

Název: Liposomes and liposomal structures as tools  
for labeling and screening of nucleic acids

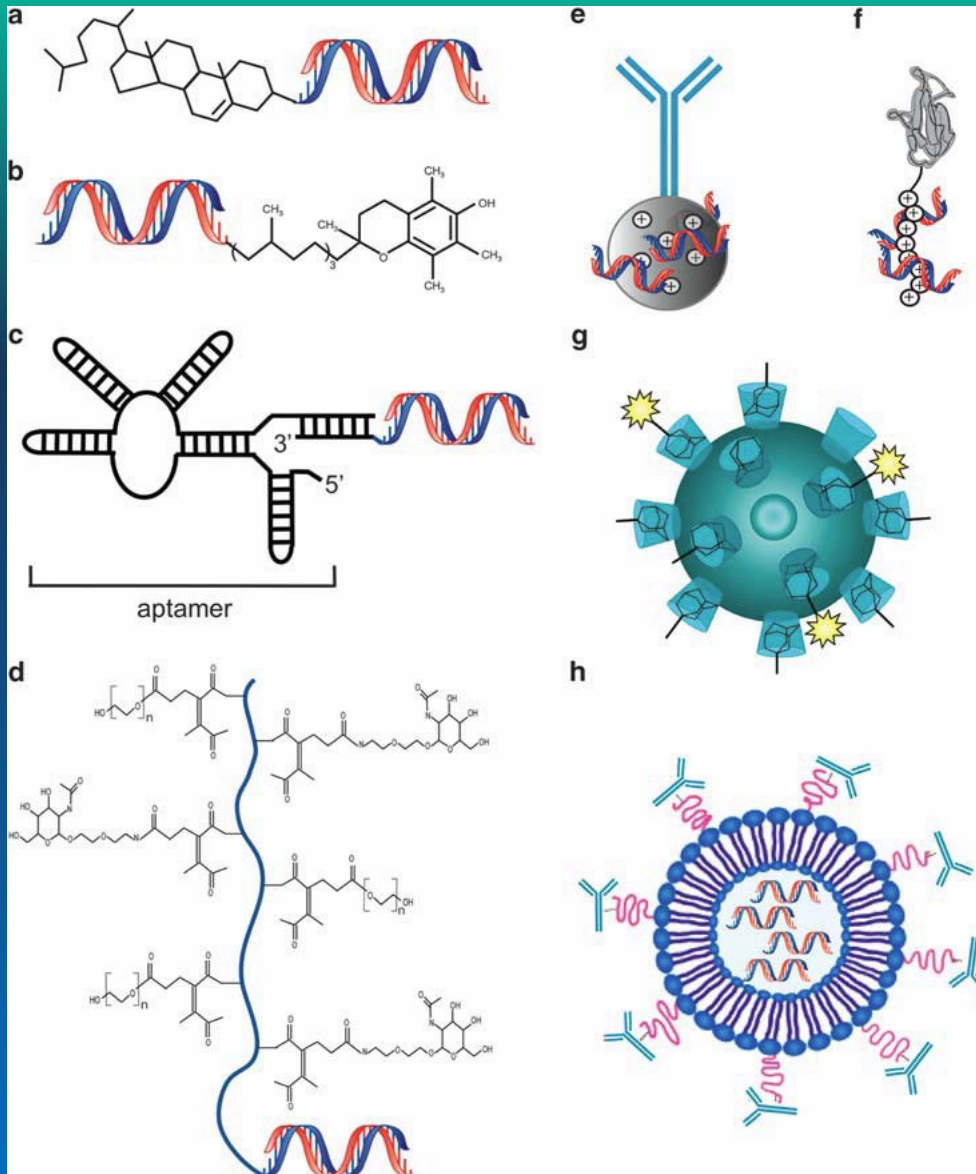
Školitel: Pavel Kopel

Datum: 19.4.2013

