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ORAL

Polymeric nanoparticles display bactericidal effect and selective fermentation for the treatment of acne vulgaris

Ming-Fa Hsieh

Department of Biomedical Engineering, Chung Yuan Christian University, Taiwan

*For correspondence:

mfhsieh@cycu.edu.tw

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Abstract

The use of antibiotics in the treatment of acne in specific group (pregnant women) of patients can lead to serious complications. We have previously demonstrated that the nanoparticles made of block copolymers of poly (ethylene glycol) and poly(e-caprolactone) can inhibit the growth of Propionibacterium acnes (P. acnes), a bacterium highly associated with the progress of acne vulgaris in the human skin [Polymers 2016; 8, 321]. To reduce the amount of antibiotics used in the treatment of skin acne, we have further demonstrated that a bacterium in the human skin microbiome can utilize PEG-based polymers to produce various short-chain fatty acids (SCFAs) which suppressed the growth of P. acnes. PEG-based polymers were chosen as selective fermentation initiators which specifically induced the fermentation of the skin commensal bacterium but not P. acnes. Interestingly, PEG-based polymers can efficiently suppress the growth of P. acnes. An acne ex vivo explant was established by using acne biopsies collected from patients with acne vulgaris at the early and middle stages. The levels of pro-inflammatory interleukin (IL)-8 cytokine in early- and middle-staged acnes were significantly higher than those in healthy skins. Incubation of acne ex vivo explants with sucrose remarkably reduced the level of IL-8 and the number of P. acnes. Results from mouse studies revealed that PEG-based polymer functions as antibiotic adjuvants which can considerably reduce the effective doses of clindamycin, a clinically-used acne antibiotic.

Keywords

Skin microbiome, acne, poly (ethylene glycol), antibiotic adjuvant, fermentation

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References