Brief Report
Volume 15:03, 2024

Journal of Biosensors & Bioelectronics

ISSN: 2155-6210 Open Access

Creation of Non-invasive Biosensors to Identify Neonatal Jaundice: An Overview

Jayathi Saudel*

Department of Electrical Engineering, University of North Florida, Jacksonville, FL 32224, USA

Introduction

Neonatal jaundice, a condition caused by elevated levels of bilirubin in newborns, remains a significant health concern worldwide. While jaundice itself is common and often benign, high levels of bilirubin can lead to severe neurological complications if not promptly identified and treated. Traditional methods for diagnosing neonatal jaundice involve blood tests, which can be invasive, distressing for infants, and may not be readily accessible in all healthcare settings, especially in resource-limited areas. To address these challenges, researchers have been developing non-invasive biosensors that can accurately detect bilirubin levels through methods such as transcutaneous bilirubinometry and optical sensing technologies. These biosensors offer promising alternatives to traditional blood tests, providing healthcare providers with timely and reliable information to guide clinical decision-making [1,2].

Neonatal jaundice occurs when there is an accumulation of bilirubin, a yellow pigment produced during the breakdown of red blood cells, in a newborn's bloodstream. Bilirubin is typically processed by the liver and excreted in the bile, but in newborns, the liver might not yet be fully matured, leading to slower processing and potential buildup of bilirubin in the blood. The visible symptom of jaundice is a yellow discoloration of the skin and whites of the eyes. While mild jaundice often resolves on its own without treatment, high levels of bilirubin can pose serious risks, including kernicterus, a condition characterized by brain damage due to bilirubin toxicity. Therefore, timely monitoring and intervention are crucial, making accurate and non-invasive diagnostic tools essential in neonatal care [3].

Historically, the diagnosis of neonatal jaundice has relied on blood tests to measure Total Serum Bilirubin (TSB) levels. These tests involve drawing blood from the infant, which can be stressful and uncomfortable. Moreover, in resource-limited settings, the availability of laboratory facilities and trained personnel to conduct these tests may be limited, delaying diagnosis and treatment. Traditional methods also present challenges in terms of frequent monitoring, especially for infants at higher risk of developing severe jaundice. This necessitates repeated blood tests, further increasing the discomfort and potential risks associated with invasive procedures. Non-invasive biosensors offer a promising solution to these challenges by allowing healthcare providers to monitor bilirubin levels without the need for blood samples. These biosensors utilize various technologies to assess bilirubin levels through the skin or other non-invasive means, providing rapid and reliable results. One of the most established non-invasive methods is Transcutaneous Bilirubinometry (TcB), which measures the yellow light reflected from the skin to estimate bilirubin levels. This method is quick, painless, and does not require blood samples, making it suitable for frequent monitoring of jaundiced infants. Recent advancements in optical sensing technologies have also contributed to the development of non-invasive biosensors for neonatal jaundice. These technologies often involve the use of specialized light sources and detectors to analyze the optical properties of biological tissues, providing accurate measurements of bilirubin levels. The creation of non-invasive biosensors for neonatal jaundice involves interdisciplinary collaboration between engineers, biomedical scientists, and healthcare providers [4].

Description

Biosensors must provide measurements that correlate closely with TSB levels measured through traditional blood tests. Ensuring that the technology is safe for use with newborns and does not pose any risk of harm or discomfort. Designing biosensors that are cost-effective, portable, and suitable for use in diverse healthcare settings, including those with limited resources. Simplifying the operation of biosensors to enable healthcare providers with varying levels of training to use them effectively. Successful implementation of non-invasive biosensors requires rigorous testing and validation in clinical settings to demonstrate their reliability and accuracy compared to traditional methods. Regulatory approval and integration into clinical practice guidelines are also crucial steps in ensuring widespread adoption and impact on neonatal care. Looking forward, ongoing research aims to further enhance the performance and accessibility of non-invasive biosensors for neonatal jaundice. This includes exploring new sensing technologies, improving algorithms for data analysis, and integrating biosensors into digital health platforms for remote monitoring and telemedicine applications. Additionally, efforts are underway to expand the capabilities of biosensors beyond bilirubin measurement, potentially incorporating additional biomarkers or physiological parameters to provide comprehensive neonatal health assessments [5].

Conclusion

Non-invasive biosensors represent a transformative advancement in the management of neonatal jaundice, offering healthcare providers a safe, efficient, and patient-friendly alternative to traditional blood tests. By facilitating early detection and monitoring of bilirubin levels, these biosensors have the potential to reduce the incidence of severe complications associated with untreated jaundice and improve outcomes for newborns worldwide. As research and development in this field continue to progress, non-invasive biosensors are poised to become integral tools in neonatal care, ensuring that every infant receives timely and appropriate management for jaundice, thus safeguarding their long-term health and well-being.

Acknowledgement

None.

Conflict of Interest

None.

***Address for Correspondence:** Jayathi Saudel, Department of Electrical Engineering, University of North Florida, Jacksonville, FL 32224, USA; E-mail: jayathsa@gmail.com*

Received: 01 June, 2024, Manuscript No. jbsbe-24-142457; **Editor Assigned:** 03 June, 2024, PreQC No. P-142457; **Reviewed:** 15 June, 2024, QC No. Q-142457; **Revised:** 22 June, 2024, Manuscript No. R-142457; **Published:** 29 June, 2024, DOI: 10.37421/2155-6210.2024.15.448

References

1. Bernaldo, Adélia Jeha Nasser and Conceição Aparecida de Mattos Segre. "Bilirubin dosage in cord blood: Could it predict neonatal hyperbilirubinemia?." *Sao Paulo Med J* 122 (2004): 99-103.
2. Asefa, Guesh Gebreayezgi, Teklay Guesh Gebrewahid, Hailemariam Nuguse and Mengistu Welday,et al. "Determinants of neonatal jaundice among neonates admitted to neonatal intensive care unit in public general hospitals of central zone, tigray, northern Ethiopia, 2019: A case-control study." *Biomed Res Int* 2020 (2020): 4743974.
3. Weaver, Lauren, Abdul-rizaq Hamoud, David E. Stec and Terry D. Hinds Jr. "Biliverdin reductase and bilirubin in hepatic disease." *Am J Physiol Liver Physiol* 314 (2018): G668-G676.
4. Čvorović, Jovana and Sabina Passamonti. "Membrane transporters for bilirubin and its conjugates: A systematic review." *Front Pharmacol* 8 (2017): 887.
5. Hamoud, Abdul-Rizaq, Lauren Weaver, David E. Stec and Terry D. Hinds. "Bilirubin in the liver–gut signaling axis." *Trends Endocrinol Metab* 29 (2018): 140-150.

How to cite this article: Saudel, Jayathi. “Creation of Non-invasive Biosensors to Identify Neonatal Jaundice: An Overview.” *J Biosens Bioelectron* 15 (2024): 448.