# Continuous *In Vivo* Monitoring of a Flexible Subcutaneous Sensor in Freely Moving Diabetic Rats

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Subcutaneous tissue is frequently the target site for placement of continuous, real-time metabolic sensors. Since the 1960s, numerous research groups have developed needle-like sensor designs, patterned after the Clarke Electrode, to monitor glucose in subcutaneous tissue. These designs perform well in vitro but often fail *in vivo* due to sensor instability and tissue response. None of these studies focused on the mechanical properties of implanted sensors and how these properties may affect *in vivo* performance. To investigate the role of sensor stiffness on short term functionality we developed a low stiffness subcutaneous sensor patterned after the Clarke Electrode and tested it in rodents. The purpose of this study was two-fold. The first goal was to demonstrate the *in vivo* functionality of the flexible sensor. The second goal was to evaluate the effect of stiffness on functionality by co-implanting stiff and flexible sensors. In the first series of studies the low stiffness sensors provided glucose level measurements that fell within the A and B regions of the Clarke Error Grid 93.0% of the time. The results of the second study yielded similar accuracy; however, no performance difference was seen between the stiff and flexible sensors. We concluded that the flexible sensor works for at least 3 days after implantation in the subcutaneous tissue of freely moving rats and that the key property of low stiffness has no differential effect on the accuracy of the sensor in the freely moving rodent model of these studies.