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Approaches for determining dehydration, and its compartmentation, in horses at rest and with exercise

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Multi-frequency bioelectrical impedance analysis (MFBIA) has been, and likely will increasingly be, used to rapidly and non-invasively assess the time course of volume losses and recovery in horses. Dehydration in performance horses is frequently the cause of health and performance problems, and presently used techniques for objectively quantifying optimum hydration are time consuming and challenging to perform accurately. Dehydration can take a number of different forms, with a balanced loss of water and electrolytes from both extracellular and intracellular fluid compartments, or a primarily extracellular dehydration or intracellular dehydration. The ways in which dehydration are partitioned will determine how physiological systems are affected. For example, a primarily extracellular dehydration will compromise cardiovascular and thermoregulatory ability, while a primarily intracellular dehydration may compromise excitability of nerves and muscles. Because performance horses are typically very tolerant of dehydration, the negative effects of dehydration on health and performance are often overlooked and underappreciated. We summarize the current state of knowledge regarding the quantification of dehydration, and the time course of losses of water and electrolytes from extracellular and intracellular fluid compartments. The effects of dehydration on exercise performance, muscle function, cardiovascular function, thermoregulation and feeding are briefly summarized. We provide a quantitative description of the magnitude and time course of compartmental fluid losses and recovery in horses in response to feeding and due to exercise at different intensities and durations representing the endurance horse to the track racehorse. Effective rehydration requires knowledge of the losses from the main body fluid compartments, which is now possible using MFBIA technology. We outline the key approaches that have been used to assess dehydration in horses, including the new technique of MFBIA.