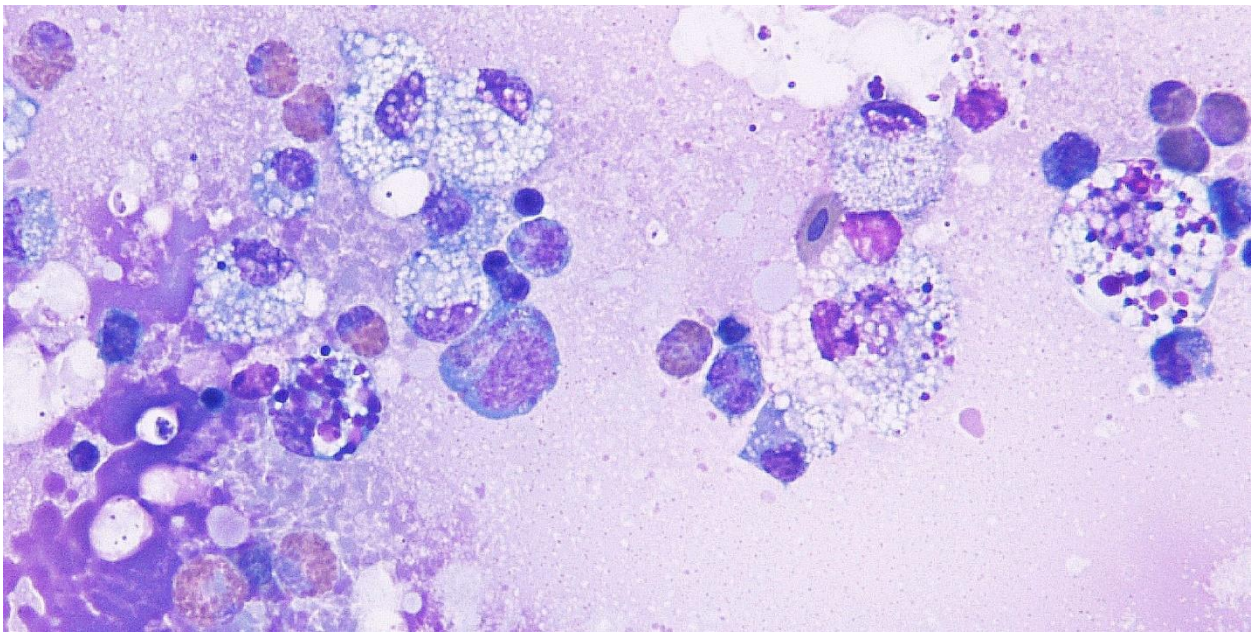

Figure 4: Cytocentrifuged preparation of coelomic fluid, 50x objective, automated Wrights-Giemsa stain

