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Source: Journal of Wildlife Diseases, 15(1) : 125-126

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-15.1.125

WET VERSUS DRY WEIGHTS FOR HEAVY METAL TOXICITY DETERMINATIONS IN DUCK LIVER

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Abstract: Determinations for heavy metals in duck liver using wet weight in lieu of dry weight produced errors that could not be quantitated. Weight loss through air-drying ranged from 10 to 21% in the first 2 h. for frozen tissue and 7 to 11% for fresh tissue. This difference becomes increasingly variable with time.

INTRODUCTION

Wet weight is a popular basis for heavy metal toxicity determinations in soft tissues.[1,2,3] However, since 60-80% of soft tissue weight is water, sizable errors are possible because of the analyst's inability to achieve consistency in the wetness of the tissue. Data are presented to illustrate the variation in results possible between wet weight and dry weight for duck liver.

METHODS AND MATERIALS

Nineteen dead mallards *(Anas platyrhynchos)* from traps and 6 euthanized mallards were examined at necropsy. Birds from traps were frozen (-25 C) for up to 4 weeks. The frozen bird was thawed completely before removing the liver. The lower right lobe (3 to 10g) of the liver was removed and weighed immediately (no blotting or washing) to the nearest fourth place and weighed again at intervals of 2, 5.5 and 8 h. The same lower right lobes were then oven-dried to a constant weight at 70 C (approx. 24 h.).

RESULTS AND DISCUSSION

The means, standard deviations, and range of percent weight loss in liver are presented in Table 1 for fresh and frozen tissue. Livers that were frozen lost approximately 10% more weight and showed a greater degree of variation than did fresh samples. Age or sex did not appear to influence the percent weight loss with time.

Sizable errors that cannot be quantitated are inevitable (10 to 21% in the first 2 h. for frozen tissue and 7 to 11% for fresh samples) and this weight loss (error) increases with time.

The importance of any change in sample weight on the resulting sample value can be seen in the formula:

$$\text{Sample Value} = \frac{\text{Atomic Absorption Value} \times \text{Dilution}}{\text{Sample Weight}}$$

where the atomic absorption value and dilution are constant for each sample. If wet weights are utilized, sample weight can vary from 0 to 75% (Table 1). Loss of moisture with time is error and cannot be quantitated. The effect of this weight loss on a typical liver sample for a bird poisoned with ingested lead would be 80 ppm wet weight to 315 ppm oven-dry weight or would range anywhere between 80 and 315 ppm depending on the moisture lost with time. Therefore, to avoid this 0 to 75% non-quantitative error, samples should be oven-dried to a constant weight. Consistency in dryness is easily achieved, but consistency in wetness is impossible.

There is no detectable weight difference between liver samples which

TABLE 1. Means, range, and standard deviation of percent weight loss after 2, 5.5, and 8 h., and oven-drying, for fresh and frozen mallard liver samples.

	Time (Hrs.)			Oven-dry weight
	2	5.5	8	
		Frozen		
	$\bar{X}$ S.D.	$\bar{X}$ S.D.	$\bar{X}$ S.D.	$\bar{X}$ S.D.
Overall mean	14.87 (2.76)	32.52 (4.19)	38.27 (4.55)	74.29 (2.76)
Range	10.02-21.76	25.66-39.65	30.21-44.51	66.90-77.53
		Fresh		
Overall mean	9.20 (1.42)	18.61 (2.42)	23.34 (2.92)	64.57 (2.37)
Range	7.65-11.07	15.22-21.86	19.31-27.31	60.35-67.15

have been partially or totally air-dried and then oven-dried, and those samples immediately oven-dried.

This allows field personnel to collect liver samples and air-dry them (to a hardened or "jerkied" state) on clean glass plates or in petri dishes (Anderson samplers). The samples can then be mailed to the laboratory without refrigeration and/or fear of spoilage. Once received at the laboratory the samples should be oven-dried to a constant weight before beginning the digestion.

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Received for publication 18 March 1977