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1. Education

박사: The Univ. of Texas at Austin, Biomedical Engineering (2020)
석사: 성균관대학교, 화학공학과 (2015)
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2. Experience

2023 ~ 현재	KAIST 바이오및뇌공학과, 조교수
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제목 공학적 접근으로 풀어보는 사람-마이크로바이옴 상호작용 연구
Employing engineering principles to investigate host-microbiome crosstalk

초록

The human microbiome and their community shape human physiology through unceasing crosstalk with the host. Because a disturbed host-microbiome ecosystem often leads to disease development, it is of great importance to scrutinize the role of the microbiome in disease milieus to develop better diagnostic, therapeutic, and prognostic strategies. While probiotic intervention or fecal microbiota transplantation have shown clinical potential, microbiome-based therapies are often questionable in terms of clinical implementability, therapeutic efficacy, and underlying mechanism. Here, I discuss breakthrough technologies that leverage microphysiological intestine models and synthetic biology to study the contributions of the human microbiome and to develop next-generation living therapeutics. To discover complex host-microbiome crosstalk in the human gut, microphysiological human intestine models that faithfully mimic 3D tissue structure, in vivo-relevant functions, oxygen-controlled microenvironment, and biomechanics of the living human gut have been developed and utilized. Furthermore, integration of clinical samples including patient-derived intestinal organoids, fecal microbiota, and blood-derived immune cells enabled to investigate the role of the microbiome in a patient-specific intestinal microenvironment. Finally, synthetic biology approaches allow engineering the genetic machineries of human commensal gut bacteria or probiotic strains to innovate the functions of “druggable designer microbiome” towards programmable living therapeutics. Hence, we envision that the convergence of microengineering principles and synthetic biology strategies will bring a significant translational impact on Precision Medicine and open up new avenues for studying the human microbiome.

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