

Submitted to Journal of Applied
Physiology

UC-48,37, and 38
LBL-6488
Preprint c.1

SNAP HARNESS FOR BIOTELEMETRY FROM RODENTS

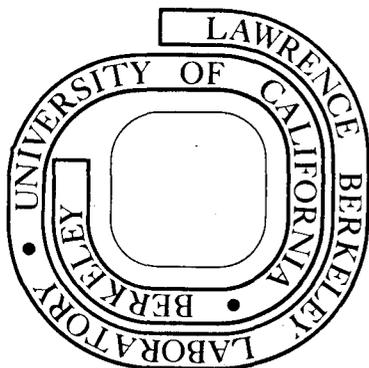
Bogdan Roman and Edward L. Bennett

June 1977

Prepared for the U. S. Energy Research and
Development Administration under Contract W-7405-ENG-48

For Reference

Not to be taken from this room



LBL-6488
c.1

DISCLAIMER

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.

Snap Harness for Biotelemetry from Rodents

Bogdan Roman and Edward L. Bennett

Laboratory of Chemical Biodynamics

Lawrence Berkeley Laboratory

University of California

Berkeley, CA 94720

Running head: Snap Harness for Biotelemetry

Mail proofs to:

Dr. Edward L. Bennett

Laboratory of Chemical Biodynamics

Lawrence Berkeley Laboratory

University of California

Berkeley, CA 94720

Roman, Bogdan and Edward L. Bennett. Snap Harness for Biotelemetry from Rodents. J. App. Physiol.

A snap harness is described which incorporates a commercially built 5g FM transmitter (FM-110-E3)¹ for telemetering biopotentials in rats and other small rodents. The harness allows the stable recording of a variety of biopotentials from unanesthetized freely moving animals for experimental periods of a few weeks. There is the added advantage and flexibility of easily snapping the harness on and off during and after experimental periods, permitting recordings from a number of animals with the same transmitter.

Telemetry; unrestrained rats.

Conventional cable transmission methods for recording biopotentials prove inadequate due to their physical restriction of activity, as well as influencing the animal's behavior(1). The necessity of unrestricted behavior called for the telemetering of the biopotentials. However, in small rodents such as the rat, the method of transmitter attachment is not only critical for eliminating movement artifact but important in avoiding possible damage to the transmitter unit. The snap harness described has been used for over two years to record circadian EKG, EGG, and respiration (2).

Although it would have been easier to attach the transmitter directly onto the skull, the grooming behavior of rats would have introduced noise artifacts as well as possible destruction of the radio unit. The use of straps tends to restrict movement, annoy the animal, and promote lesions. In our initial experiments we tried using a harness described by Rubin and Brown (3) which was constructed from a pair of "0" rings sewn to waistband elastic. The rats spent much of their time chewing the "0" rings and within a few days tore off the harness. In addition to preventing the animal from reaching the transmitter, the snap harness provides the stability for decreasing the relative motion of the transmitter; avoiding further complications in signal analysis. The transmitter together with the 10.7 g. snap harness has a total weight of 16.6 g.

The system consists of three basic parts: a subcutaneously implanted support, a surface socket base, and a stud snap pedestal which holds the transmitter.

Construction

The stud pedestal (Fig. 1) was hand-filed from a small block (2.3 x 2.3 x 1.9 cm) of clear plexiglass to the appropriate size and shape. Before shaping, two holes were drilled on one side of the block which matched the distance between the input terminals of individual transmitters to give a tight fit. Transmitters used in our studies had slight differences in distance between input terminals. The holes in the pedestal allow a pair of short (8.6 cm) auxiliary electrodes to connect the input terminals of the transmitter with the subcutaneous sensory electrodes. At the base of the pedestal a pair of stud snaps (No. 16) is cemented. If desired, one can prepare a mold from the original plexiglass model and make a number of these pedestals by using dental cement. Dental cement has an advantage over epoxy resins because it gives a more even matrix with fewer air bubbles. In addition, it sets more quickly and is light and durable. In our experiments, the use of pedestals made from dental cement permitted the metal studs to be readily attached by simply using more dental cement. One side of the pedestal has a vertical face which is drilled and tapped to receive a 2-56 brass flathead machine screw. This side is used to screw on a shield which serves to protect the batteries of the transmitter as well as give additional support to the radio unit. The shield (3.2 x 0.6 x 1.3 cm) is cut from plexiglass and drilled at one end in order that it can be easily screwed to the threaded pedestal. To provide a snug fit over the batteries, two holes (1.0 x 0.4 cm) are drilled on the inner face of the shield. The surface socket base is constructed by taking fiberglass screen (5.0 x 2.5 cm) and folding it in half to give a 2.5 cm square. On top of the fiberglass screen is placed a small piece (2.3 x 1.3 cm) of flexoglass screen. The fiberglass and flexoglass screens are held together

by applying a pair of socket snaps with Gripper² pliers. Four holes are made in the fiberglass screen to accommodate four subcutaneous nylon screws. The implanted support is made of 0.5 mm thick teflon, which is lighter and more flexible than stainless steel, and is based on a design by Davis(4). The support measures 2.5 x 2.0 cm and has holes in each corner for nylon screws³ (0.5 and, 2-56) which are securely kept in place by matching hex nuts³ (2-56). The sharp corners are cut and curved. Additional elliptical cuts are made on each side in order to reduce the weight of the support.

