

# Directed evolution of pathways for non-natural squalenes

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Squalene and squalane are compounds in demand in many industries, from ointments, health foods, special lubricants, nutrients and pharmaceuticals to biofuels, as well as in many cosmetics as a skincare ingredient due to its excellent emulsifier performance and outstanding stability. Highly efficient and stable microbial production is required as a highly efficient and sustainable supply method for these compounds. However, squalenes maintain a large C<sub>30</sub> skeleton, and the cells had to be disrupted to extract the squalene from the cells, resulting in the contamination of countless impurities in the extract. In this study, we developed a system to synthesise mini-squalenes was created, for enabling the hyperproduction of squalene-like compounds via continuous extraction and the creation of novel squalene alternatives possibly with the better quality as cosmetic ingredients.