## Outline:

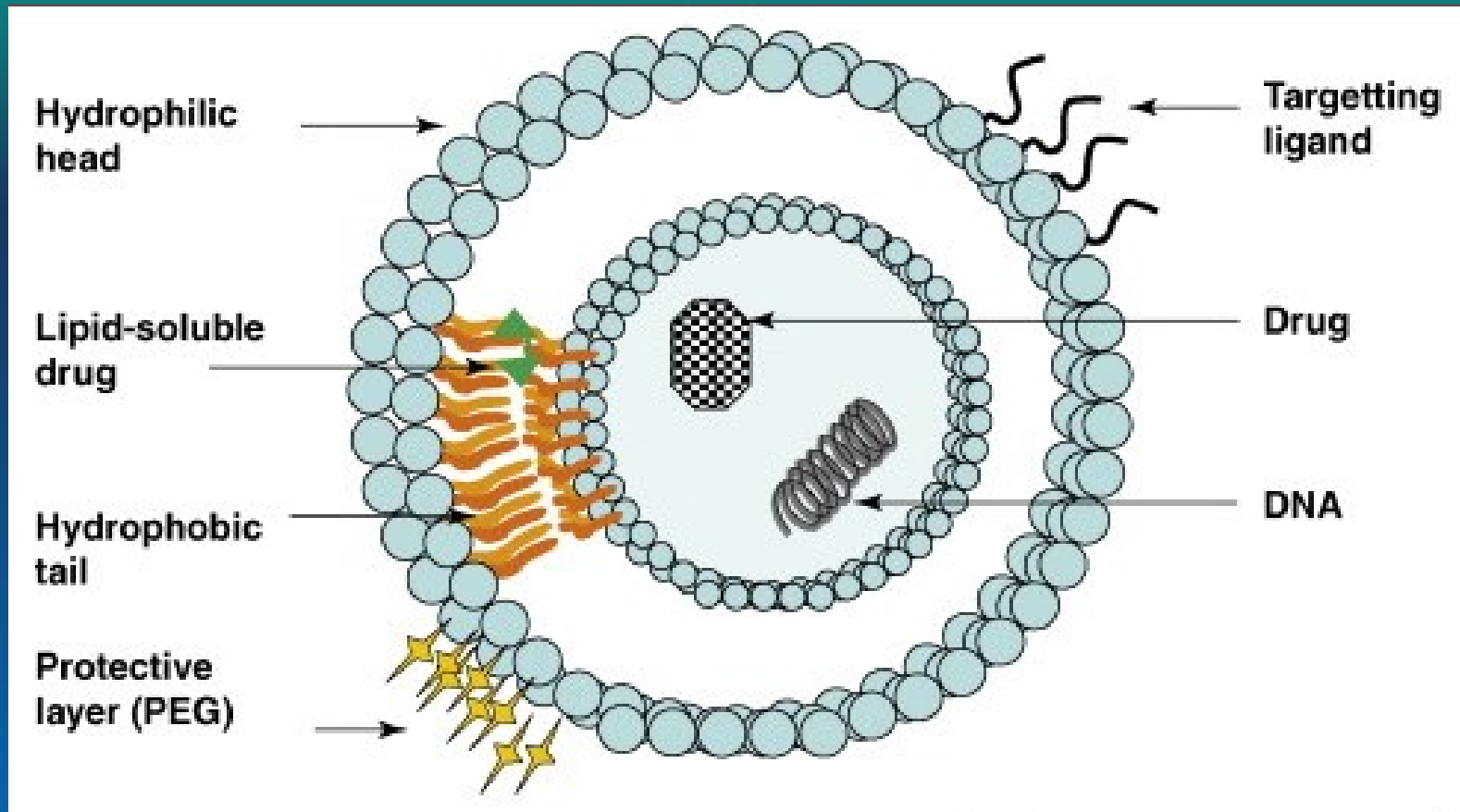
- Liposomes, its structure, composition
- Preparation routes
- Liposome modification
- Cationic liposomes
- Conclusion