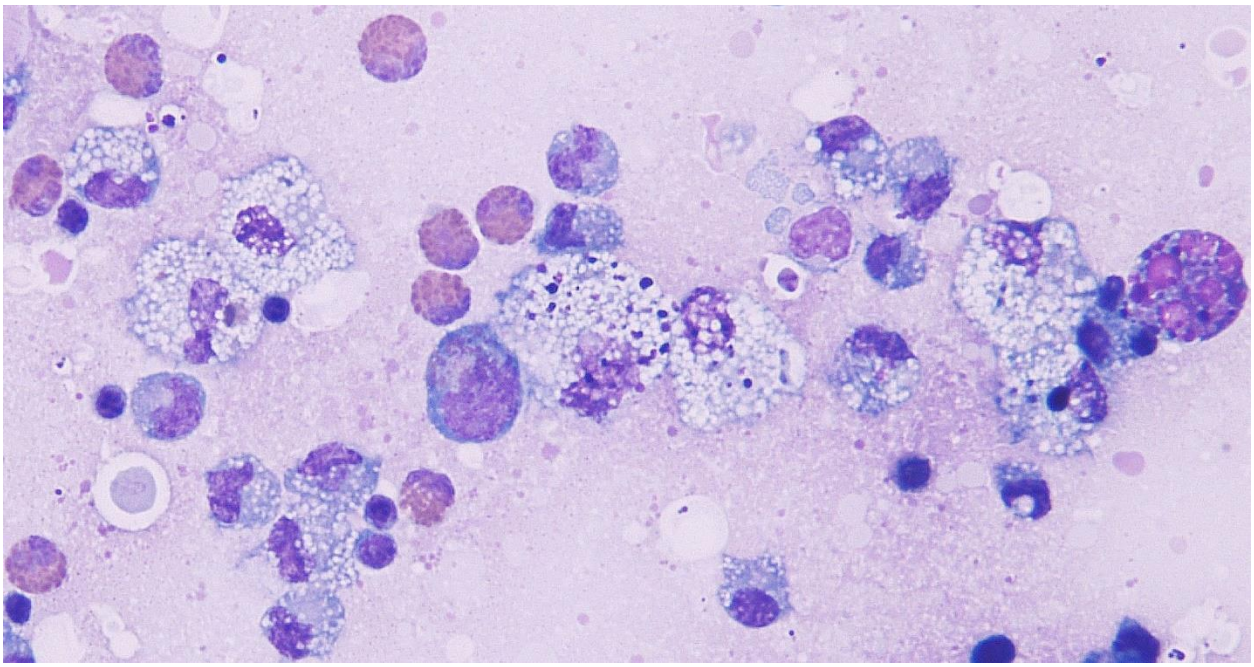

Figure 5: Cytocentrifuged preparation of coelomic fluid, 50x objective, automated Wrights-Giemsa stain

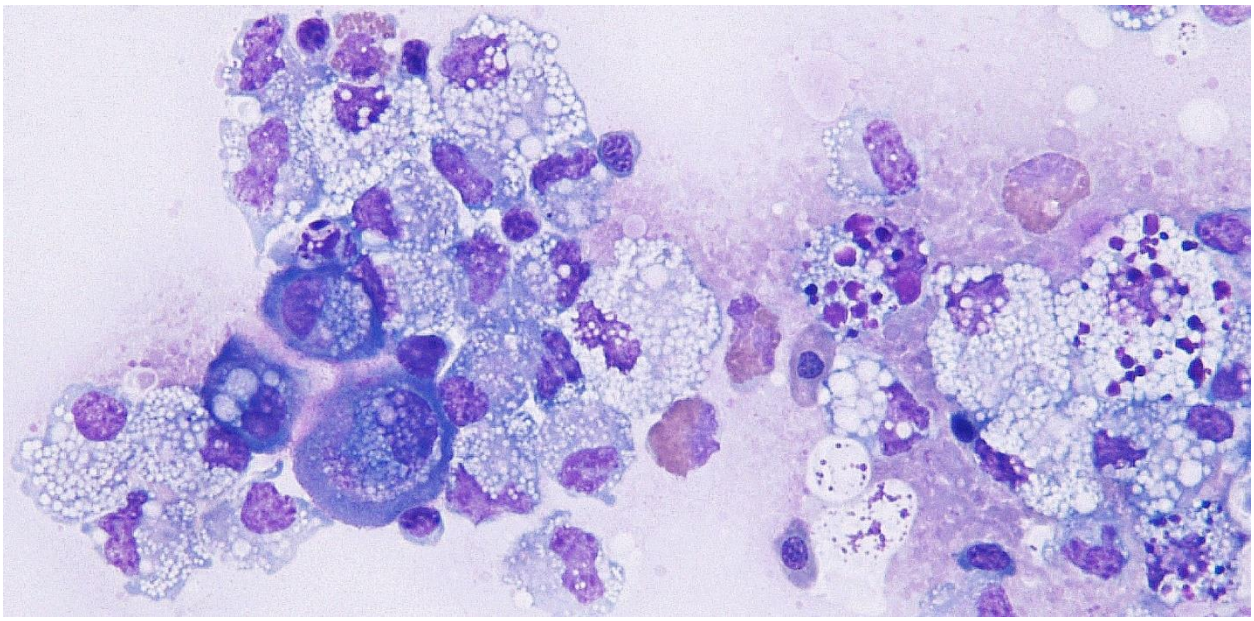

Figure 6: Cytocentrifuged preparation of coelomic fluid, 50x objective, automated Wrights-Giemsa stain

QUESTIONS

1) What cell populations are present in this fluid?

2) What processes could have caused their presence?

3) What is the cytologic diagnosis?

