NOTES

Evaluation of a New Microquantity Blood Collector

TERRY L. FOSTER,* LU'THER WINANS, JR., AND JOHN H. BREWER
Science Research Center, Hardin-Simmons University, Abilene, Texas 79601

Received for publication 1 November 1977

A new device for collecting small amounts of blood from laboratory animals offers distinct advantages over standard syringes during the collection of serum or plasma.

Numerous texts and manuals describe procedures for collecting blood samples from laboratory animals. These procedures generally include directions for (i) restraining the animal, (ii) using a syringe and needle for blood collection, (iii) removing the needle from the syringe, and (iv) transferring the blood to a tube for clot formation and centrifugation.

The object of this investigation was to evaluate a new microquantity blood collector (Micro Blood Collector) and serum separator tube (Hynson, Westcott & Dunning, Inc., Baltimore, Md., patent applied for). This polyethylene collector is shown in Fig. 1. It has a unit construction and is 57 mm high when fully assembled. The container is 38 mm high, with an outer diameter of 18 mm at the top and 14 mm at the bottom. It has a volume of 6 ml. This collector is designed to fit into standard 16-mm centrifuge shields to allow direct centrifugation without sample transfer. The upper portion is tooled to accept standard hypodermic needles and has a cap attached to provide a covering when the needle is removed. Because this investigation was for collecting blood samples and not for injection, it was not necessary to use sterile microquantity blood collectors. Although the unit is not heat sterilizable, other means of sterilization, such as ultraviolet light, should be satisfactory.

An excellent opportunity to evaluate this microquantity blood collector occurred during an investigation of a new brucellosis vaccine. In these experiments, small samples of serum were periodically required from more than 200 guinea pigs and 60 rabbits. Intracardiac bleeding of guinea pigs and marginal ear vein bleeding of rabbits were performed. Pictures of these procedures are shown in Fig. 2 and 3. For cardiac bleeding of guinea pigs, animals can be held with one hand and bled with the other. This procedure allows for the faster handling of large numbers of animals because one person can restrain

the animal without the use of a restraining board. Because of their size, rabbits must be restrained with a conventional restraining apparatus, and the ear must be prepared by routine methods.

When the animal is ready, the collector is

FIG. 1. Microquantity blood collector showing single-unit construction and needle attachment.

FIG. 2. Collecting a blood sample from the heart of a guinea pig.

FIG. 3. Collecting a blood sample from the marginal ear vein of a rabbit.

FIG. 4. Clot retraction after 2 h at room temperature in (A) alkylene glycol-treated, (B) Siliclad-treated, and (C) untreated microquantity blood collectors.

squeezed to expel the air, the needle is inserted into the heart or vein, and the pressure is released, allowing blood to flow into the collector. Even though the collector has a 6-ml capacity, about 3 ml is the most that can be collected effectively.

Blood clotting occurs normally in the microquantity blood collectors, but unless the polyethylene surface is wetted, the clot fails to retract from the walls of the collector. Solutions of alkylene glycol (5% aqueous solution) and Siliclad (1% aqueous solution; Clay Adams, Div. of Becton, Dickinson & Co., Rutherford, N.J.) were used to treat the collector surfaces to allow proper clot retraction. After contact for 1 min, the collectors were emptied and then turned upside down to dry without washing off excess reagent solution. A comparison was made with treated and untreated collectors by observing clot retraction at 2 h and then overnight. Figure 4 shows examples of clot retraction after 2 h. All untreated collectors showed early clots, no retraction, and hemolysis. All of the alkylene glycol-treated collectors showed extensive clot retraction from the wall, erythrocyte entrapment, and a straw-colored serum around and above the clot. The Siliclad-treated collectors showed incomplete clot retraction and hemolysis of all samples.

To determine optimal centrifugation times, blood samples were obtained in treated (alkylene glycol and Siliclad) and untreated collectors and centrifuged at 2,500 rpm. Serum separation was observed every 10 min for 30 min. Results with alkylene glycol-treated collectors were superior to those with the other two procedures. Not only was serum separation better, but it was also faster, being complete after 20 min of centrifugation. Therefore, glycol was used to treat

all collectors used in our study.

Plasma can be collected as easily as serum when the former is required. Blood was collected in microquantity blood collectors into which 0.1 ml of a 10% solution of sodium citrate had been added. A comparison was made of untreated and alkylene glycol-treated collectors, using 2 to 3 ml of collected blood. After centrifugation for 10 min at 2,500 rpm, good separation was achieved in both sets of collectors, and there were no apparent differences in compaction. In the larger samples, plasma separation was complete after 20 min of centrifugation.

Microquantity blood collectors have been found to be superior in collecting small amounts of blood from animals when compared with a standard syringe. The free-standing, unbreakable collector allows free use of one hand during the collecting process so that a single individual performing cardiac puncture need not restrain the animal. The one-piece construction insures no loose parts. The container can be immediately capped for centrifugation. Because centrifugation can be performed directly in the collector, there is no need to transfer the sample to another tube. Accidental spillage and erythrocyte hemolysis are thus reduced.

The alkylene glycol-treated collectors gave excellent clot retraction and serum separation. Small amounts of alkylene glycol will not interfere with most analytical procedures. It is also possible to pretreat the collector with an anticoagulant if the investigation requires the collection of plasma. No disadvantages of the microquantity blood collectors were encountered in this investigation, and these new devices were found to save time and be very practical for the collection and centrifugation of small amounts of blood.