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Restoration of the gut microbiome in paediatric patients with acute lymphoblastic leukaemia after haematopoietic cell transplantation

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Statement of the Problem: Allogeneic hematopoietic stem cell transplantation (allo-HSCT) is a critical treatment for paediatric acute lymphoblastic leukaemia (ALL), the most common childhood cancer. While effective, allo-HSCT significantly disrupts the gut microbiota, weakening immune function and increasing vulnerability to complications. This study aimed to examine the impact of allo-HSCT on gut microbiota composition in children with ALL and to assess its recovery over a four-year period. Methodology &Theoretical

Orientation: We conducted an Ex Post Facto study comparing the gut microbiome of seven paediatric ALL patients (2 girls, 5 boys; aged 8, 4±5, 8 at the time of transplantation) 7 days before transplantation, 30 days after transplantation, and 4 years after transplantation. To compare the microbiome of children treated for ALL, we included 16 healthy controls in the study (6 girls, 10 boys; aged 9,1±6) Gut microbiota was analyzed using metagenomic sequencing of the 16S rRNA gene (V3–V4 region).

Findings: The results suggest an increase in bacterial diversity from day seven before transplantation to 4 years after treatment. In addition, we observed a significant increase in butyrate producers (p= 0,0001) from day 30 after transplantation to 4 years after transplantation. When comparing the microbiome of patients 4 years after transplantation with healthy children, we found no significant difference in bacterial diversity.

Conclusion & Significance: The gut microbiota is a dynamic system of different bacteria that changes due to various factors, especially in paediatric ALL patients undergoing challenging treatment. Recovery of the gut microbiota takes several years and yet may not reach the full recovery of a healthy individual. Therefore, our recommendations for the future are to incorporate probiotics suitable for immunodeficient paediatric patients.

Biography

Mgr. Miroslava Šimiaková is a passionate and driven molecular biology & biotechnology graduate with a strong enthusiasm for science and research. She completed her Master's degree in Biotechnology at the University of Ss. Cyril and Methodius in Trnava and is currently expanding her knowledge through studies in Sports Sciences at Comenius University in Bratislava. Her hands-on laboratory experience at Medirex a.s. includes clinical microbiology and SARS-CoV-2 diagnostics. Miroslava also has a background in swimming instruction and lifeguarding, combining scientific precision with practical skills. She is proficient in Microsoft Office, speaks English (B2) and German (B1), and holds a category B driving license. Known for her curiosity, resilience, and adaptability, she enjoys traveling, learning, cooking, and staying active outdoors—all while keeping science at the heart of her professional journey.

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