Breed-specific haematology in companion animals: *One size does not necessarily fit all*

Amy Weeden, Clinical Pathologist at Gribbles Veterinary, outlines some of the variations to look out for when using haematology in diagnostic workups.

HAEMATOLOGY IS USED daily in the diagnostic workups of our companion animal patients. We primarily use species-specific reference intervals to look for clues about our patients. It's important to keep in mind that these reference intervals represent normal values for the majority of our patients, but any given animal's 'normal' is not necessarily going to be represented in that general range. It's also important to note we can expect some degree of morphologic variation in blood cells from patient to patient. The ideal condition would be to have a patient-specific reference interval, which has been generated from prior blood work when that individual was healthy/normal. The reality is that we're not going to have that in most cases. However, having some knowledge of breed-specific differences and clinically silent anomalies may help us to interpret our data. The following are some relatively common examples.

VARIATIONS IN RED CELL MASS, RED CELL INDICES OR MORPHOLOGY

Greyhounds and other sighthounds

It's well known that Greyhounds and other sighthounds have several differences in their haematology and clinical chemistry values compared to the general canine population. Sighthounds tend to have higher measures of red cell mass (haematocrit/packed cell volume [HCT/PCV], haemoglobin concentration and red blood cell [RBC] count) as well as increased mean cell volume (MCV) and mean cell haemoglobin concentration (MCHC) (Zaldívar-López et al., 2011).

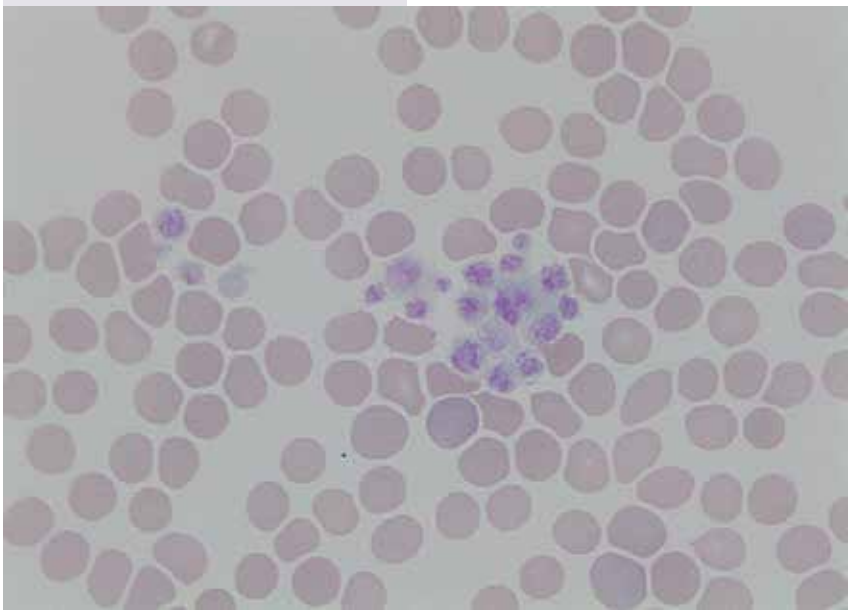
Miniature Dachshunds

A breed that is quite different from the sighthounds in appearance shares some of the above haematologic variations. Miniature Dachshunds have recently been shown to have higher HCT/PCV, RBC count and haemoglobin concentration than mixed breed dogs (Torres et al., 2014).

Poodles

Some Miniature and Toy Poodles have a clinically silent condition called hereditary poodle macrocytosis. These dogs are not anaemic, but they do have increased MCV, which may be accompanied by metarubricytosis (increased numbers of nucleated RBCs) and/or increased numbers of Howell-Jolly bodies (Harvey, 2012).

FIGURE 1: Feathered edge of a blood smear from a Cavalier King Charles Spaniel. This dog did have significant platelet clumping, and overall numbers appeared reduced. Note the size of the platelets; some are similar in size to RBCs (100x objective).



