

# The Relationship Between Canine Nasal Length and Cotinine Level in Second-hand Smoke

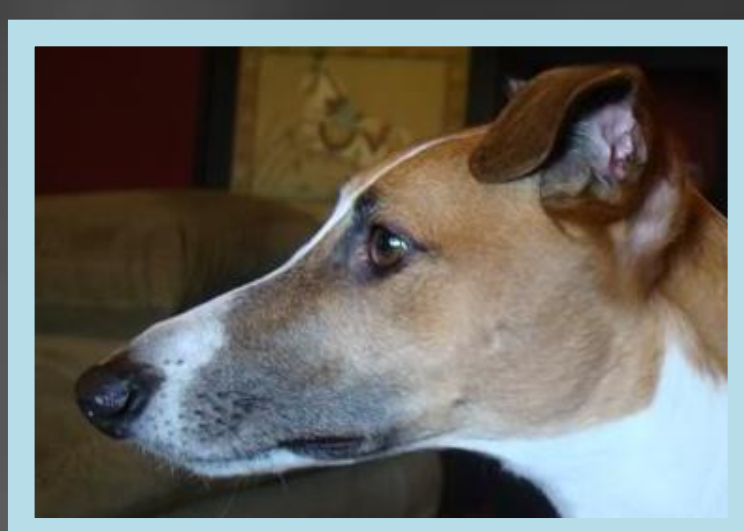
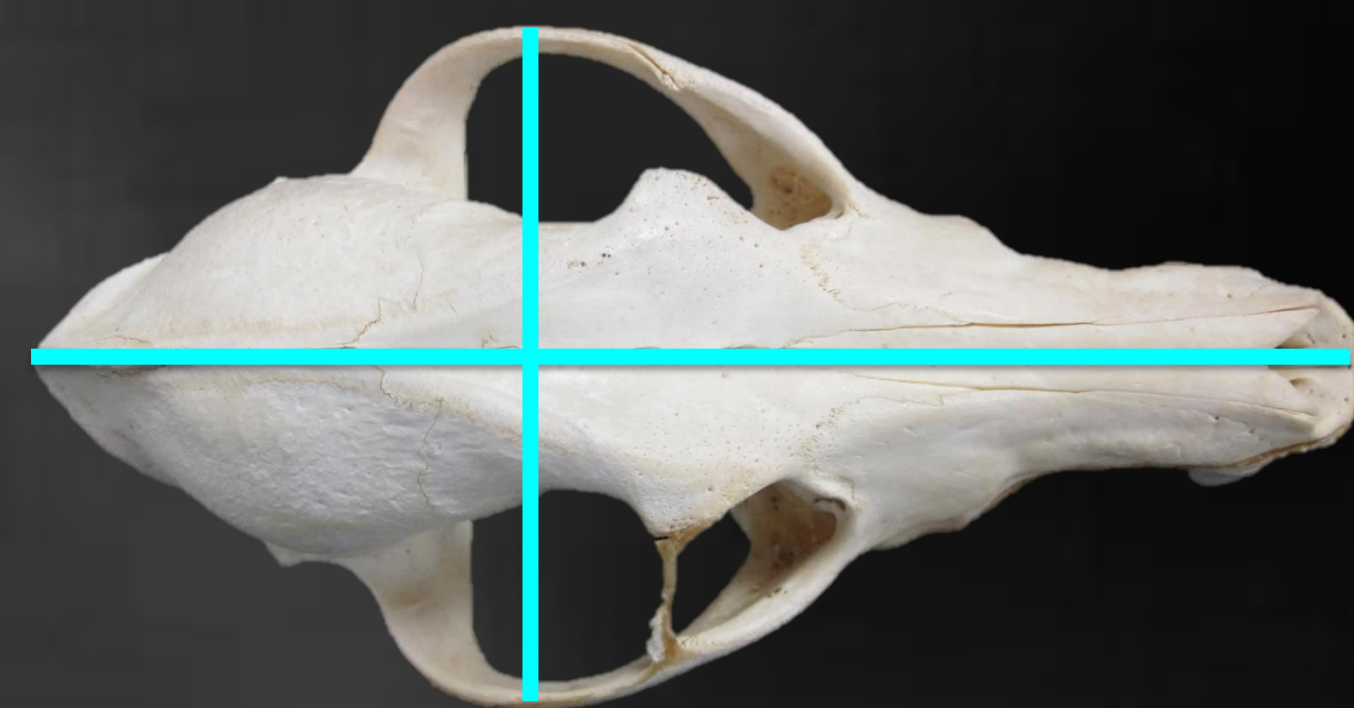
SIERRA R. WILSON and TERRY L. DERTING,  
Department of Biological Sciences, Murray State University

