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Respirometry: Correcting for Diffusion and Validating the Use of Plastic Multiwell Plates with Integrated Optodes

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Abstract:

Polystyrene multiwell plates with integrated optodes act as multiple closed-system respirometers that enable the simultaneous measurement of oxygen consumption in small animals. However, the diffusion of oxygen through polystyrene needs to be taken into consideration. Here we provide an equation that accounts for the empirically determined rate of oxygen through a polystyrene well when calculating the instantaneous rate of oxygen consumption. Furthermore, we describe a novel method of calibrating a small respirometer for accuracy using micro-osmotic pumps containing an oxygen scavenger, which is delivered at a constant rate and therefore yields a constant rate of oxygen consumption in an airtight system.

Keywords: Respirometry, oxygen diffusion, oxygen scavenger, instantaneous oxygen consumption rate, polystyrene