Biofunctional Engineering

2 units (selection)

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Target〉 Biological membranes play an important roll in structure formation and function revelation of cells. Characteristic properties owned by lipid membranes are mainly described and the structure and function of biological membranes are reviewed.

Outline〉 This lecture describes fundamental matters concerning self-association of biomolecules such as structure of water and hydrophobic effect, properties for molecular aggregates of amphiphilic molecules, after that various structure changes for molecular aggregates formed by lipids such as phase transitions, polymorphism, non-bilayer structure and domain formation are explained. Further, significant functions revealed in biological membranes like transport phenomena and mechanisms of drug action and so on are lectured. Portfoilo lessons are also adapted depending on students.

Style〉 Lecture in combination with Portfolio

Keyword〉 ***biological membrane, lipid, molecular aggregate, membrane structure, membrane function***

Fundamental Lecture〉 "**Biochemical Thermodynamics**"(1.0), "**Advanced Biophysical Chemistry**"(1.0)

Requirement〉 Students are required to have a good understanding of undergraduate- and postgraduate-level physical chemistry and biophysical chemistry and related subjects.

Goal〉

1. To understand the structures and nature of molecular aggregates formed by lipids, which are components of biological membranes.
2. To understand the functions revealed by biological membranes such as material transport, signal transduction and drug action.

Schedule〉

1. Structures of biological membranes (1) structure of water and hydrophobic interaction
2. Structures of biological membranes (2) self-association of amphiphilic molecules 1: monolayers
3. Structures of biological membranes (3) self-association of amphiphilic molecules 2: micelles
4. Structures of biological membranes (4) bilayer structure and phase transitions of lipid membranes
5. Structures of biological membranes (5) stability and polymorphism of lipid membranes
6. Structures of biological membranes (6) non- bilayer structure of lipid membranes
7. Structures of biological membranes (7) mixed lipid membranes and domain formation
8. Structures of biological membranes (8) fluidization and dynamics of lipid membranes
9. Structures of biological membranes (9) surface and membrane potentials
10. Functions of biological membranes (1) molecular recognition of lipid membranes
11. Functions of biological membranes (2) ion transport (passive and active transport)
12. Functions of biological membranes (3) ion channel and nerve conduction
13. Functions of biological membranes (4) mechanisms of drug action (specific binding)
14. Functions of biological membranes (5) mechanisms of drug action (non-specific binding
15. Functions of biological membranes (6) cell functions and signal transduction
16. Report preparation for structures and functions of biological membranes

Evaluation Criteria〉 Assignments count 100%.

Textbook〉 To be introduced in the class.

Reference〉 To be introduced in the class.

Contents〉 http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216728

Student〉 Able to be taken by only specified class(es)

Contact〉

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Note〉 Goal 1 is related to schedules 1-9 and goal 2 is related to schedules 10-15.