## Introduction:

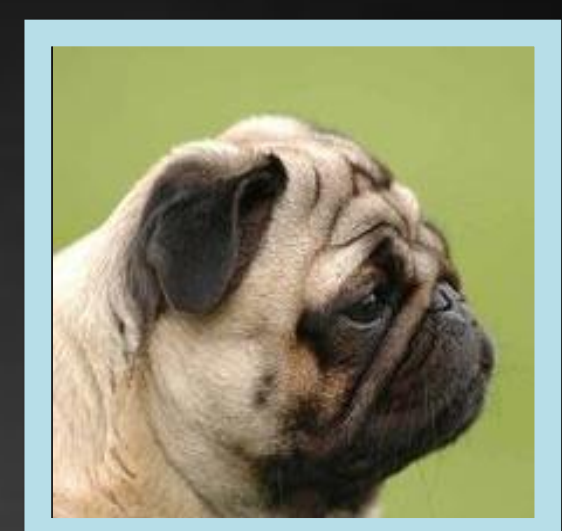
Second-hand smoke (SHS) has been associated with respiratory cancers in canines, with the predisposed locations determined by the cephalic ratio. The cephalic ratio is measured by dividing the head length by the head width (Fig. 1,3,4). Previous studies established the possible pre-disposed locations of SHS particulates according to the cephalic ratio of various dogs, where dolichocephalic breeds (long – nosed, Fig. 2) appear to retain more particulates in the nasal cavity while brachycephalic breeds (short – nosed, Fig. 2) retain more particulates in the lungs (Reif, 1992, 1998).

The exposure to SHS is frequently measured by analyzing urine or blood samples for the nicotine by-product cotinine. Cotinine is an easily measurable and commonly used because its half life is three times longer than nicotine itself. A previous study established a positive correlation between SHS exposure and the cephalic ratio via urine sampling (Bertone-Johnson, 2014). The drawback to urine is the potential difficulty of collecting the sample. Also, urine is filtered through the body, whereas saliva is in direct contact with the dog's environment therefore it is not hindered by the body's filtration system.

