

A device for quantitative urine collection from male sheep in balance trials

J. Kowalczyk, Beata Skiba, Z. Buczkowski and Barbara Kowalik

*The Kielanowski Institute of Animal Physiology and Nutrition,
Polish Academy of Sciences
05-110 Jabłonna, Poland*

(Received 6 May 1996; accepted 9 July 1996)

ABSTRACT

A simple device for quantitative urine collection from male sheep kept in metabolic cages is described. The device consists of a modified funnel-urinal fixed to the body of the animal. The urinal is made of: a soft plastic foil internal funnel that collects the urine; an external strong nylon tissue funnel to protect from mechanical damage; a plastic ring joining both funnels and ties fixing the funnels to the body; a connector joining the funnels with soft plastic flexible tube draining the excreted urine into the collection container. The device performed satisfactorily in numerous balance type experiments. An advantage of the described method is that it uses a simple, easily made device and prevents urine loss during collection. The urine is free of contamination with faeces and feed.

KEY WORDS: urine collection, male sheep

INTRODUCTION

Quantitative collection of urine in nitrogen, mineral, allantoin or other metabolite balance trials for male sheep is an integral part of many investigations. It is usually carried out using the classical method in metabolic cages with a perforated steel sheet or wooden wire-netting floor, described in detail in numerous papers by, e.g. Horn et al. (1954), Morrison (1957), Harris (1970), Watts (1976), Smith (1979). The disadvantage of this method is that urine is often splashed around the floor and usually contaminated with faeces and feeds and difficult to collect quantitatively. These negative factors are hard to eliminate in practice and entail errors in estimation of the amount of components excreted in

urine. This may lead to erroneous estimations of components excreted in urine and influence the reliability of the balance value. Another method of urine collection from male sheep or cattle is based on fixing different types of urinal funnels covering the penis of the animal as described by Ervin et al. (1959), Bredon et al. (1961), Wainman and Peterson (1963), Colebrook and Black (1980). Funnels fixed to the body were made of different materials such as tarpaulin or rubber. Materials like these were sometimes uncomfortable for animals, provoking chafing and difficult to keep fixed in the proper position (Ziołowska, 1969).

The objective of this work was to elaborate a simple but efficient device for quantitative urine collection without contamination with faeces and feeds.

MATERIAL AND METHODS

Description of device

A simple device was constructed and applied for urine collection from male sheep kept in metabolic cages as demonstrated on Figure 1. The device consists of a soft internal funnel-shaped sleeve about 20 cm long (a) made of heat-fused (about 0.1-0.2 mm) plastic foil to collect excreted urine and prevent urine leakage (Figure 2). This internal sleeve is covered by an external sleeve to protect from mechanical damage. This sleeve has a shape similar to the internal sleeve and is made of a strong cloth, e.g. nylon tissue (b). Both sleeves are fixed by winding the upper edges around a plastic ring of about 12 cm diameter (c) and with 4 tapes (d) fastening the device to the body. Both internal and external lower ends of the collecting sleeves are connected with a clamp (e) to a short plastic connector (f) with soft, flexible plastic tubing (g) draining urine into a container located under the cage floor. The hole in the floor through which the tube passes has a longitudinal opening to avoid damage to the tube by the moving animal and permits urine collection from an animal in any position. The device covering the penis is fixed to the body by the tapes tied over the back of the animal.

Comparison urine cleanness

Six weathers of about 34 kg body weight fed the same diet were placed in metabolic cages and daily urine with or without addition of sulphuric acid was collected quantitatively for 3 days using classic methods from 3 weathers and using the described device from another 3 animals. The urine was filtered and the dry matter of the particulates retained on the filter was measured. Bacteria number was counted in non-acidified urine.

