

**Vetpath** is a specialist veterinary laboratory dedicated to providing our clients with the finest laboratory diagnostic service. A team of veterinary pathologists and medical scientists with extensive experience in veterinary diagnostic pathology forms the core of the Vetpath team.

# VN News

**FEBRUARY 2014**

## Paediatric Clinical Pathology

Veterinarians routinely treat a wide variety of animals. Species, breed, age and gender are variables taken into account when assessing patients.

These factors are particularly important when interpreting blood results. Vetpath provides specific reference ranges for many species. However, these ranges were created for adult animals and may not always be appropriate in paediatric patients. Knowledge of the more common differences between adult and young animals will help prevent misinterpretation of results falling outside of the reference ranges.

### Haematology

A decline in haematocrit is expected in the first three weeks of life as foetal erythrocytes are

replaced. The PCV will then gradually increase from approximately 8 weeks of age to reach the adult reference range by 6 months. Lymphocytosis is a common finding in young animals and is sometimes accompanied by neutrophilia. These changes reflect an adrenaline response associated with excitement.

### Biochemistry

Urea and creatinine are often below adult reference intervals between the ages of 2 weeks and 3 months. Multiple mechanisms are behind these elevations include increased GFR and lower muscle mass. Urine specific gravity is expected to be low (1.006 – 1.017) before 3 weeks of age, but adequate concentrating ability is present by 6 – 8 weeks of age.

Liver enzymes rapidly increase during the first 2 – 3 days of life and decrease to closer to adult reference ranges at 2 weeks of age. ALP is commonly known to remain increased until 6 – 12 months of age due to increased activity of the bone isoenzyme

with active growth. Serum bile acid concentrations are within adult reference ranges from birth.

Both albumin and globulin concentrations are usually below the adult reference range in puppies under 8 weeks of age (kittens can be more variable). After 8 weeks, albumin is usually within the reference range; however globulins can be persistently reduced until antigenic stimulation occurs.

Information on paediatric coagulation parameters is limited; however PT, PTT and fibrinogen seem to fall within adult reference ranges from 8 weeks.



## What are toxic changes?

One of the most important elements of blood smear evaluation is assessment of leukocyte morphology. This includes evaluation of neutrophils for left shifting and toxic changes.

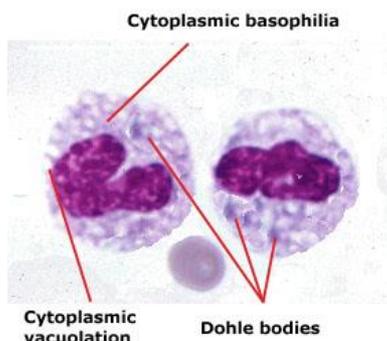
Toxic changes are cytoplasmic abnormalities in neutrophils. These changes form while the neutrophils are still in the bone marrow as a developmental abnormality. Toxic changes occur when there is rapid granulopoiesis due to intense inflammation.

Toxic changes include:

1. **Dohle bodies** composed of clumps of basophilic material composed of rough endoplasmic reticulum (1+ toxic).
2. **Cytoplasmic basophilia** due to retention of free ribosomes (2+ toxic).
3. **Cytoplasmic vacuolation** due to disruption of cytoplasmic granules (3+ toxic).
4. Retention of **primary granules** (4+ toxic).
5. **Giantism** resulting in large neutrophils that have skipped a mitotic cell division (4+ toxic).

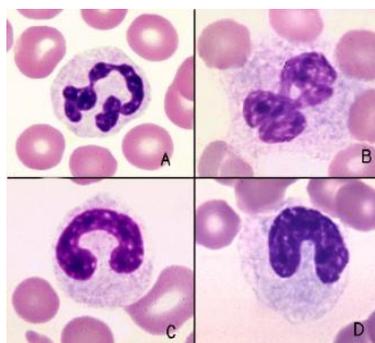
The degree of toxic changes is usually described as 1 - 4+ with Dohle bodies and cytoplasmic basophilia indicating mild (1 - 2+) toxic change and giantism

and primary granules indicating severe toxic change (4+).



**Figure 1:** Toxic changes in neutrophils

Primary granules can be visible during toxic change but must be differentiated from normal neutrophil granulation in some patients. Birman cats and foals often have purple cytoplasmic neutrophil granules. Rare disorders such as Chediak-Higashi syndrome and lysosomal storage disease are also possible. Identifying other signs of toxic changes such as Dohle bodies and cytoplasmic basophilia will help confirm that cytoplasmic granulation is due to toxic change.



**Figure 2:** Normal neutrophil (A), toxic segmented neutrophil (B) and toxic band neutrophils (C and D)

## Fluoride samples

Artifactual hypoglycaemia in clotted serum samples is a problem for most clinics due to metabolism of glucose by erythrocytes.



Placing blood into a fluoride tube often minimizes this change. However, artifactual hypoglycaemia can still occur when the tube is under filled. We suspect when the small amount of blood does not mix adequately with the fluoride, the advantage of using this tube is lost.

However, do not under fill the EDTA and serum tubes to ensure the fluoride tube is full. If you have a small sample and you suspect hypoglycaemia is present, in house testing on a glucometer is recommended.



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