**Fig. 1**  
Cephalic ratio determined by head length / head width



Dolichocephalic  
Cephalic ratio ~ <55%



Brachycephalic  
> 65%

**Fig. 2.** Examples of dog breeds with a large and a small cephalic ratio.

## Objectives:

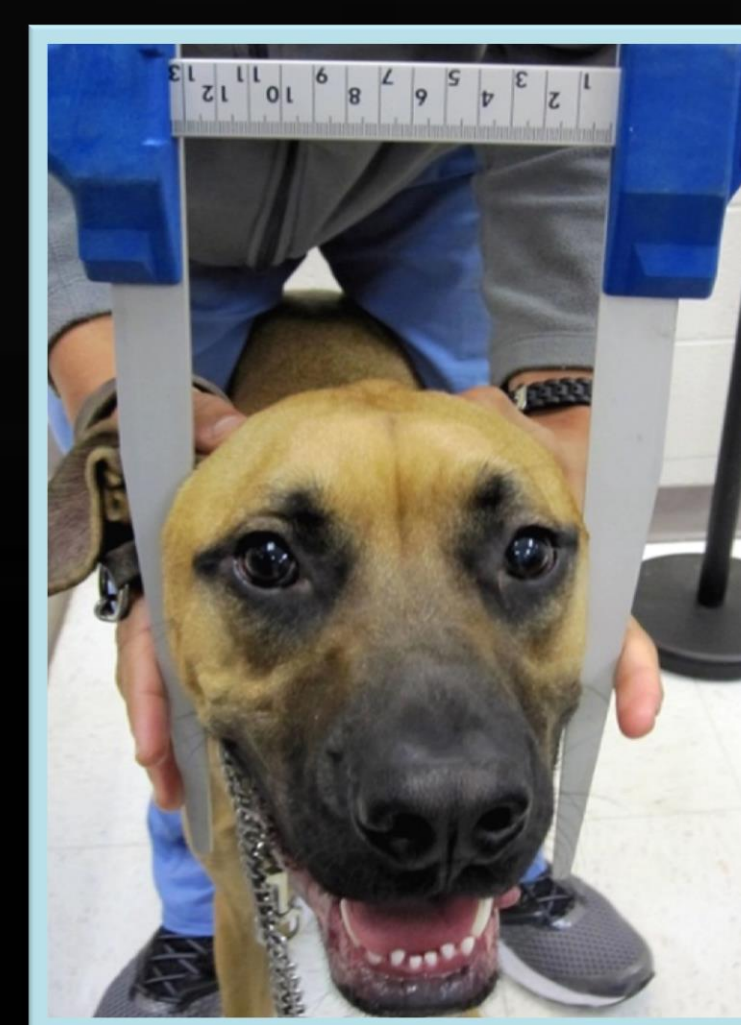
- Determine the suitability of saliva as an alternative to urine for measuring cotinine concentration.
- Determine a possible quantitative relationship between the cephalic ratio and salivary cotinine concentration.

## Methods:

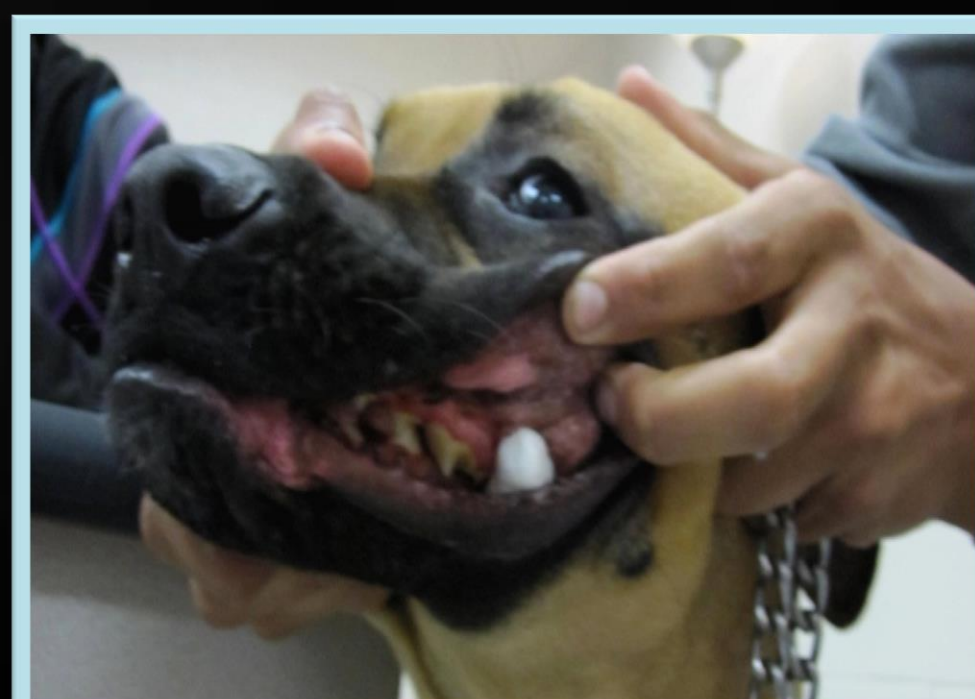
- Owners were recruited at a local community dog wash
- Owners were surveyed about dog's exposure to smoking
- Cephalic ratio was measured (Figs. 3 - 4)
- Saliva samples were obtained (Fig. 5)
- Body condition score was recorded (Fig. 6)



