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THE ROLE OF GLUCONEOGENESIS IN EMERGENCY MEDICINE: METABOLIC ADAPTATION IN CRITICAL CONDITIONS

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Introduction: Critical illness, including sepsis, severe trauma, and prolonged fasting, triggers significant metabolic changes aimed at maintaining energy supply to vital organs. Gluconeogenesis is an essential metabolic pathway through which glucose is produced from non-carbohydrate sources, such as lactate, glycerol, and amino acids; however, glucose homeostasis **in critical illness and acute emergency conditions** is also influenced by glycogenolysis, peripheral insulin resistance, and alterations in glucose utilization. Understanding these interconnected mechanisms is key to interpreting glycemic fluctuations and the body's adaptive response to severe physiological stress.

Methods: This narrative review examines the role of gluconeogenesis in glucose homeostasis during acute medical emergencies and critical illness. Relevant literature was searched in PubMed/MEDLINE and Google Scholar using combinations of **the following terms:** "gluconeogenesis," "emergency medicine," "hypoglycemia," "stress hyperglycemia," "sepsis," "trauma," and "acute liver failure." Particular attention was given to the hormonal and inflammatory regulation of gluconeogenesis, alterations in endogenous glucose production, and their clinical implications for the assessment and management of acute metabolic disturbances.

Results: Evidence demonstrates that critical illness markedly alters endogenous glucose production through inflammatory cascades, counterregulatory hormone release, and peripheral insulin resistance. While gluconeogenesis sustains glucose availability, particularly as glycogen stores deplete, its dysregulation may contribute to stress hyperglycemia, whereas impaired endogenous glucose production may contribute to hypoglycemia, particularly in conditions such as acute liver failure. These disturbances are clinically relevant in emergency and intensive care settings. Furthermore, amino acid mobilization to support gluconeogenesis is associated with protein catabolism and may contribute to skeletal muscle loss during prolonged critical illness.

Conclusion: Gluconeogenesis plays a pivotal role in metabolic adaptation during critical illness **and acute medical emergencies**. Understanding its regulatory mechanisms, **together with the roles of glycogenolysis and peripheral glucose utilization,** provides valuable clinical insights into glycemic control and metabolic **assessment** in emergency and intensive care settings. Further research is warranted to elucidate the relationship between **alterations in endogenous glucose production** and patient outcomes.

Keywords: Gluconeogenesis, Critical Illness, Emergency Medicine, Metabolic Adaptation, Glucose Homeostasis