# A method for low stress, large volume, serial blood collection of cattle

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Collection of multiple large volume blood samples from cattle can be difficult to achieve without repeat venepuncture and significant restraint of the animal; both concerns for animal welfare (Hopster *et al.* 1999). Indwelling catheters mitigate the need for repeat venepuncture, but may be displaced by normal animal movements and behaviours, and require close handling of the animal increasing the likelihood of animal stress and operator harm (Zalkovic *et al.* 2001). This paper describes a method of remote manual sampling using an indwelling jugular catheter, a foam collar and 2.8 metres of extension set that can be employed for reduced animal stress, increased collection speed and increased collection reliability. The described technique has a reduced complexity compared to previously described methods (Kay and Grobbelaar 1985; Zalkovic *et al.* 2001) which reduces the likelihood of failure.

Steers destined for repeat blood sampling were recruited from a commercial beef enterprise and moved to the research facility three weeks prior to induction into the trial. All steers were acclimated to restraint via rope halters, and familiarised to the indoor facility, including feed and water stations. At induction to the trial, steers were restrained using a cattle crush and rope halter to give access to the left jugular vein. The catheter site (middle third of the neck) was clipped then prepared using 2% chlorhexidine in 70% ethanol. 1 ml of 2% lignocaine was injected subcutaneously over the catheterisation site and a small skin scalpel incision was made over lignocaine bleb. The jugular vein was occluded and a 140 mm x 14-gauge catheter (Angiocath; BD) was introduced in an anterograde direction. Correct placement was confirmed by observation of freely flowing blood from the stylet hub. The stylet was removed, and the catheter capped and secured to the skin using sutures. A 140 cm extension set (Heidelberg; B. Braun) was primed with heparinised saline (10 IU/ml) and attached to the secured catheter. The extension set was directed from the catheter site to the dorsal part of the neck and secured with sutures. A large S-flexure was introduced to the middle of the extension set and secured using three separate sutures to allow movement of the catheter if the extension set was pulled. The neck was then bandaged (Vet Wrap; 3M) to hold the extension set close to the skin. A foam collar, 250 mm wide and 50 mm thick, was cut to length for each steer and fitted around the neck, ensuring a firm fit while covering the catheterisation site. The ends of the foam collar were connected using cable ties and contact adhesive. The extension set was then fed through the foam collar at the dorsal extreme and the foam collar secured to the rope halter using cable ties, preventing slippage. Finally, a small satchel was affixed to the dorsal side of the foam collar and used to store the extension set during relocation of the cattle (Figure 1a & 1b).

The cattle were moved into the research facility and loosely cross-tied to their rope halter, in individual pens. This allowed the animals to eat, drink, stand and lie down, but prevented the animal from turning around. A remote sampling system was affixed to each stall. This consisted of a length of 100 cm x 15 mm PVC conduit and a primed 140 cm extension set passed through the final 70cm of the conduit. The extension set attached to the animal was connected to the remote sampling system. An appropriate length of elastic was attached to the end of the conduit, positioned above the animal's head, and connected to the gathered extension set using tape (Figure 1c). This allowed for extension and retraction of the extension set when the animal moved. A capped three-way valve, located outside of the crate, allowed for collection of blood using a 30ml syringe. At sampling, an initial 10ml of blood was drawn and discarded to remove the heparinised saline. Thereafter 20ml blood samples were drawn and transferred to vacutainers. After blood collection, the extension set was back flushed with 10ml of heparinised saline.

The methodology was employed in a pharmacokinetic trial involving 21 cattle. Serial blood sampling occurred over 48 hours, during which 441 blood sample collections were successful and no collections failed. In a small number of instances, animal movement lead to a kink, either underneath the collar or, or at entry point to the conduit. To rectify this, the collar was moved until the kink was corrected, or the steer was moved forward until the conduit kink resolved. The described methodology was successful in reducing human-animal interaction and increasing operator safety, while proving to be extremely reliable. This methodology may also be modified for use in other livestock species that can be restrained via halters for extended periods of time.

**References**

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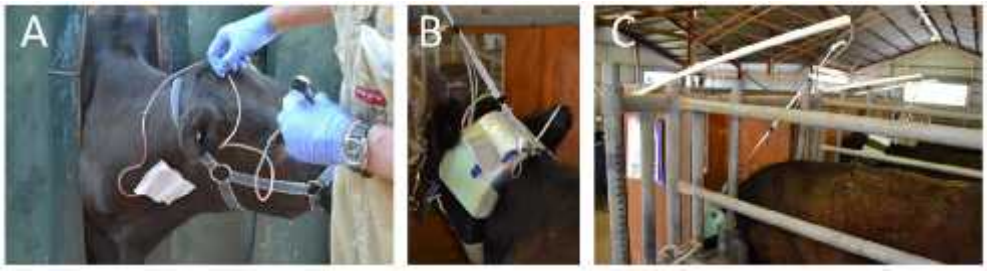


**Figure 1. Fabricated collar designed to ensure catheter security and remote venous sampling. A. 'S' bend extension and suture location. B. Steer fitted with foam neck collar to protect the cannulation site and extension set. C. Giving set to allow remote sampling for venous blood sample collection.**