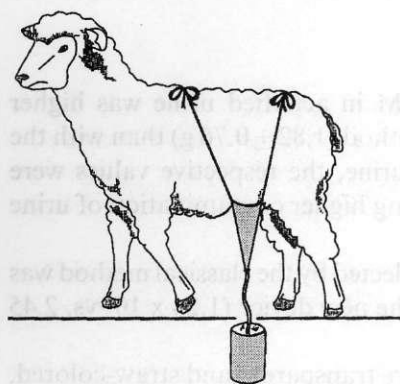


Figure 1. Fixing of device to the body

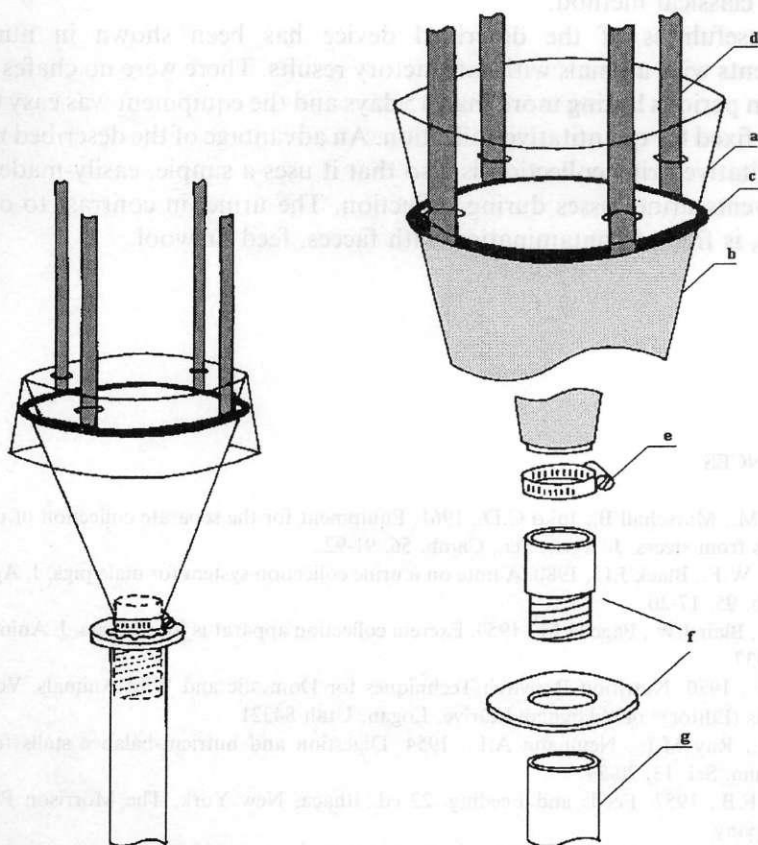


Figure 2. Device construction: a – internal thin plastic foil sleeve; b – external protective sleeve; c – plastic ring; d – tapes fixing device; e – clamp; f – connector; g – flexible plastic tube

RESULTS AND DISCUSSION

The average daily amount of insoluble DM in acidified urine was higher ($P \leq 0.01$) in urine collected using the classic method (1.82 ± 0.76 g) than with the tested device (0.72 ± 0.25 g); in non-acidified urine, the respective values were 1.98 ± 0.47 and 0.41 ± 0.20 g ($P \leq 0.01$) indicating higher contamination of urine collected classically.

The bacteria count in non-acidified urine collected by the classical method was higher ($P \leq 0.01$) than in urine collected with the new device (1.24×10^5 vs. 2.45×10^5 ml⁻¹).

The urine collected using the device was more transparent and straw-colored, whereas urine collected with the classical method was dark brown. These results indicate that urine collected using the tested method was cleaner than collected with the classical method.

The usefulness of the described device has been shown in numerous experiments with animals with satisfactory results. There were no chafes during collection periods lasting more than 15 days and the equipment was easy to keep properly fixed for quantitative collection. An advantage of the described method of quantitative urine collection is also that it uses a simple, easily-made device and prevents urine losses during collection. The urine, in contrast to classical methods, is free of contamination with faeces, feed or wool.

REFERENCES

- Bredon R.M., Marschall B., Juko C.D., 1961. Equipment for the separate collection of urine and faeces from steers. *J. Agric. Sci., Camb.* 56, 91-92
- Colebrook W.F., Black J.L., 1980. A note on a urine collection system for male pigs. *J. Agric. Sci., Camb.* 95, 17-20
- Erwin E.S., Blair J.W., Page H.M., 1959. Excreta collection apparatus for wethers. *J. Anim. Sci.* 18, 935-937
- Harris L.E., 1970. *Nutrition Research Techniques for Domestic and Wild Animals*. Vol.1. L.E. Harris (Editor). 1408 Highland Drive, Logan, Utah 84321
- Horn L.H., Ray M.L., Neumann A.L., 1954. Digestion and nutrient-balance stalls for steers. *J. Anim. Sci.* 13, 20-24
- Morrison F.B., 1957. *Feeds and Feeding*. 22 ed. Ithaca, New York, The Morrison Publishing Company
- Smith T., 1979. The collection of faeces and urine from steers. *J. Sci. Food Agric.* 30, 215-217
- Treła S., Krefłowska M., 1963. A device for the collection of excrements from males (in Polish). *Zesz. nauk WSR, Kraków, Ser. Zoot.* 4, 29-32

- Wainman F.W., Peterson D., 1963. A note on the collection of urine from male cattle and sheep. *J. Agric. Sci., Camb.* 61, 253-254
- Watts P.R., 1976. A system for automatic collection and removal of urine from male farm animals. *Brit. J. Nutr.* 36, 295-297
- Ziolecka A., 1969. Investigations on the determination of digestibility in ruminants (in Polish). *Rocz. Nauk rol., Ser. D – Monography* 127, pp. 1-153

STRESZCZENIE

Urządzenie do ilościowego zbierania moczu od tryków i skopów w doświadczeniach bilansowych

Opisano proste urządzenie do ilościowego zbierania moczu od tryków i skopów utrzymywanych w klatkach metabolicznych w doświadczeniach bilansowych. Urządzenie umocowane jest taśmami na ciele zwierzęcia i składa się z lekkiego rękawa wewnętrznego wykonanego z cienkiej, miękkiej folii plastikowej oraz podobnego ochronnego rękawa zewnętrznego wykonanego z mocnej tkaniny nylonowej. Obydwa lekkie rękawy umocowane są na obręcz z pręta plastikowego (\varnothing 4 mm) z przytwierdzonymi taśmami mocującymi. Dolna, węższa część rękawa połączona jest łącznikiem z elastycznym węzłem plastikowym odprowadzającym mocz do zbiornika.

Skuteczność działania urządzenia sprawdzono w doświadczeniach bilansowych. Jest ono proste w wykonaniu, zapobiega stratom moczu podczas jego zbierania, a mocz jest wolny od zanieczyszczeń kałem, rozsypywanej paszy lub sierści.