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Transformative Chem-Bio Research
Nagoya University

Current Topics in Biological Science

大学院理学研究科 アドバンス生命理学特論

Two chromosomes, Four Chemosensory systems: Genome-scale phylogenomics uncovers a novel chemosensory architecture in Vibrionales

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場 所 : 理学部G館 101号室

Signal transduction is one of the most pertinent and survival-determining characteristics of bacteria. The complex microbial signal transduction mechanism, i.e., chemosensory system (CSS), is known to regulate bacterial motility and other cellular functions. This study investigates the diversity, distribution, and evolutionary dynamics of CSSs in family Vibrionales members, a group of bacteria with diverse ecological habitats. Using 116 curated representative genomes across 28 *Vibrio* clades and ~10,000 RefSeq/metagenome-assembled genomes, we characterized the chemosensory toolkit of Vibrionales. CheA-based phylogenetics and CSS architecture revealed four discrete CSS types: F6, F7, F9, and a novel lineage, F8. F6 is universally conserved on chromosome I and essential for flagellar motility, while F7, F8, and F9 show patchy distribution across replicons. We used CheA as a phylogenetic marker to infer evolutionary relationships among CSSs and classified methyl-accepting chemotaxis proteins (MCPs) based on their heptad-repeat architecture. Structural analysis reveals conserved CheA folds despite sequence divergence, with lineage-specific domain insertions in F8 and F9. Ongoing work involves analyzing the flagellar gene clusters, functionally linked to CSS across Vibrionales. Collectively, this study reveals a two-tier chemosensory architecture within order Vibrionales, 1) a chromosomally stable F6 (motility), 2) overlaid by dynamically evolving F7, F8, and F9 accessory systems.

細菌ゲノムデータの蓄積に伴い、その生態もゲノムベースで議論できる時代になってきました。今回、メタゲノム解析から見えてきたビブリオ属菌の化学感覚受容体の多様性とその意義についてインド工科大学ハイデラバード校のSharma博士に講演していただきます。ぜひご来聴ください。

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