

Electrochemical Analysis of Bovine Exhaled Breath Condensate to Detect Biomarkers of Respiratory Disease Using Nanocarbon Electrodes

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Bovine respiratory disease (BRD) is a multi-factorial disease endemic in the North American dairy and feedlot cattle populations. Its presence in the United States is ubiquitous, with up to 97% of feedlots having positive BRD cases (1). BRD has a significant economic impact on U.S. bovine industries, costing \$4.9 billion in revenue between 2015–2018 in the beef cattle industry alone (2). Considering that early diagnosis and subsequent treatment of BRD in cattle improves prognosis, there is economic importance to creating rapid, non-invasive, and inexpensive diagnostic technologies to detect BRD. Exhaled breath condensate (EBC) is a biospecimen that can be collected non-invasively and contains a host of potentially useful diagnostic targets that could indicate differences between the healthy and diseased states. Additionally, electrochemical sensors are advantageous due to their portability, rapid results, and inexpensive fabrication. This presentation outlines a facile EBC collection and analysis methodology utilizing flexible inkjet-printed carbon electrodes to detect electrochemically active species in bovine EBC and reports differences between the EBC of healthy and diseased animals. Once matured, this technology could be adapted into a multi-sensor screening platform to diagnose BRD and monitor treatment effectiveness.

- (1) Feedlot 2011. *Part IV: Health and Health Management on U.S. Feedlots with a Capacity of 1,000 or More Head*; U. S. Department of Agriculture National Animal Health Monitoring System: Fort Collins, 2013; 53.
- (2) Johnson, K. K.; Pendell, D. L. Market Impacts of Reducing the Prevalence of Bovine Respiratory Disease in United States Beef Cattle Feedlots. *Front. vet. sci.*, **2017**, 4(189).