HAEMOGRAM FINDINGS: Compared with the provided reference ranges obtained from a textbook, the leukon is largely unremarkable except for a mild increase in the percentage of monocytes and mild toxic change in the heterophils, which together suggest the presence of inflammation. The exotics specialist clinicians involved with the case considered the total leukocyte to be increased relative to their experience of healthy chickens, which also supports the presence of inflammation. The PCV is within the provided reference range, albeit towards the lower end, but there is moderate polychromasia, which suggests in this patient a PCV of 30% represents anaemia. Regenerative anaemia in exotics may be due to haemorrhage or haemolysis. Haemolytic anaemia is usually due to toxins or infectious agents such as *Plasmodium*, but organisms or other erythrocyte changes suggestive of toxic injury were not observed on the blood film, and in the absence of known toxin exposure haemorrhage was favoured. The total protein is at the upper end of the reference interval, which suggests if haemorrhage is occurring blood loss is internal (eg into the abdominal cavity) rather than external (eg into the gastrointestinal tract).

These findings highlight the difficulties in interpreting routine haemograms from exotic species, in which interpretation is often limited by 1) the lack of lab-established, age-specific and reproduction stage-specific reference intervals, and 2) in this instance, lack of reference absolute leukocyte counts, which are generally more helpful than percentages. Lack of appropriate reference intervals is a common and mostly unavoidable challenge faced in exotic medicine due to the very wide range of species and difficulty obtaining adequate reference populations. Subtle abnormalities are therefore often difficult to detect by comparison to reference intervals alone.

CYTOLOGIC FINDINGS: On the direct smear (Figure 1), the sample is moderately cellular, which suggests the cellularity is within the exudative range (>5000 cells/uL^{1}). The protein determined by refractometry is also in the exudative range (>3.0 g/dL^{1}); however, some of the increased refractivity may be due to the presence of lipid in the sample, and the protein may therefore be overestimated. In the feathered edge of the direct smear (Figure 2), and also seen in the background of the cytocentrifuged preparation, there is extracellular globular purple material consistent with egg yolk. On the cytocentrifuged preparation (Figures 3-6), the predominant cell type is foamy macrophages (54% of the differential non-erythrocytic nucleated cell count performed during analysis), which often contain phagocytosed egg yolk material or round, clear vacuoles consistent with lipid. There are also many heterophils (25%) and small lymphocytes (21%). Additionally, there are erythroid and granulocytic precursors, which are highlighted in Figures 7-9 below. Rare larger individualised round cells with abundant basophilic vacuolated cytoplasm and pink cytoplasmic fringe were interpreted as reactive mesothelial cells (Figure 6).

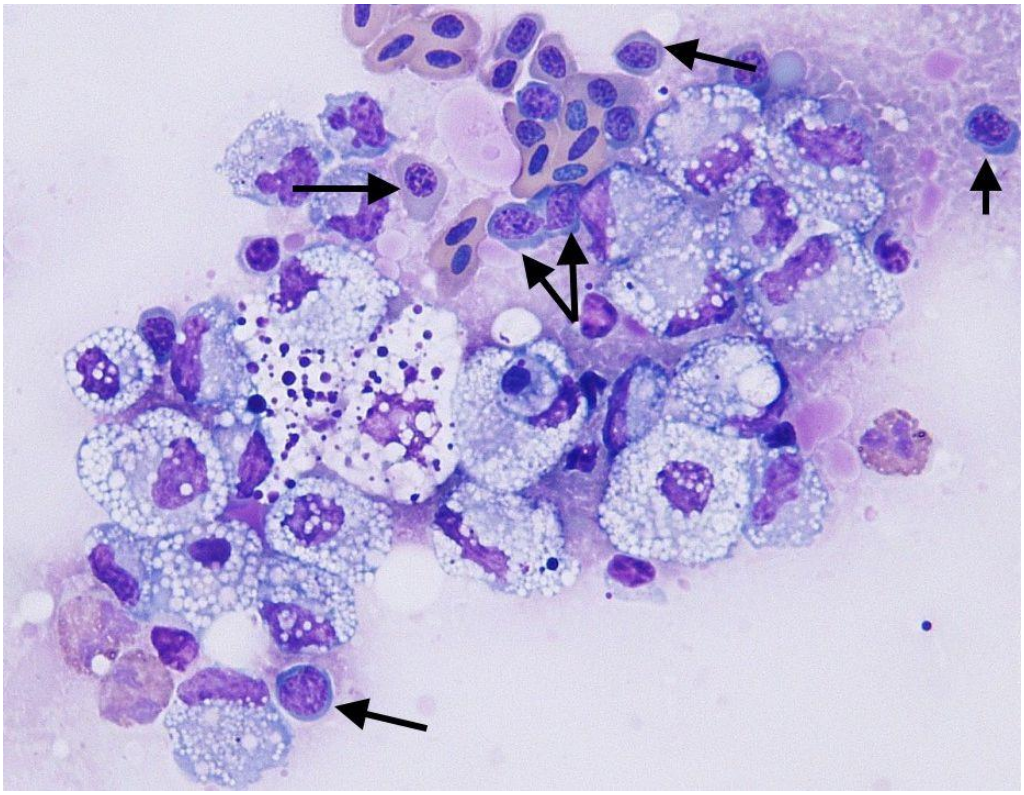

Figure 7: Erythroid precursors are shown with black arrows.