Surgical Procedure

To implant the subcutaneous support, a 4 cm incision is made on the dorsal midline of the animal, posterior to the scapular. This position was found to be advantageous since it prevents the rat from reaching the transmitter. The skin is then separated from the underlying tissue by blunt dissection about 5 cm away from each margin of the incision. Puncture wounds are made through the skin, two on each side of the incision through which the screws can pass. The teflon support along with its screws is laid under the skin, the screws are run through the puncture wounds, and the incision is closed. It is important that the sensory electrodes make their exit at the posterior end of the incision before it is closed. The resultant four protruding nylon screws then pass through the fiberglass screen base which is held down by a second set of hex nuts and washers.

Acknowledgements

The expertise and construction assistance of Mr. Dick O'Brian is gratefully acknowledged. This research was supported by the Division of Biomedical and Environmental Research of the U.S. Energy Research and Development Administration.

Footnotes

¹Narco Bio-Systems, Inc., Houston, Texas.

²Scovill Mfg. Co., Spartanbury, South Carolina 29301.

³Product Components Corp., 30 Lorraine Ave., Mount Vernon, N.Y. 10553.

References

1. Haupt, R. The sleep-wake behavior of rats. A comparison of cable and telemetric registrations. In: Sleep, Physiology, Biochemistry, Psychology, Pharmacology, Clinical Implications, edited by Koella and Levin. Basel: Karger, 1973, p. 285-289.
2. Grant, C. V., R. D. Thompson, and G. W. Corner, Determining avian ECG and respiration with a single-channel radio transmitter. J. App. Physiol. 30(2): 302-303. 1971.
3. Rubin, H. B., and H. J. Brown. A harness and electrode connection for rats. J. Exp. Anal. Behav. 18: 384-387, 1972.
4. Davis, J. D. A method for chronic intravenous infusion in freely moving rats. J. Exp. Anal. Behav. 9(41): 384-387. 1966.

Figure Legends

Figure 1. Snap harness and its component parts for attaching transmitter.

(1.28 x 1.28 x 2.21cm)

Transmitter

Stud Pedestal

.35 dia.

0.4cm

1cm dia.

.95cm

metal screw (2-56)

Shield

(3.2 x 0.6 x 1.3 cm)

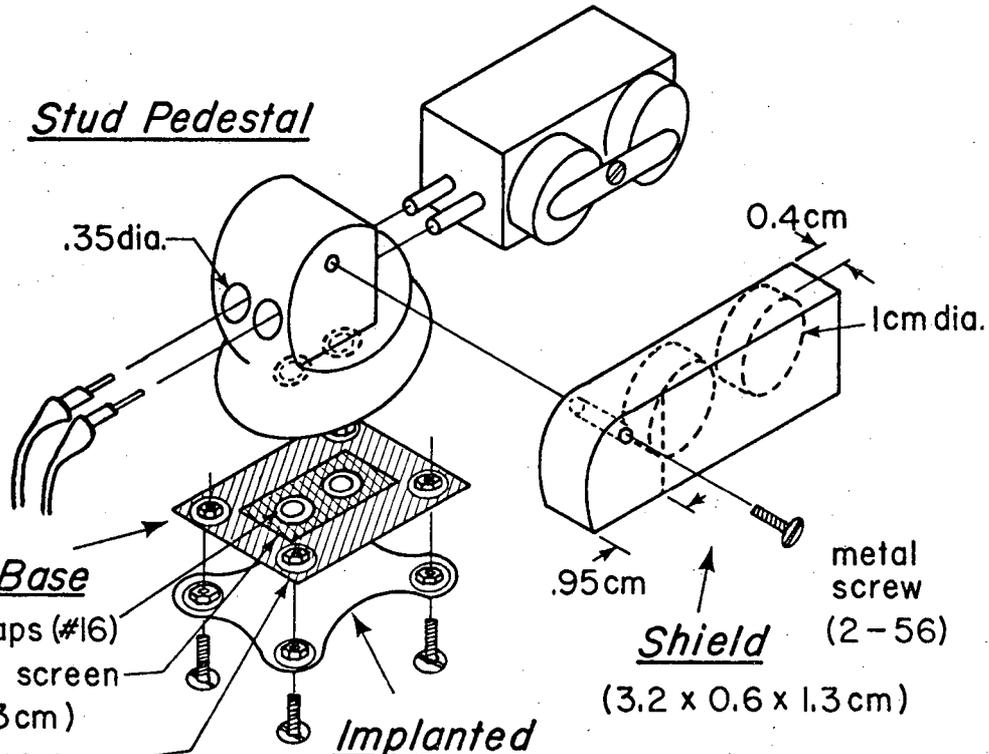
Snap Base

female snaps (#16)
"flexoglass" screen
(2.3 x 1.3cm)
fiberglass screen
(2.5cm sq)

Implanted Support

(2.5 x 2.0cm)

nylon nut, screw, washer (2-56)



XBL 775-4405

Fig. 1
Roman & Bennett

This report was done with support from the United States Energy Research and Development Administration. Any conclusions or opinions expressed in this report represent solely those of the author(s) and not necessarily those of The Regents of the University of California, the Lawrence Berkeley Laboratory or the United States Energy Research and Development Administration.

TECHNICAL INFORMATION DIVISION
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA 94720