

Use of online rapid sampling microdialysis electrochemical biosensor for bowel anastomosis monitoring in swine model

Abstract

Bowel anastomosis ischemia carries a significant rise in morbidity and mortality after bowel surgery. Clinical measures of bowel ischemia are often non-specific and only become evident at a late stage. There is currently no method to continuously monitor, in real time, metabolic impairment at the anastomosis site. Our online rapid sampling microdialysis biosensor system has proved its efficacy in monitoring ischemia in the bowel. Selective glucose and lactate biosensors are coupled online to the microdialysis probe through a flow injection analysis (FIA) system, which performs in vivo bowel monitoring at high time resolution, typically every 30 seconds. The enzymatic reactors containing substrate oxidase (SOx) and horseradish peroxidase (IIRP) are coupled to flow cell electrodes. The system was used to monitor ischemia at the bowel anastomosis level, by monitoring in vivo changes in the metabolic substrates, like glucose and lactate in the colon of swine models. The rapid decrease in glucose and increase in lactate 5 minutes post-clamping of the artery feeding the anastomosis highlights the vulnerability of the bowel to damage with surgical stress and previous ischemic insults.