Blood sampling

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Ellegaard Göttingen Minipigs

Introduction

The traditional method for sampling blood from a minipig is to place it in a V-trough in dorsal recumbency to have access to the blood vessels in the neck. This system is quite established and it allows for fast sampling with high turnover. Its limitation, however, becomes obvious when minipigs become larger or begin to struggle. Smaller animals can easily be put in and restrained in this position, but as minipig size and strength increase, more manpower is required to do the job. It is unnatural for any animal to be placed on its back, and as it makes them feel vulnerable with their underbelly exposed; it is likely that stress levels are quite high, too. This is not the only option for obtaining blood from a minipig, so in the spirit of refinement, we explored other options to reduce the stress and strain on the animal.

Sampling in a sling

Göttingen Minipigs usually adapt quite well to the sling and are quite happy to hang in it, so it was self-evident to investigate the possibilities of using this device. First we cut a hole in the hammock, around where the appropriate vessels could be placed when the minipig is in it. It was possible to take blood this way, but it was quite clear that a standard sling frame puts the technician in an awkward working position. This challenge was resolved using a height-adjustable frame. The minipig can be placed in the sling at a lower level, then raised so the technician can comfortably take the sample sitting down. Finding the right point for the needle through this hole proved to be the next challenge. The tip of the sternum was used as a landmark and could be palpated, but the entry site for the needle was not always placed over the hole and the minipig had to be repositioned. This was suboptimal, and an enlargement of the hole led to difficulties when positioning the minipig: they tended to stick their snout through it. Once properly positioned, the minipig's neck was not sufficiently extended as hanging loose skin made sampling challenging. We altered the design of the device to put the neck in a raised, extended position but it proved difficult to fit different sizes of minipigs. Ultimately, the simplest way turned out to be the lifting of the head by an assistant. The equipment was modified so the frame is relatively wide to prevent the insert, which is cut in a way that no longer supports the head, from hanging too much. After placing the minipig in the modified sling (lower position), the technician lifts the head and extends the neck. At the same time, the sling is raised to a position which allows the seated technician to take the sample comfortably. The sling is then lowered again, the minipig is removed and replaced with the next one.

Proof of principle

We tested this procedure in three setups:

1. A study where the collection of one sample of blood was required from 22 pigs (males and females) weighing 10–12 kg. The vacutainer system was applied. The pigs were naïve: they had never been used for blood sampling before and had never been in a sling before. They all accepted the sling very well and there was no problem lifting the head and basically no struggling was observed. The only challenge here was the technician, who was used to the traditional sampling method and had to adapt to the new approach of collecting samples with speed and confidence.
2. Two minipigs of about the same weight as above were sampled four times at 90-minute intervals. The minipigs were calm and sampling was effortless. No significant change in behaviour was observed from start to finish.

Photo 1: Modified sling

Photo 2: Holding the head of the minipig in raised sling

3. The next test was to sample pigs weighing more than 25 kg. It was easy enough to get them into the sling; it was decided that two persons should do this to reduce the burden of lifting a heavy minipig. After the animal was placed in the sling, only one technician was needed to hold the head up so the other could take the sample. The limitation (for staff) of these larger animals was felt when many animals had to go through the process or several vials of blood were taken which meant that the head had to be held for a prolonged period of time.

Conclusion

All the minipigs were easily placed in the sling and were quite relaxed. No signs of stress were observed, even during multiple sampling. Blood could be obtained from all pigs, but there were some technical challenges for technicians until they became accustomed to looking at the sampling site from a different angle. The time used to obtain one sample per minipig was longer than using the traditional method due to placing the animals in the sling and raising and lowering it. This disadvantage however is offset by the fact that only two technicians need to be present and no force is necessary to restrain the minipigs. The reduction of stress compared to the traditional technique was noticeable by mere observation; it is therefore a true refinement in the sense of the 3Rs. We did not test the system using very small minipigs, so we cannot report about a minimum size limit. The limitations we reached with the large minipigs might be overcome by further modification of the material.

Some further studies will be necessary to determine the shortest time interval possible and to determine the most practical solution for situations like multiple blood sampling to obtain a TK profile.

Crucial factors

It is worthwhile to give special attention to the following two topics:

First, it is imperative to take your time when placing the minipig in the sling. You need to give this procedure utmost attention when you do it the first time with the minipig because the outcome of this first attempt will affect all subsequent sling placements. Do it calmly, concentrate on what you are doing and observe the minipig's behaviour. Only one person should be in control and guide the minipig. Preferably train this in a quiet moment when no sampling is required, so you and the minipig are ready when it comes to the "crunch". You can learn this procedure by joining one of our Handling and Dosing courses or as a minimum by reading our Handling and Dosing guidelines (downloadable from our website).

Second, the actual sampling technique needs to be adapted to the new position. Do not despair or give up if you are unsuccessful the first time. Practice has shown that technicians who are less experienced in the traditional technique initially do better using this method, as they may not be as "hardwired" as experienced technicians.

Photo 3: Ready to sample

Photo 4: Taking a blood sample