The Role of Microbiome in Organ Transplantation Outcomes

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e human microbiome, comprising bacteria, fungi, viruses, and other microorganisms, plays a vital role in human physiology, including immune system development, metabolism, and nutrient absorption [1]. Disruptions in the microbiome, termed dysbiosis, have been linked to various diseases, including in ammatory bowel disease, autoimmune disorders, and cancer. In the context of organ transplantation, the microbiome has been increasingly recognized as a key factor in uencing post-transplant outcomes [2]. e transplantation process itself, including surgery, immunosuppressive medications, and antibiotic use, can signi cantly disrupt the recipient's microbiome, creating an environment conducive to complications.

Studies have demonstrated a clear link between gut microbiome dysbiosis and post-transplant infections, particularly in liver and lung transplantation [3]. Dysbiosis can lead to increased intestinal permeability, allowing bacteria and bacterial products to translocate into the bloodstream, triggering systemic in ammation and increasing the risk of infections. Speci c bacterial taxa have been associated with increased risk of infections, while others have been linked to protective e ects.

e microbiome has also been implicated in in uencing the risk of rejection a er solid organ transplantation. e gut microbiome can modulate the recipient's immune response, a ecting the balance between pro-in ammatory and anti-in ammatory pathways [4]. Speci c microbial metabolites, such as short-chain fatty acids (SCFAs), can in uence T cell function and di erentiation, potentially impacting rejection risk. Studies have shown that speci c microbial pro les are associated with increased or decreased risk of rejection in di erent organ transplants.

In HSCT, the microbiome plays a crucial role in the development of GVHD, a severe complication where donor immune cells attack the recipient's tissues [5]. Dysbiosis in the gut can exacerbate GVHD by promoting in ammation and disrupting immune homeostasis. Speci c bacterial taxa have been associated with increased risk of GVHD, while others have been linked to protective e ects.

e mechanisms by which the microbiome in uences transplant

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