

A Minimally Invasive Device for Continuous Glucose Monitoring in Infants

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Blood sugar management is particularly critical in the neonatal intensive care unit where the incidence of hypoglycemia is high and patients run the risk of brain damage. The staff at most hospitals obtain glucose levels in infants by drawing blood from the heel, which is a cause for recurrent pain. Some infants undergo this procedure every 1–3 hours for up to a few months. Our goal is to design a minimally invasive device that allows for real-time glucose monitoring in very low birth weight infants in the neonatal intensive care unit (NICU). This glucose monitor will reduce the amount of pain and physiological stress on the infants, de-

crease the risk of hypoglycemia in neonates and reduce the workload on hospital staff. There is currently much room for emerging technologies in this market as it trends towards less pain and faster responses. The device should only slightly hinder the infant's motion, be as painless as possible, and all materials used in contact with the body need to be biologically inert and cause no irritation or allergic reaction. The device will utilize a microneedle array to extract interstitial fluid and draw it through a hydrophilic polyurethane membrane and into a polarimetry chamber. Circularly polarized light will be passed through the chamber and the differential absorbance of left and right polarized light will be used to calculate the glucose concentration. A literature and patent review showed that each separate portion could be used in an effective device for minimally invasive, continuous glucose monitoring.