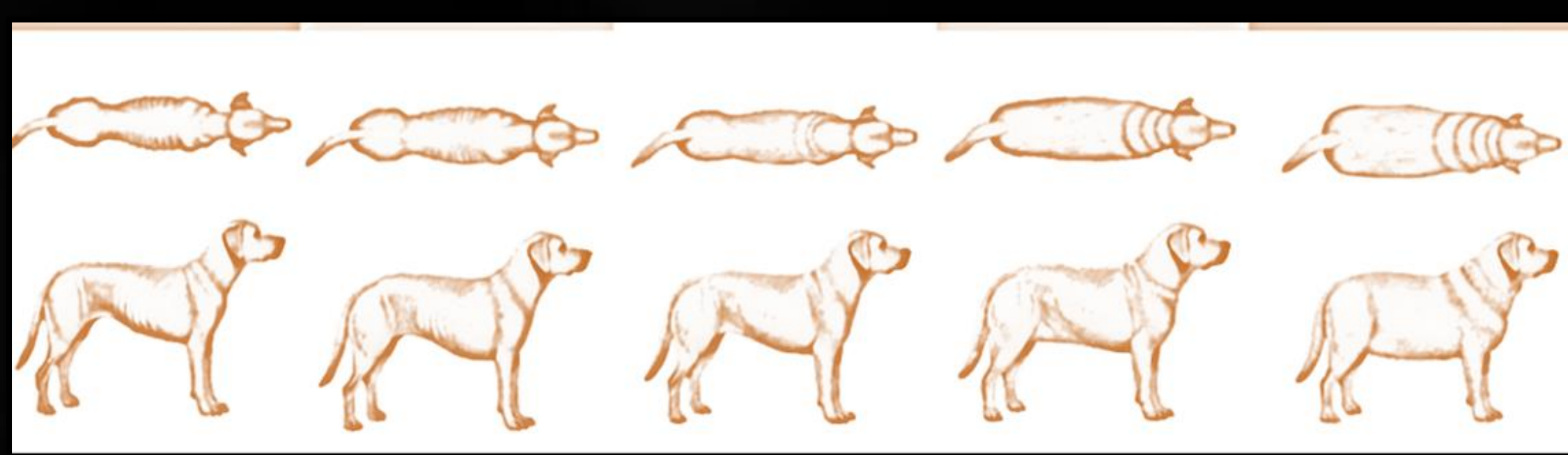
**Fig. 3.** Measurement of head length



**Fig. 4.** Measurement of head width

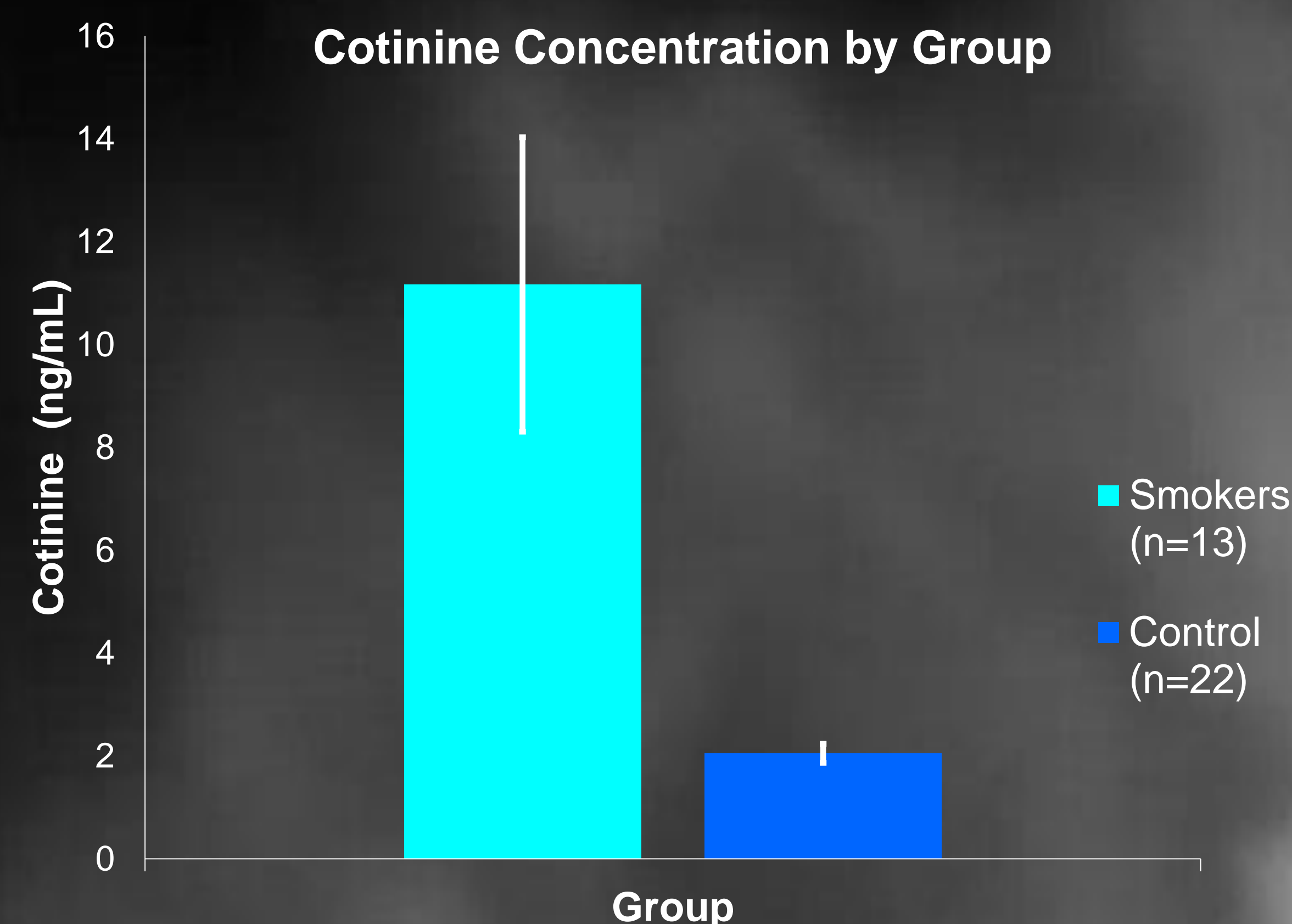


**Fig. 5.** Obtaining saliva sample

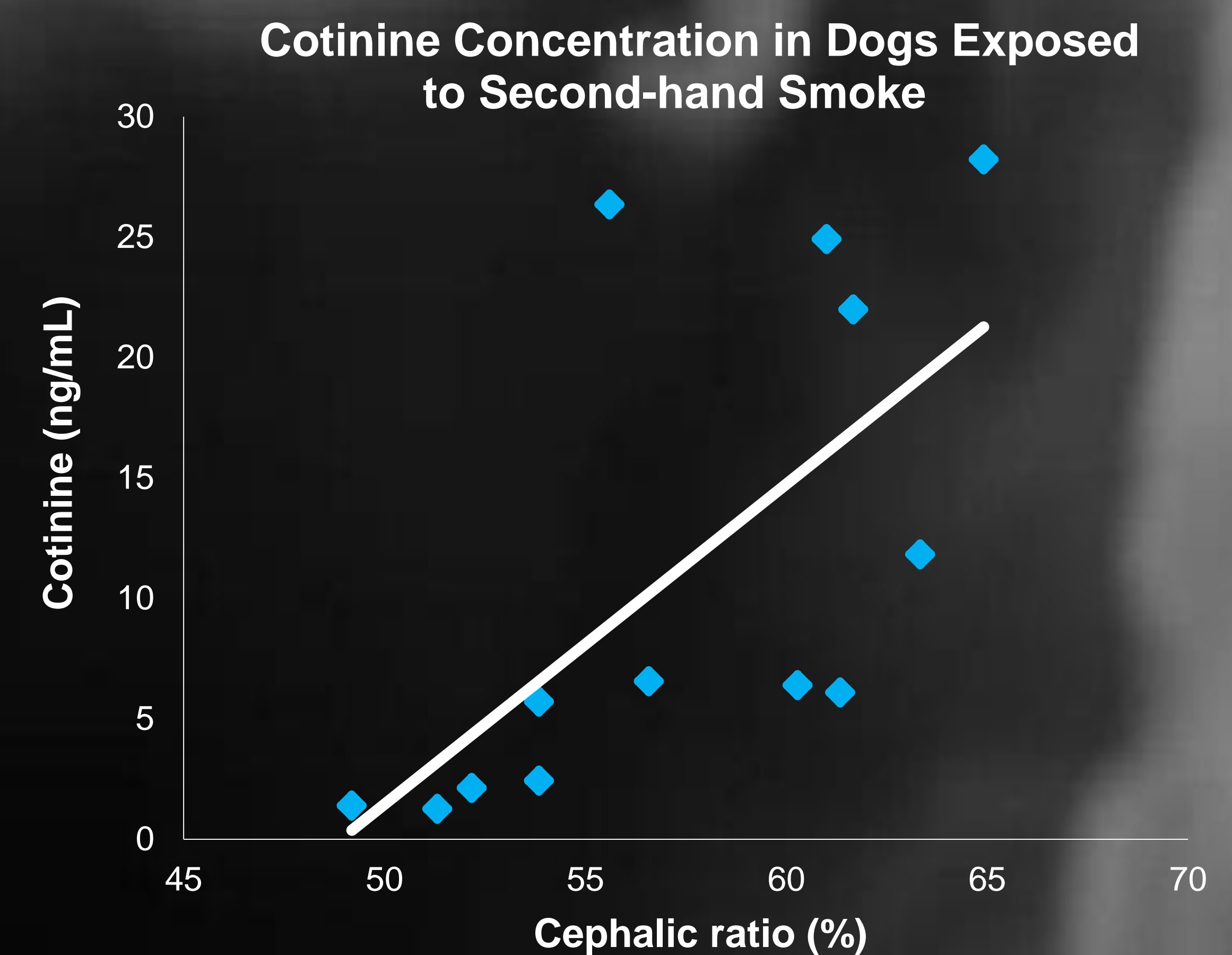


1 - Severely Underweight  
9 - Morbidly Obese  
**Fig. 6.** Body condition score chart

## Results:



**Result 1.** The mean ( $\pm$  1. S.E.) cotinine concentration of dogs not exposed to smoke was much lower than for dogs exposed to smoke (t-test,  $P < 0.01$ ;  $N = 35$ ).



**Result 2.** A positive linear relationship occurred between the concentration of cotinine in the saliva and the cephalic ratio ( $r^2 = 0.42$ ,  $p = 0.016$ ).