# Nanotransporters of RNA

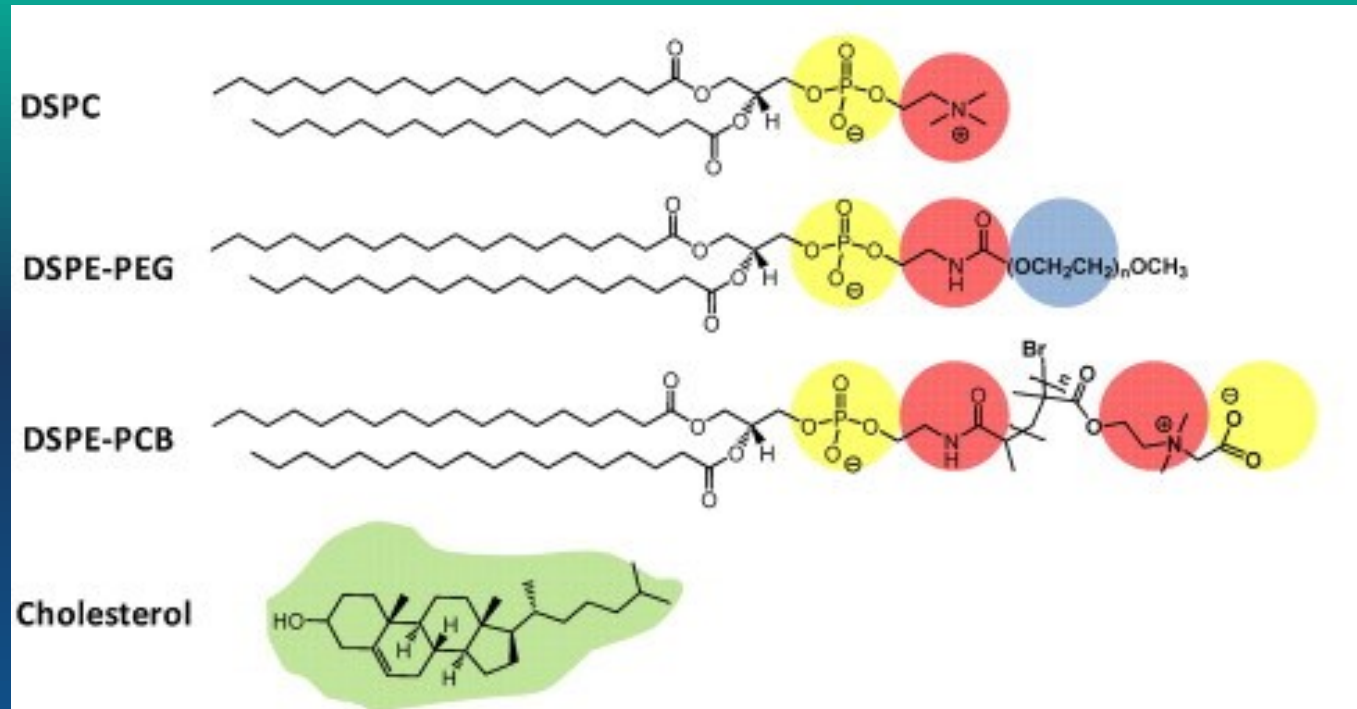


- a) siRNAs that are directly conjugated to cholesterol
- b) small targeting molecules
- c) aptamer
- d) membrane-penetrating polymers linked to targeting small molecules
- e) complexed with fusion proteins composed of an antibody fragment or targeting peptide linked to an RNA-binding domain that is either protamine
- f) polyarginine
- g) encapsulated within nanoparticles
- h) liposomes

