

Bioelectrical Impedance Measurements for Predicting Body Composition of Horses

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In many situations, including the design of feeding and training regimens for horses, it is desirable to have an accurate measure of body composition. This is usually estimated from body condition score but in other animal species, techniques including dissection and tracer dilution are used. In man, a variety of techniques are available, e.g. skin-fold thickness measurements, DXA, underwater weighing (Ellis, 2000). However, many of these techniques are impractical for use with horses. What is required is an inexpensive, rapid and non-invasive technique that will allow the accurate estimate of body composition and can be routinely applied over time.

Recent developments in the application of bioelectrical impedance analysis provide an inexpensive and rapid technique for determining human body composition in terms of total body water, lean body mass and fat. The underlying principle of bioimpedance is that the body consists of two chemically distinct components (fat and fat-free). The chemical composition of the fat-free mass is relatively constant with a consistently higher water and electrolyte content than fat. The main components of the body are muscle, bone, water and fat. Conductivity is greater in the fat-free mass than in fat tissue. The high electrolyte content of the fat-free mass allows this component of the body to be a good conductor and leads to a low impedance to electrical currents. Conversely, fat, as a poor conductor has a high impedance to a high frequency current. This difference has been used successfully to predict body composition of humans and rodents (De Lorenzo *et al.*, 1997).

The results of our current studies, evaluating bioelectrical impedance spectroscopy for predicting lean tissue mass in mares, foals and geldings, will be reported. The application of this technique to the horse, together with its validation by isotope dilution measurement of total body water (Ellis and Wong, 1998), will greatly assist in the refinement of equine feeding and training practices and improve equine welfare.

De Lorenzo, A., Andreoli, A., Matthie, J. and Withers, P. (1997). *J. Appl. Physiol.* **82**:1542.

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