A Dual-Mode Point-of-Care Assay for Noninvasive Monitoring of Iron Levels in Menstrual Blood

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Iron deficiency is the most widespread nutritional disorder affecting women of reproductive age leading to fatigue, dizziness, and impaired brain function, among other symptoms thereby significantly affecting the quality of life. Current tests to diagnose iron deficiency rely on vein blood samples and centralized labs limiting point-of-care results. While there are at home tests, the use of lancets, finger pricking and the lack of quantitative results limit their diagnostic value. In addition, socioeconomic factors as well as health system factors often deprioritize diagnosis and treatment of iron deficiency among women. Finally, there is currently no gold standard assay for testing iron levels in reproductive-aged women where menstrual bleeding is a major contributor to iron deficiency and anemia. As such, menstrual blood also provides a unique opportunity for monitoring of iron levels in a noninvasive manner. In this project, I designed and developed a dual-mode noninvasive assay based on the principles of chelation therapy for monitoring of iron levels using menstrual blood. The novel assay comprises of a colorimetric (visual qualitative) and electrochemical (sensitive and quantitative) sensor integrated within a sanitary pad. The results from the sensor are analyzed in a portable, cost-effective, and easy to use system providing discreet information on the iron levels classifying into normal, iron deficient and anemic conditions. This point-of-care noninvasive assay will provide early diagnosis, monitoring, and management of blood iron levels while enabling doctors for therapeutic intervention and empowering women to improve their quality of life with a positive outcome.

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