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Cord Blood Biochemical Profiling in Neonates: Goals of Future

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Abstract

Cord blood provides a valuable source of biological information about the intrauterine environment and the physiological condition of a newborn at birth. Biochemical profiling of cord blood has gained increasing attention as a potential approach for understanding neonatal health, identifying early risk factors, and supporting personalized approaches to neonatal care. This paper explores the current significance and future goals of cord blood biochemical profiling in neonates, with emphasis on the identification of biochemical indicators associated with metabolic status, oxidative stress, inflammation, organ function, and early developmental outcomes. Analysis of selected biochemical parameters, including glucose, electrolytes, proteins, enzymes, lipid profiles, inflammatory markers, and oxidative stress indicators, may provide insights into the physiological adaptation of neonates during the transition from intrauterine to extrauterine life. Advanced analytical techniques, including metabolomics, proteomics, and integrated multi-omics approaches, offer opportunities to identify novel biomarkers and establish comprehensive biochemical profiles. Such approaches may contribute to the early recognition of neonates at increased risk of metabolic disturbances, infection, hypoxic conditions, or other complications. The future application of artificial intelligence and data-driven analytical models could further enhance the interpretation of complex biochemical datasets and support predictive neonatal healthcare. However, standardization of sampling procedures, analytical methods, reference ranges, ethical considerations, and large-scale validation remain important challenges. Overall, cord blood biochemical profiling represents a promising area for neonatal research, with potential to strengthen early diagnosis, risk assessment, and individualized clinical management.

Keywords: Cord Blood, Neonates, Biochemical Profiling, Biomarkers, Neonatal Health, Metabolomics, Proteomics, Oxidative Stress, Inflammation, Personalized Medicine.