ダンシル蛍光団を有するフェニルボロン酸デンドリマーを用いた高感度細菌認識法の開発

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Development of sensitive bacterial detection by phenylboronic acid modified dendrimer with fluorescent dansyl group

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This study reported a convenient and sensitive bacterial detection using fluorescent phenylboronic acid modified PAMAM dendrimer (Dan-B-PAMAM, Figure), which could recognize bacterial surface and formed aggregation. Dan-B-PAMAM was newly synthesized from B-PAMAM and fluorescent dansyl group. When Dan-B-PAMAM was mixed with bacteria, the microscopy images showed aggregation as expected. Following the experiment, the aggregates were removed by filtration and fluorescence decreasing of filtrate solution was measured. Fortunately, changing was obtained even in 10^4 CFU/mL solution and Dan-B-PAMAM gave higher sensitivity than B-PAMAM. It was also worth mentioning that MTT assay showed that about half of gram-negative bacteria existed as dead bacteria. The result described that Dan-B-PAMAM give antibacterial activity for gram-negative bacteria.

Keywords : Bacterial Detection; Phenylboronic Acid; Dendrimer; Fluorescence; Antibacterial Activity

本研究では、細菌を認識し凝集する蛍光型フェニルボロン酸デンドリマーDan-B-PAMAM を用いることで、簡便かつ高感度な細菌認識法の開発を試みた(Figure)。Dan-B-PAMAM は、蛍光を有するダンシル基を B-PAMAM に修飾することで新規に合成した。合成した Dan-B-PAMAM を細菌と懸濁し顕微鏡で観察すると、凝集体の形成が確認できた。さらにろ過で凝集体を除去し、ろ液中に残ったプローブの蛍光強度を測定すると、10^4 CFU/mL でも蛍光強度の減少が見られ、B-PAMAM よりも感度が向上した。また、MTT アッセイで菌の生死判定を行うと、グラム陰性菌は約半数が死細菌として存在することが確認できた。したがって、Dan-B-PAMAM はグラム陰性菌に選択的な抗菌作用を持つことが明らかとなった。

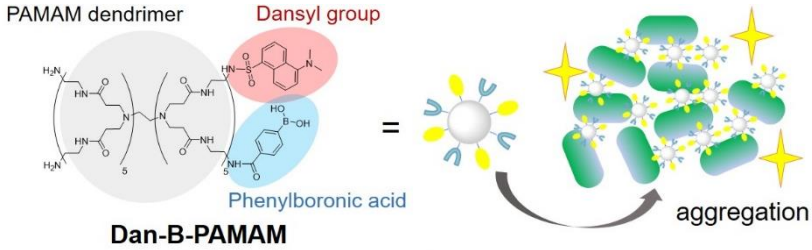

Figure. Bacterial recognition by **Dan-B-PAMAM**.

[1] Y. Tsuchido, R. Horiuchi, T. Hashimoto, K. Ishihara, N. Kanzawa, T. Hayashita, *Anal. Chem.*, **91**, 3929-3935 (2019).

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