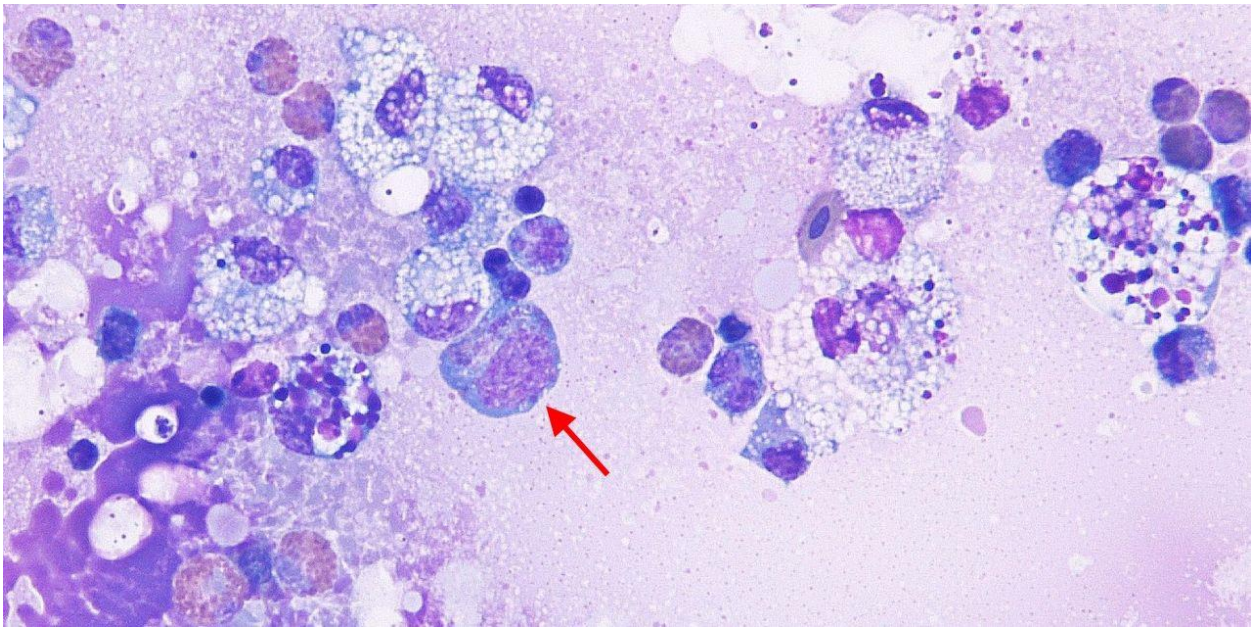

Figure 8: A heterophilic progranulocyte is shown with a red arrow.

