

## 高度好冷菌 *Colwellia psychrerythraea* strain 34H の脂肪酸

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### Fatty acids of the extremely psychrophilic bacterium *Colwellia psychrerythraea* strain 34H

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The marine bacterium *Colwellia psychrerythraea* strain 34H (strain 34H; ATCC BAA-681) is an extreme psychrophile isolated from the near-freezing sediments of the Northeast Water polynya, Greenland<sup>1</sup>. This bacterium has been used as a psychrophilic model organism because of its optimal growth temperature at 8°C<sup>1</sup>, mobility using flagella even at subzero temperatures<sup>2</sup>, and significant production of various types of cold-active extracellular enzymes<sup>1,3</sup>. Industrial use of strain 34H is also expected. This bacterium has been considered to contain eicosapentaenoic (EPA) and/or docosahexaenoic acids (DHA) from the existence of *pfaA-pfaE* genes responsible for the biosynthesis of these long-chain polyunsaturated fatty acids (LC-PUFAs) from its genome sequence<sup>4</sup>. These fatty acids have been regarded as a modulator of membrane fluidity at low temperatures also in this bacterium. However, no biochemical evidence on their presence has been available<sup>5</sup>. In this study, we identified LC-PUFAs including DHA and EPA as very minor fatty acid components of strain 34H cells grown at 5°C and the sum of *cis*-monounsaturated fatty acids including palmitoleic acid was more than 50% of total fatty acids, suggesting that *cis*-monounsaturated fatty acids would serve a principal role adjusting the membrane fluidity at low temperatures in this bacterium.

*Colwellia psychrerythraea* strain 34H (strain 34H; ATCC BAA-681)はグリーンランド近海のポリニヤの海底堆積物から単離された細菌である<sup>1</sup>。その増殖至適温度は8°Cにあり<sup>1</sup>、氷点下でも鞭毛運動を示す<sup>2</sup>など、高度な好冷性をもつほか、各種の低温性菌体外酵素を生産すること<sup>1,3</sup>から工業的な利用も期待されている。Strain 34Hのゲノム配列は2005年に解読された<sup>4</sup>が、その遺伝情報からもこの菌の好冷的な性質が裏付けられている。Strain 34Hはそのゲノムに長鎖多価不飽和脂肪酸(LC-PUFA)合成に関わる遺伝子群(*pfaA-pfaE*)をもつ<sup>4</sup>ことから、LC-PUFAを合成するとみられてきたが、生化学的な証明はなかった<sup>5</sup>。本研究では、strain 34Hの脂肪酸成分を解析した。LC-PUFAとしてドコサヘキサエン酸、エイコサペンタエン酸、アラキドン酸が検出されたが、その含量は何れも著しく低かった。一方で、パルミトオレイン酸を含むモノ不飽和脂肪酸の含量は合わせて50%以上であった。以上の結果から strain 34Hの低温下での膜流動性はLC-PUFAではなく、シス型のモノ不飽和脂肪酸によって維持されていると考えられる。

#### References

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