Self-Assembled Molecules – New Kind of Protein Ligands

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Editors

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Supramolecular Ligands

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Foreword

This collection of publications serves as the introduction to a new approach in biology and pharmacology: exploiting the peculiar properties of supramolecular systems, particularly ribbonlike micellar structures which constitute an entirely new category of protein ligands. The novelty of the problem is reflected by the specific character of such ligands but also by the way in which they bind to proteins – a mechanism unlike "classic" ligand binding. Among described problems of importance are enhancement of immune complexation by supramolecular ligands and their possible use as carriers for drugs. Many of those supramolecular compounds, including Congo red and Evans blue, have long been used as dyes and amyloid markers; however, we are only now beginning to understand their specific chemistry and interaction with proteins.

The micellar structure of supramolecular ligands enables intercalation of foreign particles, including drugs. This phenomenon is particularly interesting given the ligands' known affinity for antibodies – but only those engaged in immune complexes. Another important advantage is the strengthening of antigen-antibody interactions brought about by complexation of a supramolecular ligand. It therefore seems likely that supramolecular ligands will find use in immunotargeting.

Intercalation of customized complexones enables supramolecular ligands to inject metal ions into proteins – in order to provide contrast for EM imaging but also for therapeutic purposes.

The analysis of the complexation behavior of supramolecular ligands casts a new light on the phenomenon of amyloidogenesis. We can expect that further research into supramolecular systems will lead to a wider range of practical applications. The authors are predominantly biochemists involved in supramolecular compound application in biology and medicine. The ideas and results presented shall be of interest for researchers looking for new materials and methods in antibacterial therapy.

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Contents

Abbreviations

AC	Alizarin complex
AFM	Atomic force microscopy
B-J proteins	Bence-Jones proteins
CDR	Complementarity-determining regions
CR	Congo red
CYAB	Cetyltrimethylammonium bromide
DDAB	Dimethyldioctadecyl-ammonium bromide
DLS	Dynamic light scattering
DMSO	Dimethyl sulfoxide
DOX	Doxorubicin
DY	Direct yellow
DY28	Direct yellow 28
DY9	Direct yellow 9
EB	Evans blue
EDS	Energy dispersive spectroscopy
EM	Electron microscopy
EUCAST	European Committee on Antimicrobial Susceptibility Testing
FOD	Fuzzy oil drop model
Hb	Hemoglobin
ILs	Ionic liquids
IP	Propidium iodide
PA	*Pseudomonas aeruginosa*
PTFE membrane	Name of product
MDR	Multidrug resistant
MHA	Mueller-Hinton agar
MRSA	Methicillin-resistant *Staphylococcus aureus*
PDB	Protein Data Bank
RB	Rhodamine B
Rdf	Radial distribution functions
RILs	Room-temperature ionic liquids

RPMI 1640 medium	Name of compound
SDBC	Sodium dodecylbenzenesulfonate
SDS	Sodium dodecyl sulfate
SEM	Scanning electron microscopy
SRBC	Sheep red blood cells
SWNT	Single wall carbon nanotubes
TB	Trypan blue
TEM	Transmission electron microscopy, TEM
TY	Titan yellow
U937	Human lymphoid cell line