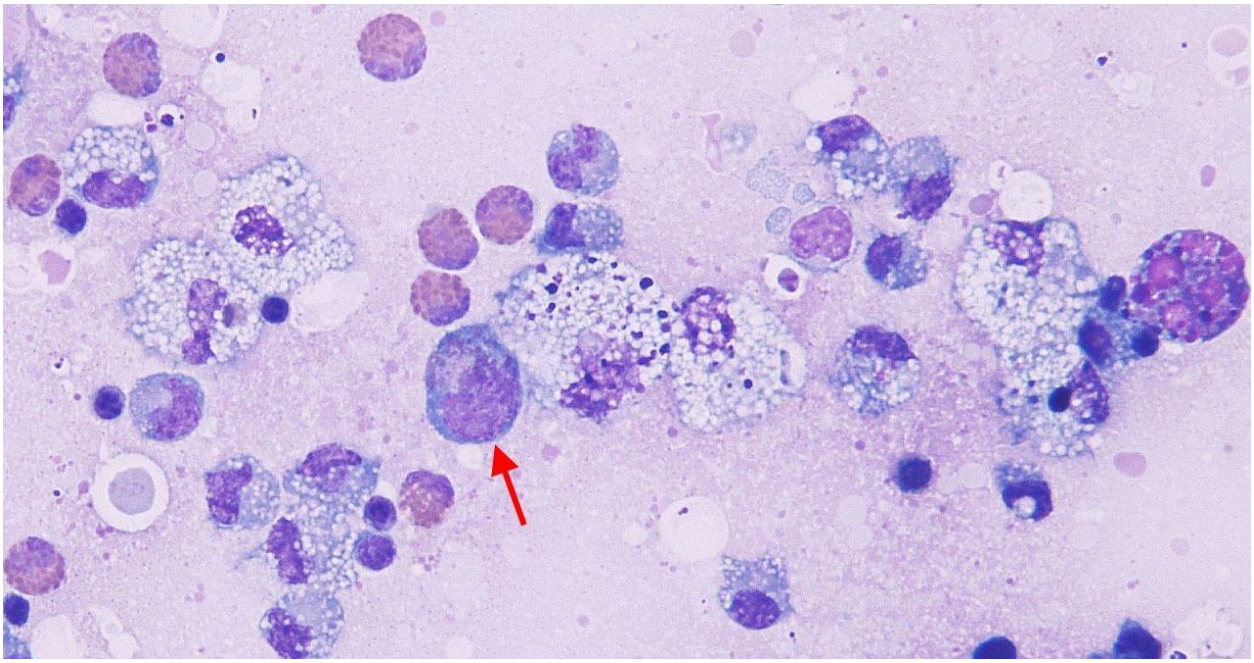

Figure 9: A heterophilic progranulocyte is shown with a red arrow.

BACTERIAL CULTURE RESULTS: No growth after 6 days of aerobic incubation

OUTCOME: The patient was discharged with meloxicam and antibiotics, and a deslorelin implant recommended to control reproductive activity.

QUESTIONS:

1) What cell populations are present in this fluid? Foamy macrophages, heterophils, small lymphocytes, erythroid precursors, granulocytic precursors, and reactive mesothelial cells.

2) What processes could have caused their presence? As for dogs and cats, there is usually insufficient coelomic fluid in a normal patient to be sampled, and 'normal' coelomic fluid therefore not available for comparison. Transudative effusions typically yield mostly low numbers of macrophages, and it is therefore likely low numbers of macrophages would be present in normal coelomic fluid also. The cellularity is suspected to have been in the exudative range, however, and since macrophages form 54% of the differential count, it seems likely they are increased in response to the presence of egg yolk within the coelomic cavity. Low numbers of heterophils may be seen in transudative effusions, especially when blood is present, but a mild heterophilic component to the inflammation was suspected given the exudative nature of the effusion and final diagnosis. The lymphocytes were all small and therefore considered to be inflammatory or possibly chylous in origin, rather than neoplastic. The haematopoietic precursors were an interesting finding, and in this case may reflect either intra-coelomic haematopoiesis or accidental puncture of the spleen during coelomic fluid sampling.

3) What is the cytologic diagnosis? Egg-yolk coelomitis

DISCUSSION

Egg yolk coelomitis refers to the inflammatory response associated with the escape of immature ova into the coelomic cavity. The pathogenesis is poorly described in the literature, with limited sources available. It may present acutely, which may or may not be accompanied by sepsis, or be chronic or subclinical in nature[2]. Presenting signs may involve malaise, ill-thrift, decreased physical activity, and delayed moulting, in addition to abdominal distension. On palpation, abdominal mass effects may be present due to ventriculus displacement, eggs within the oviduct, free-floating ectopic eggs, or ovarian masses. Diagnosis may be made from imaging findings and/or laparoscopy/laparotomy alone, or in conjunction with cytology of the coelomic fluid. In addition to providing confirmation of egg yolk material in the fluid, which has a classic globular pink or purple appearance[3] (Figure 2), cytology also has the advantage of potentially detecting concurrent sepsis if present. Egg material provides an excellent growth medium for bacteria within the coelomic cavity, predisposing to secondary infection. Fortunately in our case bacteria were not detected either cytologically or by coelomic fluid culture.

REFERENCES

1 Campbell T. Effusions. In: Campbell T, eds. *Exotic Animal Hematology and Cytology*. 4th ed. John Wiley & Sons, Inc.; 2015: 309-321.
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3 Latimer KS, Rakich PM. Avian cytology. *Vet Clin Exot Anim* 2007;10:131-154.