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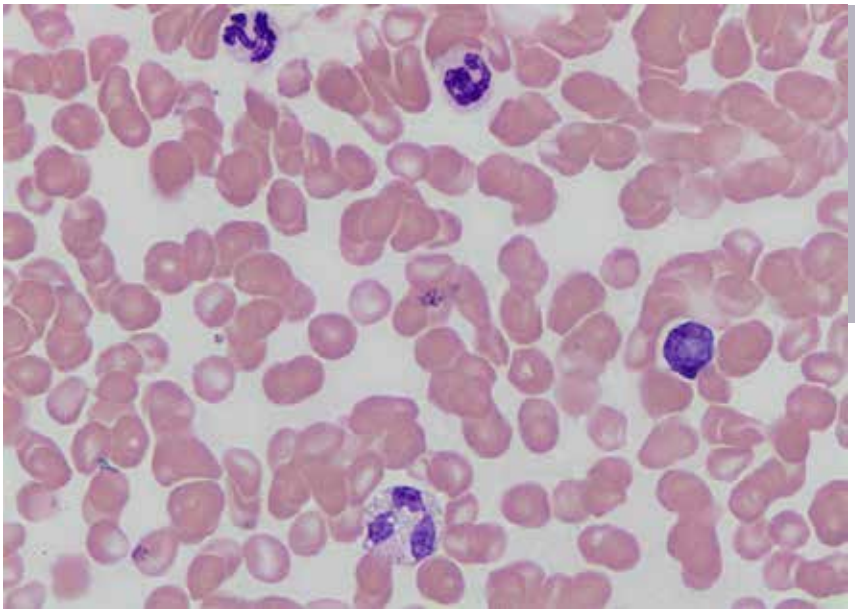

FIGURE 2: Blood smear from a Greyhound. There is a vacuolated grey eosinophil at the bottom of the image. This dog did not have any toxic change in the neutrophils; two are shown at the top of the image for comparison. The neutrophils are smaller than the eosinophil, have colourless to faint pink cytoplasm, and do not contain vacuoles (100x objective).

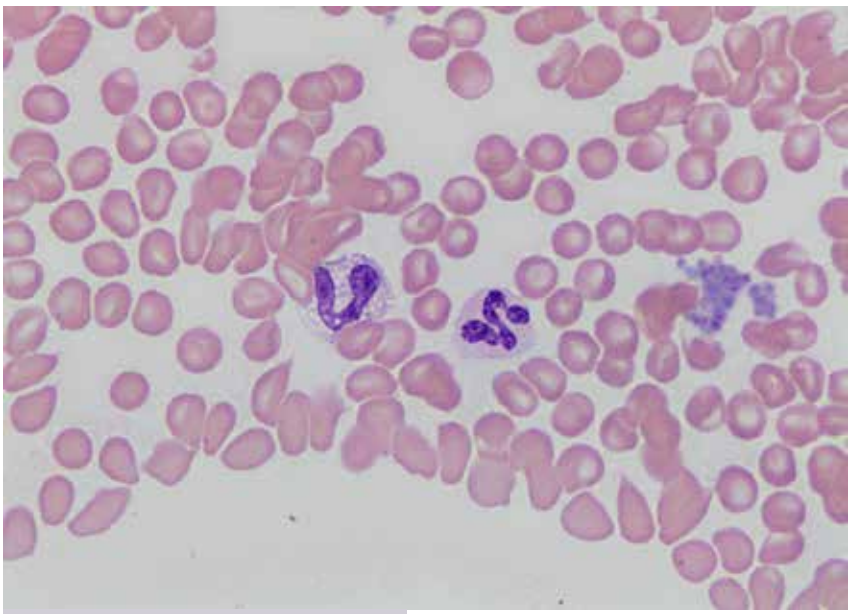

FIGURE 3: Another grey eosinophil from a Greyhound is shown on the left with a neutrophil on the right (100x objective).

Japanese dog breeds

Some of the Japanese dog breeds have been shown to have asymptomatic variations in red cell indices when compared to the general dog population. A recent study looked at the Shiba, Akita and Hokkaido and found that some of these clinically healthy dogs have lower MCV, mean cell haemoglobin (MCH) and MCHC, as well as significant anisocytosis (variation in red cell size) on smear exam, and increased red cell distribution width compared to mixed breed dogs (Aniołek et al., 2017).

VARIATIONS IN PLATELET COUNT OR MORPHOLOGY

Greyhounds

Greyhounds have been shown to have lower platelet counts than the general canine population (Zaldívar-López et al., 2011). Note that healthy Greyhounds do not tend to have counts below 100 x 10^9/L, so thrombocytopenia of this degree generally should be investigated (Santoro et al., 2007).

