Adult Consequences of Extremely Preterm Birth

Cardiovascular and Metabolic Diseases Risk Factors, Mechanisms, and Prevention Avenues

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KEYWORDS

• Preterm birth • Developmental origin of adult health and diseases
• Cardiovascular diseases • Metabolic syndrome • Hypertension • Inflammation
• Oxygen • Parenteral nutrition

KEY POINTS

- Extremely preterm birth occurs at a time of active vasculogenesis and organogenesis.
- Incidence of risk factors for chronic cardiovascular and metabolic diseases is higher in young adults born extremely preterm, such as high blood pressure, modified arterial structure, smaller kidneys, impaired glucose tolerance, gestational hypertension and diabetes, and preeclampsia.
- Understanding the role of altered organogenesis and of altered organ function should allow targeted preventive and therapeutic strategies to minimize development of chronic disease-related morbidity in preterm born adults.

INTRODUCTION

Many chronic adult diseases have their onset during development, from fetus to childhood. Preterm birth, affecting nearly 12% of US children each year, is the main cause of neonatal mortality and morbidity. With the major advances in perinatal and

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neonatal medicine over the last 30 years, most preterm and extremely preterm infants now survive. The first generations of these extremely preterm infants are reaching young adulthood, and their numbers are increasing. Beyond their well-studied neurodevelopment, other health consequences associated with preterm birth are being found now that these infants we cared for are entering active work life and having their own families.[1]

Childhood and adolescent studies have been reviewed in Thuy Mai Luu and colleagues' article, "Long-Term Impact of Preterm Birth: Neurodevelopmental and Physical Health Outcomes," in this issue; this report focuses on adult cardiovascular, renal, and metabolic health of individuals born extremely preterm. Evidence from clinical and from preclinical experimental studies of preterm birth and preterm birth–related neonatal conditions are presented, and the possible role of specific neonatal factors on the pathophysiology of organ structural and functional maladaptive changes is reviewed.

WHY ARE PRETERM INFANTS MORE VULNERABLE?

Preterm birth, especially extremely preterm birth, occurs at a critical stage of organ development (**Fig. 1**). The brain is in a rapidly expanding phase of neuronal migration and establishment of gyri and sophisticated connectivity, all of which are exquisitely sensitive to external perturbation. Lungs are in the late canalicular stage, during which

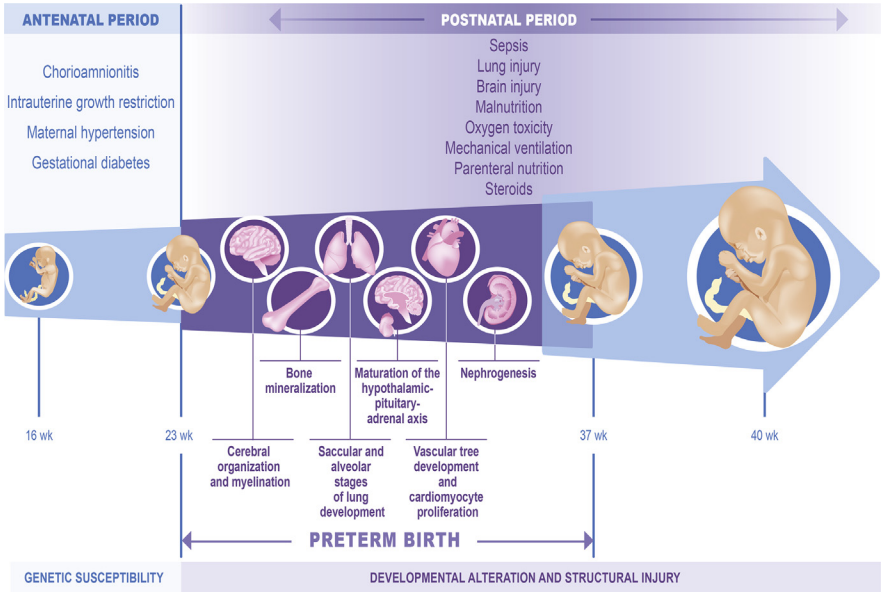

Fig. 1. Preterm birth, and especially extremely preterm birth, occurs at critical stages of organ development. Adverse intrauterine conditions that may lead to preterm birth and impact programming of long term health and diseases include chorioamnionitis, fetal growth restriction, maternal hypertension and gestational diabetes. Prematurity-related complications such as sepsis, lung and brain injury, or malnutrition and their treatments (oxygen, parenteral nutrition, steroids) can further alter organ system development. (*From* Luu TM, Katz SL, Leeson P, et al. Preterm birth: risk factor for early-onset chronic diseases. CMAJ 2016;188:737; with permission. This work is protected by copyright and the making of this copy was with the permission of the Canadian Medical Association Journal (http://www.cmaj.ca/) and Access Copyright. Any alteration of its content or further copying in any form whatsoever is strictly prohibited unless otherwise permitted by law.)