

VN 'How to': Obtain a biochemistry sample

In this, the second of four special 'How to' articles for vet nurses, Ann-Marie Byrne RVN uses a case study to describe the protocol for obtaining a biochemistry sample in a cat, and explores the possible causes for inaccurate results from a nursing perspective. These articles are aimed at student VNs and self test multiple choice questions can be found at the end of each article.

Case history

The patient, a 14-year-old male neutered domestic shorthaired cat, presented with a three-week history of lethargy, anorexia, weight loss, gingivitis, polydipsia and polyuria. A blood sample was required for biochemistry analysis to measure serum levels, metabolites and enzymes. The results provide data on organ function and disease processes, thereby assisting in the investigation and diagnosis of the symptoms.

Preparation

The patient was fasted for 12 hours prior to sampling as a recent meal causes lipaemia, inhibiting analysis and alters blood glucose levels. Hair over the left jugular vein was removed using an Oster clippers and a size 40 blade, and the site was then prepared using swabs saturated with a solution of 75% alcohol, 15% water and 10% chlorhexidine solution (Hibitane). This solution disinfects the skin by removing superficial contaminants, while causing slight vasodilation thus improving visualisation of the vein.

Equipment

The equipment required included:

- Clippers and blade no.40;
- Skin preparation solution;
- Swabs;
- Sterile 2.5 ml syringe, 23 g 5/8" needle;
- A blood collection tube with lithium heparin anticoagulant;
- A plain collection tube;
- Centrifuge;
- Disposable pipette; and,
- Appropriate specimen container for transportation, sample labelling and packaging.

Preparation of equipment

- Clippers harbour bacteria and must be cleaned and disinfected with a commercial antibacterial lubricating solution;
- Sterile syringe and hypodermic needles pre-sterilised by gamma radiation were used; and,
- The needle was aseptically placed on the syringe, the barrel of the syringe was drawn back to prevent excessive negative pressure and returned to position prior to sampling as this pressure may disrupt the delicate vein.



Figure 1: Feline restraint in order to obtain a jugular sample.

Method of sample collection

The jugular vein was selected as the most appropriate site to obtain the sample, and the patient was restrained snugly with the cat's body up against the restrainer's chest. The restrainer's right hand was used to grasp both front legs above the elbows. The head was then extended upwards and the forelegs downwards to expose the jugular vein. Two fingers are used to hold the head under the mandible (Figure 1) This is a skilled technique on the part of the restrainer and requires a lot of practise and patience. As cats do not tolerate this position for too long it is imperative to have all the equipment you require prepared in advance (Figure 2) An alternative technique is to place the cat on its back, either wrapped in a towel or placed in a commercial cat restrainer bag.

Once skin preparation was completed, the vein was occluded at the thoracic inlet by the free hand of the phlebotomist. With the syringe in the other hand the needle is placed within the vein, bevel side up at a 25° angle up to

the needle hub. Gentle negative pressure is applied to allow the blood to enter the syringe chamber, and once sufficient blood was obtained occlusion of the vein ceased and the needle was gently removed. Gentle pressure was applied to the area of venepuncture for greater than one minute to minimise haematoma formation.

Preparation of sample for testing/storage

Immediately after collection, the blood was gently transferred from the syringe into a Lithium heparin collection tube suitable for biochemistry testing; removing the needle from the syringe first to avoid damaging the blood cells during transfer. The blood was gently rotated/rolled to prevent haemolysis and in order to evenly mix the blood and the anticoagulant. The blood tube was then placed into a centrifuge in order to separate the cells and fluid, leaving only the cell free fluid (plasma) at the top of the tube. Plasma can be removed using a pipette, transferred into a plain tube and stored in a refrigerator at 4°C.

Procedure for test/packaging and postage

Primary packaging consisted of a leak-proof container



Figure 2: Sampling equipment prepared for the procedure.

labelled with the date, name, age, species, breed, sex, owner's surname and veterinary practice name. A submission form was included. This form had the referring veterinarian details. Secondary packaging included the sample wrapped in cotton wool for absorption, within a watertight sealed bag to contain any possible leaks. Finally, the outer packaging included the sample being placed in a rigid, suitably sized box stating the type of diagnostic specimens in addition to the sender's details.

Results

The results indicated liver damage, as Alanine aminotransferase (ALT) and ALP Alkaline phosphatase (ALP) were both elevated at 273 u/l and 113 u/l respectively. High blood levels of these enzymes indicates hepatocyte damage when accompanied with the presenting clinical signs. Reduced liver function was indicated by low Total protein (TP) and Albumin (ALB) levels at 56 g/l and 17 g/l. All other parameters were within normal range.

Possible causes of inaccurate results

- The rapid transfer of blood via needle from syringe or vigorous mixing of blood and anticoagulant can haemolyse blood cells affecting analysis;
- Under or over filling the blood collection tube can also affects results, as a predetermined volume of anticoagulant to blood ratio per tube is required;
- Using an inappropriate anticoagulant i.e., Ethylene-diamine-tetraacetic acid (EDTA) which is used for routine haematology;
- Prolonged exposure of serum to cells decreases glucose

and increases phosphorus levels; therefore immediate serum/plasma cell separation is required;

- Unnecessary stress to a feline patient can affect glucose levels and red blood cell volume;
- Fluid therapy was not administered prior to blood collection as this can directly affect the results i.e., PCV levels; and,
- Recent barbiturate therapy can induce similar

signs of hepatocyte damage due to hepatic drug metabolism. Cholestasis – bile duct disease – also causes hepatocellular damage.

Test your knowledge

Complete the following multiple choice questions. Answers can be found at the bottom of this page.

1 A biochemistry test was performed for this case. This tests for:

- Various biochemical substances in the blood
- Glucose, total protein, blood urea nitrogen etc.
- Total red and white blood cell counts
- Both a & b

2 Polydipsia is defined as:

- Excessive drinking
- Excessive overeating
- Production of abnormally large quantities of urine
- Failure of urine production

3 Lipaemia is defined as:

- An abnormally high concentration of glucose in the blood
- An abnormally high concentration of potassium in the blood
- An abnormally high concentration of lipids in the blood
- An abnormally high concentration of sodium in the blood

4 The location of the jugular vein is best described as:

- The base of the pinna
- The cranial aspect of the radius
- The ventral aspect of the neck
- The medial aspect of the elbow

5 Unnecessary stress to a feline patient can affect the glucose levels and red blood cell volumes. This can be avoided by:

- Good restraint techniques
- Having all the equipment required prepared in advance
- Being calm and confident
- All of the above

6 Lithium heparin anticoagulants are suitable for the following tests:

- Routine haematology
- Glucose estimation
- Biochemistry
- Coagulation profiles

7 Samples must be preserved when there is a delay between sampling and testing. Causes of spoilage of samples include:

- Haemolysis of blood
- Clotting of blood
- Contamination of sample
- All of the above

8 Haemolysis is described as:

- The destruction of red blood cells
- The digestion of tissue by its own enzymes
- The accumulation of blood within the tissues that clots to form a solid swelling
- The presence of blood in the urine

9 To avoid haemolysis:

- Excessive suction should be avoided when taking the sample
- Use as wide a gauge needle as is practical
- Do not shake the blood container or roll or invert it to mix the sample
- All of the above

10 Fluid therapy is not administered prior to blood collection as:

- It can directly affect the test results
- It is too time consuming
- It is too expensive
- Fluid volumes cannot be accurately monitored

Answers: 1 (d) 2 (a) 3 (c) 4 (c) 5 (d) 6 (c) 7 (d) 8 (a) 9 (d) 10 (a)