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A Non-invasive Method of Measuring Respiration while Providing Wireless Power for Rodents with Implantable Devices

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ABSTRACT

Respiratory measurements can be used as diagnostic and research tools. Spirometry is the gold standard for gaining these measurements, but is difficult to use in rodents as it requires an invasive procedure. Total Body Plethysmography (TBP) is a non-invasive way to measure respiration rates that does not cause stress to the rodent. In this system, the subject is encased in a solid, constant volume chamber with measurements determining the subject's respiration. When using TBP in medical or research settings, challenges occur in powering devices within the TBP chamber as wires and other recording equipment compromise the airtightness of the chamber. Therefore, it is imperative to create a TBP chamber that provides wireless power for these purposes. To do so, subjects were placed in a cubic or cylindrical airtight chamber with one inflow and exhaust nozzle to control chamber pressure and provide a steady stream of fresh oxygen. Pressure readings from the inside of the chamber were taken at a rate of four samples per second. Tests were run from two minutes to three hours to encompass rodent activity. Tests were inconclusive for measuring respiration with the specific sensors used, and further research and testing is needed to perfect this method. Once the method is proven to work with the pressure sensors, it will be able to be paired with the MRC chasm and therefore implemented in other studies.

KEYWORDS

Total Body Plethysmography, wireless powering, magnetic resonance coupling, respiration, measuring respiration, rodent respiration