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In vivo measurement of pH and CO₂ levels in the uterus of sows through the estrous cycle and after insemination

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Abstract:

The pH-CO₂-HCO₃⁻ system is a ubiquitous biological regulator with important functional implications for reproduction. Knowledge of the physiological values of its components is relevant for reproductive biology and the optimization of Assisted Reproductive Technologies (ARTs). However, in situ measurements of these parameters in the uterus are scarce or null. This study describes a non-invasive method for in situ time-lapse recording of pH and CO₂ within the uterus of non-anesthetized sows. Animals were at three different reproductive conditions, estrous with no insemination and two hours after insemination, and diestrous. From pH and CO₂ data, HCO₃⁻ concentration was estimated. The non-invasive approach to the porcine uterus with novel optical probes allowed the obtaining of in situ physiological values of pH, CO₂ and HCO₃⁻. Variable oscillatory patterns of pH, CO₂ and HCO₃⁻ were found independently of the estrous condition. Insemination did not immediately change the levels of uterine pH, CO₂ (%) and HCO₃⁻ concentration, but all the values were affected by the estrous cycle decreasing significantly at diestrous condition. This study contributes to a better understanding of the in vivo regulation of the pH-CO₂-HCO₃⁻ system in the uterus and may help to optimize the protocols of sperm treatment for in vitro fertilization.

Keywords: pH-CO₂-HCO₃⁻ system, assisted reproductive technologies, in situ measurements, uterus, in vitro fertilization, pH and CO₂ measurements