## Conclusions:

- Saliva samples may be a useful alternative to samples that can be more difficult to obtain (e.g., urine) when evaluating exposure to SHS.
- The finding of higher cotinine concentration in brachycephalic dogs may be useful for informing potential dog owners of possible future illnesses and diagnoses.

## Works Cited:

- Bertone-Johnson, E., Proctor-Grey, E., Gollenberg, A., Bundga, M., & Barber, L. (2008). Environmental tobacco smoke and canine urinary cotinine level. *Environmental Research*, 106(3), 361-364.
- Reif, John S., Burns, Christa, and Lower, Kimberly S. Cancer of the Nasal Cavity and Paranasal Sinuses and Exposure to Environmental Tobacco Smoke in Pet Dogs. *American Journal of Epidemiology* 147.5 (1994): 488-92. Print.
- Reif, John S., Dunn, Kari, Ogilvie, Gregory K., and Harris, Cheryl K. Passive Smoking and Canine Lung Cancer Risk. *American Journal of Epidemiology* 135.3 (1992): 234-39. Print.

## Acknowledgements:

We thank the Office of Undergraduate Research and Scholarly Activity for funding, Department of Biological Sciences, Department of Animal Health Technology and Pre – Veterinary Medicine, Dr. William DeWees, Barbie Papajeski for providing supplies and support, and Aaron Beuoy, Mary Wilkerson, Nicole Creedon, and Chesika Crump for aid in obtaining measurements of the dogs used in this study.