Hypersecretion of vaccine antigen outer membrane lipoprotein A in Corynebacterium glutamicum through high-throughput based development process

Manman Sun[1], Xiong Gao[2], Rodrigo Ledesma-Amaro[3], An Li[1], Rongbing Wang[4], Jiangqi Nie[1], Pei Zheng[5], Yankun Yang[1], zhonghu bai[6], and xiuxia liu[6]

[1]Jiangnan University
[2]The Hong Kong University of Science and Technology
[3]Department of Bioengineering
[4]University of Turku
[5] Tecon Biology CO.Ltd
[6]National Engineering Laboratory for Cereal Fermentauition Technology

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Abstract

Outer membrane lipoprotein A (OmlA) is a vaccine antigen against porcine contagious pleuropneumonia (PCP), a disease severely affecting the swine industry. Here, we aimed to systematically potentiate the secretory production of OmlA in Corynebacterium glutamicum (C. glutamicum), a widely used microorganism in the food industry, by establishing a holistic development process based on our high-throughput culture platform. The expression patterns, expression element combinations, medium composition, and induction conditions were comprehensively screened or optimized in microwell plates (MWPs), followed by fermentation parameter optimization in a 4×1 L parallel fermentation system (CUBER4). An unprecedented yield of 1.01 g/L OmlA was ultimately achieved in a 5-L bioreactor following the scaling-up strategy of fixed oxygen mass transfer coefficient (kLa), and the produced OmlA antigen showed well-protective immunity against Actinobacillus pleuropneumoniae challenge. This result provides a rapid and reliable pipeline to achieve the hyper-production of OmlA, and possibly other recombinant vaccines, in C. glutamicum.

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