

A Biopsy Technique to Obtain Tissue for Pesticide Residue Analysis from Falconiform Birds*

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Biopsies have been utilized in collecting tissue for pesticide residue analyses from monkeys (1), cattle (2), and peregrine falcons (*Falcon peregrinus*) (3). The biopsy described here was developed to enable investigators to sample persistent pesticide residue levels present in various raptor species on a study area without sacrificing birds and, thus, altering the composition of the population under observation.

Procedure

To collect a small sample of muscle and/or fat, the bird was anesthetized or firmly restrained. Nestlings showed little sign of pain and did not require anesthesia, but I had to anesthetize older hawks (4). To restrain a nestling, a large cloth was placed over its head and the wings were folded against the body. After the wings were secure, the legs were held and the feet fitted into a small leather sack. Once the talons were rendered useless, the bird was placed on its back. The cloth remained over the nestling's head to keep it calm.

To prepare for surgery, the feathers of the keel region were wetted with alcohol from a small squeeze bottle. The feathers were spread to expose the median apertium. The exposed skin was cleaned with a small disposable alcohol sponge. With a sharp scalpel a 25 mm anterior-posterior incision was made in the skin to one side of the keel ridge just posterior to the apex. A second incision 4 mm deep and 20 mm long was made in the pectoralis muscle. The muscle and/or fat tissue

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at the anterior end of the incision was grasped with pointed forceps. A third incision of the same length was made in the muscle parallel to the first. This third incision was angled and a small triangular strip of tissue removed. This procedure is illustrated in Figure 1. The measurements given here are for a juvenile golden eagle (Aquila chrysaetos).

The average weight of tissue samples taken from red-tailed hawks (Buteo jamaicensis) and golden eagles were .05 g and .3 g respectively.

After the tissue sample was obtained, it was inserted into a clean vial and frozen.

The wound was not sutured, but left open to drain. It was, however, sprayed with an aerosol topical calloidin dressing. During experimental tests, unsutured wounds healed faster and with less infection than sutured wounds. Complete healing required about ten days. When called, manned experimental hawks would readily fly to the gloved fist the next day.

If bleeding occurred, it was stopped by placing a small disposable alcohol sponge on the wound and applying fingertip pressure for a few minutes.

Results and Discussion

During the development of the technique, more than 50 small samples of muscle were collected from four raptor species: golden eagle, red-tailed hawk, Swainson's hawk (Buteo swainsoni), and marsh hawk (Circus cyaneus). Biopsies were repeated at various intervals on some individuals and a series of tissue samples was obtained. In all cases the wounds healed without complication.

Chemical analysis data from breast muscle biopsies and entire breast muscles taken from fledgling red-tailed hawks fed DDT as nestlings at the rate of 20 mg DDT/kg body wt every 4 days for 40 days are compared in Table 1.

Generally the values obtained from the biopsies were more variable than those obtained from the whole muscles. On the average biopsies contained more extractable lipids than the whole muscle samples. These results indicate that the chlorinated hydrocarbon residues found in muscle samples which were taken via the biopsy should be viewed as estimates of the contents of the entire tissue rather than as absolute values.

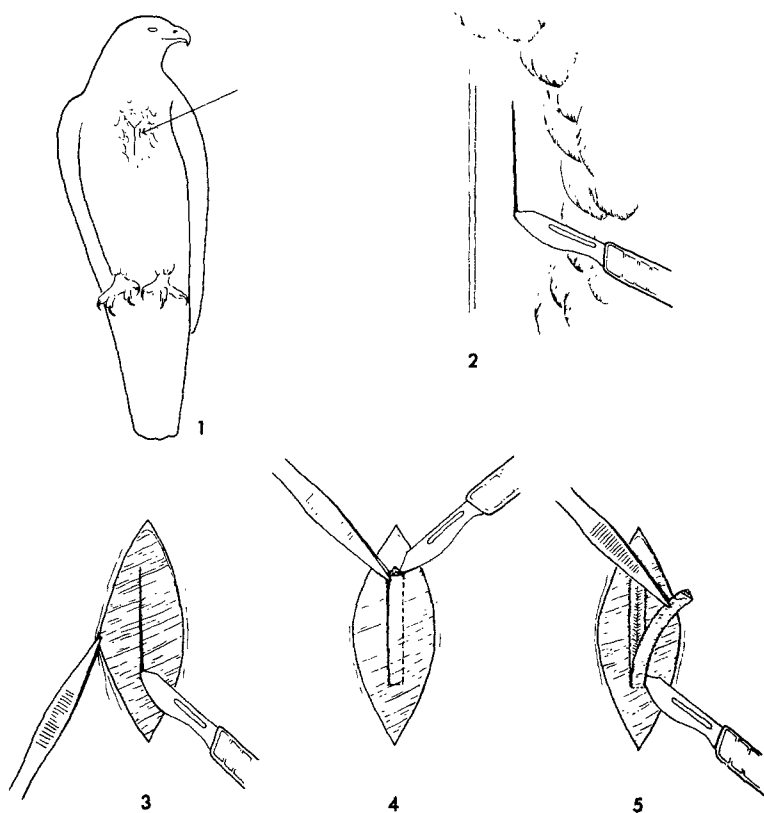


Figure 1. The biopsy: (1) the site where the biopsy was performed; (2) the initial incision in the skin; (3) the first incision in the pectoralis muscle; (4) and (5) a small triangular strip of muscle and fat was removed for residue analysis.

TABLE 1

Water, Lipid, and Organochlorine Insecticide Residue in
Whole Pectoralis Muscles and Small Muscle Samples
(biopsies) Taken From Pectoralis Muscles of
Fledgling Red-tailed Hawks

| Tissue collection | No. of speci- mens | Mean and range | | | |
|----------------------|--------------------------|-------------------|-----------------|------------------|------------------|
| | | % | % | Wet weight (ppm) | |
| | | | | DDE | DDD+ DDT |
| Whole muscle | 3 | 72.00 | 1.09 | 10.17 | 11.33 |
| | | (70.30- 73.12) | (.65- 1.65) | (9.70- 10.60) | (9.14- 15.40) |
| Biopsy | 5 | 74.41 | 3.47 | 9.19 | 8.55 |
| | | (71.42- 77.73) | (1.13- 8.16) | (1.04- 14.00) | (6.34- 11.45) |

References

1. Durham, W. F., Ortega, P., Hayes, W. S., Jr.,
Arch. Int. Pharmacodyn. 141, 111 (1963).
2. Radeleff, R. D., Vet. Med. 45, 175 (1950).
3. Enderson, J. H., and Berger, D. D., Condor. 70,
149 (1968).
4. Seidensticker, J. C., IV, and Reynolds, H. V., III,
J. Am. Vet. Med. Assoc. 155, 1044 (1969).