Cavalier King Charles Spaniel, Norfolk Terrier and Cairn Terrier

A condition called hereditary macrothrombocytopenia is common in the Cavalier King Charles Spaniel (Pedersen et al., 2002) and has also been identified in Cairn and Norfolk Terriers (Gelain et al., 2014). Mutations in the beta1-tubulin gene are responsible, and these dogs tend to have lower numbers of large platelets (Figure 1). Note that affected dogs can have quite variable platelet counts, ranging from marked thrombocytopenia to counts that are within reference intervals. The condition has not been associated with bleeding tendencies or other clinical problems (Pedersen et al., 2002; Gelain et al., 2014).

VARIATIONS IN WHITE BLOOD CELL COUNT, DIFFERENTIAL, OR MORPHOLOGY

Greyhounds

Greyhounds tend to have lower total WBC counts and neutrophil counts than

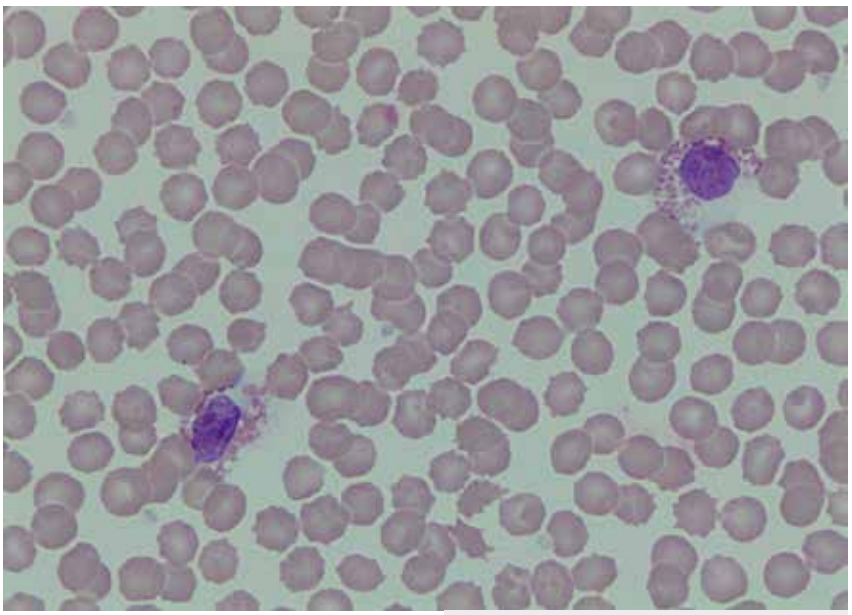

FIGURE 4: Two eosinophils with hypo-segmented, round to oval nuclei are shown from an Australian Shepherd with Pelger-Huët anomaly (100x objective).

the general canine population (Zaldívar-López et al., 2011).

Greyhounds and some other breeds also have 'grey eosinophils', or eosinophils with greyish cytoplasm and vacuolation without the bright pink granules we typically associate with these cells (Figures 2 and 3). The eosinophils can often be confused for toxic neutrophils due to the greyish tint to the cytoplasm and vacuolation. These eosinophils tend to be either under-represented or not recognised at all by haematology analysers (Giori et al., 2011). Add this to your list of reasons to review a blood smear.

Australian Shepherds and other pure bred and mixed breed dogs

Pelger-Huët anomaly is an inherited condition that has been described in multiple species and dog breeds. I mention this as a breed-specific condition as it is common in the Australian Shepherd. Pelger-Huët anomaly causes hypo-segmentation in neutrophils, eosinophils and basophils (Figure 4). This change resembles left-shifting in neutrophils, but the chromatin pattern of the cells will appear mature, and there should not be toxic changes in the cells provided the animal is otherwise normal. Similar changes (termed pseudo-Pelger-Huët anomaly) can be associated with acquired conditions (eg, myelodysplasia, inflammation), but these should resolve once the underlying cause has been treated. Animals with Pelger-Huët anomaly have normal leukocyte function. The importance in recognising this condition lies in being able to distinguish it from left-shifting associated with a significant inflammatory stimulus (Vale et al., 2011).

Birman cats

Some Birman cats have reddish granulation of their neutrophils. This anomaly does not appear to affect neutrophil function and should be clinically silent (Hirsch and Cunningham, 1984). The reddish granulation should not be confused with toxic change.

While this is not an exhaustive list of breed-specific haematology, I hope this brief review is a helpful reminder of some of the variables that can either confuse or aid our interpretation of CBC data. Note that most of the abnormalities listed (eg, macrocytosis, microcytosis and thrombocytopenia) could indicate a clinical problem. As always, in order to be useful and informative, laboratory data should be interpreted in the context of the patient presentation and the overall clinical picture. VS

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