SIMPLIFIED METHODS AND EQUIPMENT USED IN SEPARATION OF URINE FROM FECES ELIMINATED BY HEIFERS AND BY STEERS

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There is little information available on methods of separating the urine and feces in balance trials with mature cows and heifers. Forbes et al. (1937) and Briggs and Gallup (1949) reviewed the earlier literature and described acceptable methods for use with steers, involving adaptable commercial separators.

The complicated and expensive facilities required for balance trials with steers and heifers have heretofore limited the use of these animals in metabolism experimentation. This paper described an economical and dependable method for holding steers and heifers and simplified equipment that is adequate for the complete separation of the urine and feces eliminated by these experimental animals during short or extended balance studies.

Metabolism Unit

The details of the metabolism stall and adjustable feed box with stanchion feces container and splatter shield are shown in figure 1. This unit may be adaptable to either heifers or steers. The adjustable box is placed inside one end of the stall and is secured to each side by means of a 4-in. clamp. The feces collection box is made of No. 20 sheet metal. A shield is placed around 3 sides of the box to localize any splattering of feces. A 5-gal. carboy is located by the side of the feces box for the collection of urine from heifers and underneath the stand for collection of urine from steers. Ferrox — one or more coats is applied to the cleaned floor area under the animal’s feet to prevent slipping.

Method of Collecting Urine From Heifers

The urine conduit for heifers is constructed out of a 3-in. seamless rubber tube, approximately 4 ft. long (figures 2 and 3). It is prepared for use as indicated in figure 2, by making a 3½-5-in. incision along one side of the folded edge of one end of the tube and the terminal point of the incision is reinforced with a cold rubber patch (figure 2A-B). Wire rings attached, by cold rubber patches, to the outside of the upper portion of the tube have been found helpful in holding the tube open to permit a free flow.

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2 Ferrox, an abrasive paint—available from Am. Abrasive Metal Co., Irvington, N.J.
3 "Gooch" tubing available from B. F. Goodrich Rubber Company, Akron, Ohio.
of urine (figure 2B). A thin piece of strap iron about 1 in. wide and 8 in. long, attached along the top outside end of the rubber tube by means of small screw clamps (figure 2D), may be bent inward near the center to assist in keeping the tube in position between the anus and vulva.

The split end of this conduit is placed around the vulva and secured to the heifer by means of 3 pairs of 2-in. webbing straps 10–12 in. in length (figure 2E). These straps are attached to the rubber conduit by means of open-sided clamps and to the cow's rump by means of branding cement.4 The top pair of webbing straps (figure 2E) give vertical support to the tube and run from a point just above the pin bones to a point midway between the hip bones and the center of the rump. The lower pair of straps (figure 2E) serve to stretch the rubber to each side and extend from a point just below the pin bones to a point 4–6 in. below the hips. The additional 10-in. straps (figure 2E) are attached below just the vulva to hold the lower side of the tube in position. Final adjustments are made to prevent any contamination of the urine with fecal material by cementing the rubber conduit

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4 Branding cement obtained from the Nebraska Salesbook Co., P. O. Box 548, Lincoln, Neb.
to the section of skin between the anus and vulva (figure 3). This requires thorough preparatory cleansing with ether to remove the oily secretions. The

Figure 2. The cow urine conduit showing details of construction, assimilation and attachments.

Figure 3. The heifer urine conduit in position demonstrating attachments.
conduit is given additional support by means of a small cord attached to the side of the stand at the level of the heifer’s back. The bottom of the tube is held in the carboy by a small weight sufficient to cause it to slide back when it is shifted by the animal’s movements (figure 4). A 2 in. × 6 in. board 4 ft. long is hinged at the bottom to the back side of the stand and secured at top by an adjustable board arrangement (figure 4). It can be

adjusted to prevent excess lateral movement of the rear end of the animal. The heifer’s tail is prevented from interfering with the clamps which attach the conduit to the supporting straps by means of a light weight at the end of a string that is tied to the switch and passed through a small suspended pulley (figure 4).

This procedure has worked satisfactorily during the past two years for collection periods of 14 days. The method of attaching the urine conduit has caused little inconvenience or discomfort to the heifer. The straps may be removed at any time with a fat solvent.

**Method of Collecting Urine from Steers**

A simple and satisfactory funnel for the collection of urine from steers is constructed as illustrated in figure 5. A ring of desired diameter is made
from steel wire, covered with rubber tubing, and the ends of the ring are braised or taped together (figure 5A). The necessary circumference is calculated and the body of the funnel is then measured and cut from thin rubber sheeting in two or three identical pieces. Sufficient overlap is desirable for gluing the sides together. A 3-inch opening is allowed at the bottom for the attachment of a seamless rubber tube neck for conducting the urine to a 5-gal. carboy beneath the stand. The body of the funnel is then pulled through and the sides turned down over the wire ring and firmly secured to the outside with rubber glue. To support this funnel in position beneath

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**STEER URINAL**

Figure 5. The steer urinal, showing funnel construction and supporting attachments for securing urinal in position. The protective canvas apron protects the urinal from the animal's rear feet.

the steer, another heavy wire ring is constructed 1-in. smaller in diameter than the one forming the top of the funnel (figure 5B). The funnel is then placed in this supporting ring and held over the penis area by one or more 2-in. webbing straps which are attached to the supporting ring and pass up the side and over the back of the steer and buckle or snap to the part of the strap which is attached to the opposite side of the ring. Branding cement is applied beneath the webbing strap on each side of the steer 6 in. from the supporting ring to prevent lateral movement of the funnel. Additional security measures are taken by attaching two straps that are 2 in. wide and 8 in. long to the front and rear portions of the supporting ring and to the belly of the steer with branding cement (figure 6). This harness arrangement makes possible the removal of the funnel from the supporting ring at will, by releasing the back strap and passing the funnel laterally through the supporting ring from either side of the animal.

This soft rubber may be easily torn by the rear feet of the animal, but can be satisfactorily protected by means of a heavy canvas apron supported
between the funnel and the animal's rear feet (figure 5C). The apron is constructed by sewing in a window sash cord, of sufficient length to tie over the animal's back, at the top of a 20 in. × 20 in. piece of heavy canvas. The bottom end of the apron is made secure by tacking it beneath a thin lath across the floor of the stand immediately behind the opening through which the funnel neck passes. The apron is then pulled into position against the animal's belly, between his feet and the funnel, by passing the rope ends up both sides of the animal and tying them above the loin region (figure 6).

![Figure 6. The steer urinal in position, showing attachments, and protective canvas apron.](image)

This provides adequate protection for the funnel without discomfort to the animal in the prone or standing position.

**Summary**

The construction of a metabolism unit of simple design and operation is described which provides for the quantitative separation and collection of feces and urine eliminated by steers and heifers. The unit including metabolism stall, equipment construction and operation is illustrated by labelled diagrams and photographs.

**Literature Cited**
