TECHNICAL NOTE

A SHOCK-DELIVERY SYSTEM FOR NEWLY HATCHED PRECOCIAL BIRDS

The delivery of electrical shock to newly hatched chicks or ducklings has posed a major problem. While several shock-delivery systems for use with various species of birds have been described (e.g., Azrin, 1959; Hoffman, 1960), their use with smaller, newly hatched precocial birds is precluded for several reasons. For one, any system that exerts appreciable "pull" on the subject (such as might be produced by a coiled power cord or retractor line) would literally lift a newly hatched precocial bird off the ground and leave it dangling. The traditional harness or bead-chain connectors cannot be used because the bird's rapid growth would necessitate frequent adjustments, and this would entail more

extra-experimental stimulation than would be desirable with young, otherwise inexperienced organisms. For these reasons, we have developed a shock-delivery system that is specifically designed for immature precocial birds, although its use need not be so restricted.

Electrical shock (produced by a constant current generator) is administered through a pair of permanently fastened wingbands. Each band is an 8-cm length of conductive chain wrapped around the base of each wing. Fourteen carat, *double-linked* chain (six double links per centimeter) has been found to work well. Such chain is ordinarily used to hold locket and pendants and is available from any local jeweler.

Fig. 1. The shock-delivery system designed for use with precocial birds. The left portion of the figure illustrates the basic components of the system (see text for details) and the right portion details the connector and wingband arrangement.

While the chain is relatively expensive (approximately \$5.00 for a 16-cm length), its use is recommended because it is lightweight, flexible, highly conductive, and quite resistant to oxidation and corrosion.

Figure 1 illustrates the system used with newly hatched ducklings. To construct a set of wingbands, an 8-cm length of chain is permanently tied to each end of a 4-cm length of monofilament nylon (4-lb test). The nylon provides an insulated connection between the wingbands, permitting them to be loosely wrapped without falling off. To fasten the wingbands, the nylon line is placed across the bird's back and the free end of each chain is wrapped three times around the base of a wing and twisted back on itself (see Figure 1). Finally, the twisted segment is rolled into a small (3 mm diameter) lump of plastic putty (Eberhardt Faber Stay-fast Plastic Adhesive). The use of plastic adhesive is important because it permits rapid application of the bands and makes adjustments for growth relatively simple. Once applied, the wingbands are worn continuously. At the start of each experimental session, the bird is connected to the shock system through a pair of spring-loaded Pomona Mini-Test Clips (Mfg. type #3780). The wire from the clips (two conductor, 24 AWG) is connected to a multiple-circuit mercury commutator (Scientific Prototype Mfg. Corp., Model MC4), which allows the shock delivery system to rotate with the bird. A simple counterweight mechanism (made of a balsa-wood stick and an appropriate weight)

takes up slack in the connecting wires, preventing excess wire (needed if the subject is unrestrained in a large apparatus) from tangling around the bird's legs. Since the counterweight mechanism can be adjusted to balance exactly the weight of the subject, and since it is constructed of balsa wood and hence has low mass, this system exerts little pull on the subject and does not impair its movements.

The resistance of the assembly when a duckling is connected is between 25,000 and 35,000 ohms. In a recent series of experiments in our laboratory, a total of 10,000 shocks (ranging from 0.5 to 1.0 mA intensity, 300 msec duration) were administered using this system. Throughout most of this work, subjects were monitored on closed-circuit TV. We never saw an instance in which a scheduled shock delivery failed to yield an easily discerned overt reaction.

REFERENCES

- Azrin, N. H. A technique for delivering shock to pigeons. *Journal of the Experimental Analysis of Behavior*, 1959, 2, 161-163.
- Hoffman, H. S. A flexible connector for delivering shock to pigeons. *Journal of the Experimental Analysis of Behavior*, 1960, 3, 330.

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