生命分子解析ユニット
Biomolecular Characterization Unit

TP

タンパク質の構造を調べて、生命現象の謎にせまります

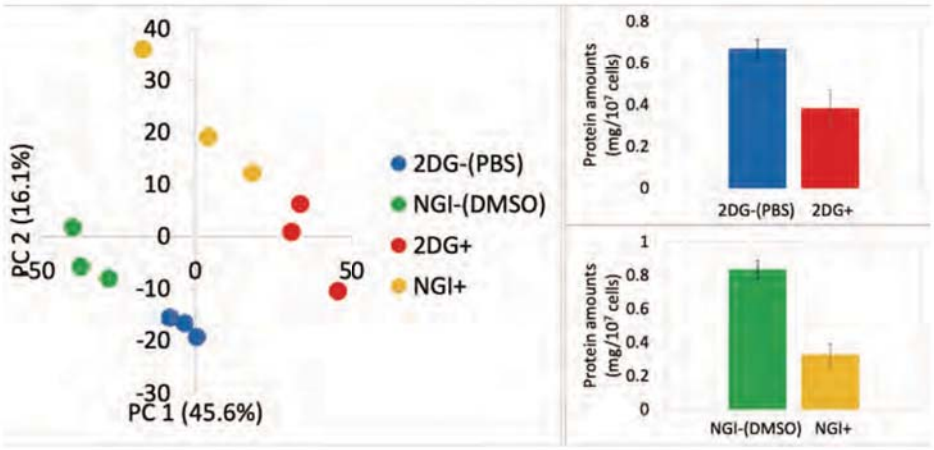
当ユニットは、生命現象の解明に向け、生体成分構造解析法の開発や構造解析の応用研究を行っている。生体成分の中でも特にタンパク質は生命現象の源であり、さまざまな生物活性がある。そのタンパク質の構造を詳細に調べることで、活性と遺伝子との対応、生物学的活性のメカニズムや活性の制御機構を解明する。また、装置ならびに設備の設置や管理、解析方法に関する情報の整備をすることで研究支援を行っている。

研究テーマ

- 生体分子の翻訳後修飾を含めた詳細な構造解析
- 生体分子の定量的解析法の開発
- RNAの質量分析

研究成果

- 小胞のプロテオーム解析によりガン細胞で生じる非エクソソーム小胞の分泌を糖代謝が制御していることを示した。
- 珪藻の光化学系Iの周りの集光性色素タンパク質 Fcpa16種類同定し、立体構造解析に貢献した。
- 開発してきたRNA解析ソフトウェアをICT企業との共同研研究開発により製薬企業向けに実用化した。



Exosomes and non-exosomal vesicles have distinct protein.
We found clear differences between the protein expression profiles of sEVs w/o 2-DG or NGI-1(N-glycosylation blockade reagents) based on PCA of LFQ proteomics(left) and protein quantification(right). We found significant reductions in non-exosomal cargo proteins in sEVs released from treated cells. N-glycosylation blockade significantly increased proteins that are reportedly enriched in distinct nanoparticles or exomeres. However, the same treatment barely affected the expression of proteins known to be enriched in exosome fractions.

2020年度メンバー / FY2020 Members

Unit Leader
Naoshi DOHMAE

Senior Research Scientist
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To resolve the mystery of biological phenomena, we examine the protein structure

ユニットリーダー／Unit Leader
堂前　直　博士(学術)
Naoshi DOHMAE Ph.D.

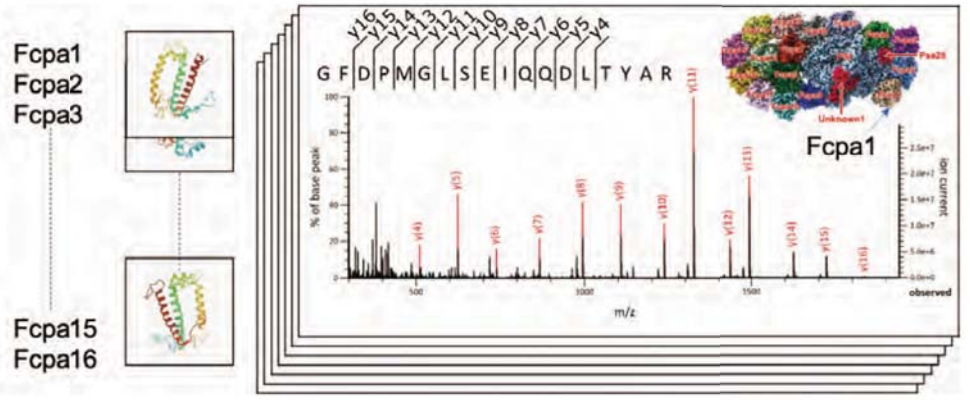
Our unit provides high quality structural characterization methods to the field of biological science, aiming to further understand the mechanism and action of biological molecules. We manage specialized and technical instruments including protein chemical analyses, mass spectrometry. Our challenge to research, develop and fine-tune novel characterization methods for biological molecules, is an endless yet rewarding process.

Research Subjects

- Development and application of analytical methods for structural details on biological molecules
- Development of quantitative analysis of biomolecules
- Identification and characterization of RNA by mass spectrometry

Research Results

- We elucidated glycometabolic regulation of the biogenesis of small extracellular vesicles in cancer cells by vesicle proteomic analysis.
- We identified 16 Fcpa subunits in diatoms for 3D structural analysis of PSI-FCPA supercomplex.
- We have been put developed RNA analysis software into practical use for the pharmaceutical industry in collaboration with an ICT company.



Identification of 16 Fcpa subunits of a diatom PSI-light-harvesting supercomplex.
For 3D structural analysis of the PSI-FCPI supercomplex by cryo-electron microscopy, we identified fucoxanthin chlorophyll *a*/*c*-binding proteins (Fcpa proteins) of *C. gracilis* using nLC-MS/MS. Figure indicates typical MS/MS spectra of Fcpa subunit peptides and 3D structure of the supercomplex.

主要論文 / Publications

Harada, Y. *et al.*
Glycometabolic Regulation of the Biogenesis of Small Extracellular Vesicles.
Cell Rep. **33**, 108261 (2020)

Deng, X., Dohmae, N., Kaksonen, AH., Okamoto, A.
Biogenic Iron Sulfide Nanoparticles to Enable Extracellular Electron Uptake in Sulfate-Reducing Bacteria.
Angew. Chem. Int. Ed. Engl. **59**, 5995-5999 (2020)

Nagao, R. *et al.*
Structural basis for assembly and function of a diatom photosystem I-light harvesting supercomplex.
Nat. Commun. **11**, 2481 (2020)