# Liposome Nanotransporters

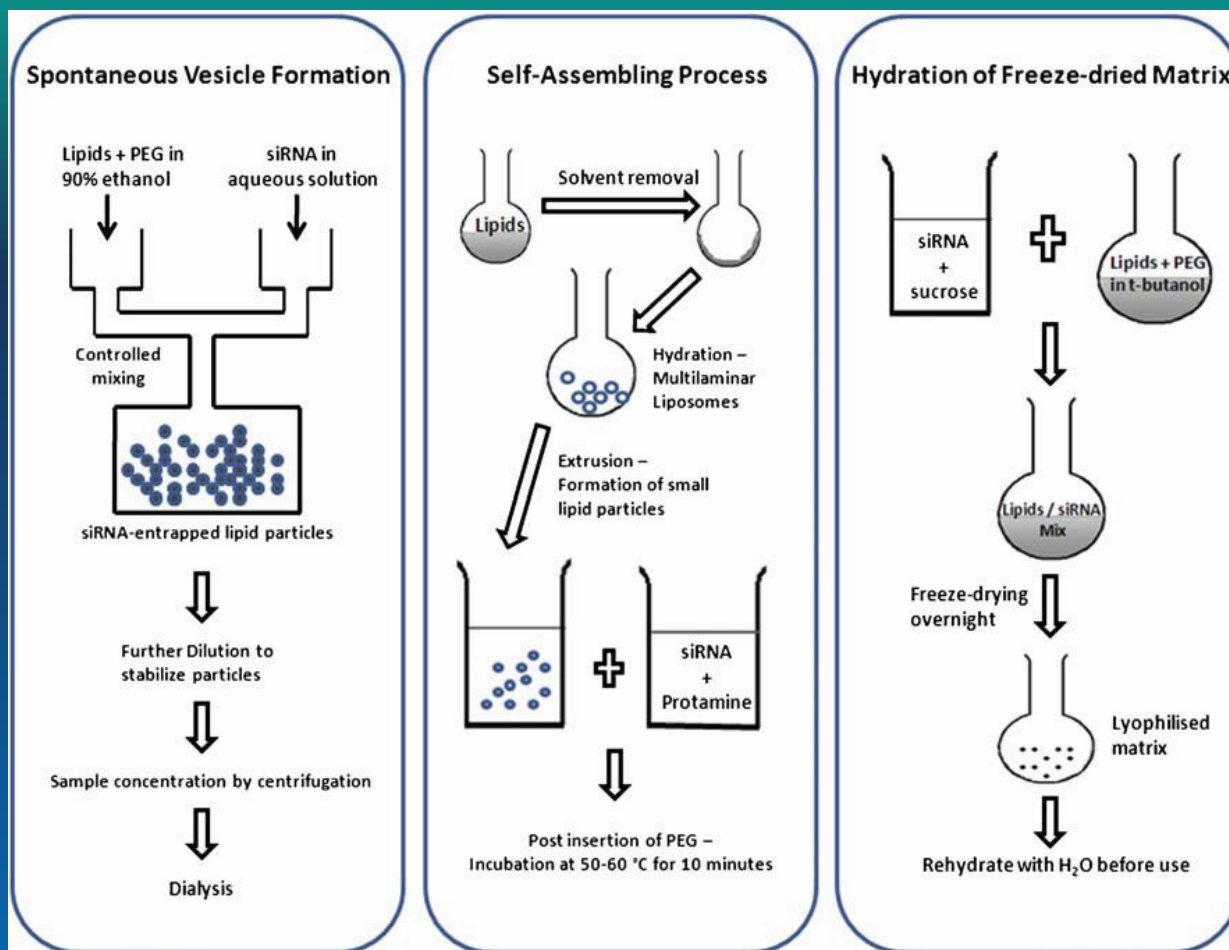


# Liposome composition



- 1,2-distearoyl-sn-glycero-3-phosphatidylcholine (DSPC)
- 1,2-diarachidoyl-sn-glycero-3-phosphatidylcholine (DAPC)
- 1,2-dibehenoyl-sn-glycero-3-phosphatidylcholine (DBPC)
- 1,2-distearoyl-snglycero-3-phosphatidylethanolamine (DSPE)
- 1,2-dioleoyl-sn-glycero-3-phospho-rac-(1-glycerol) sodium salt (DOPC)

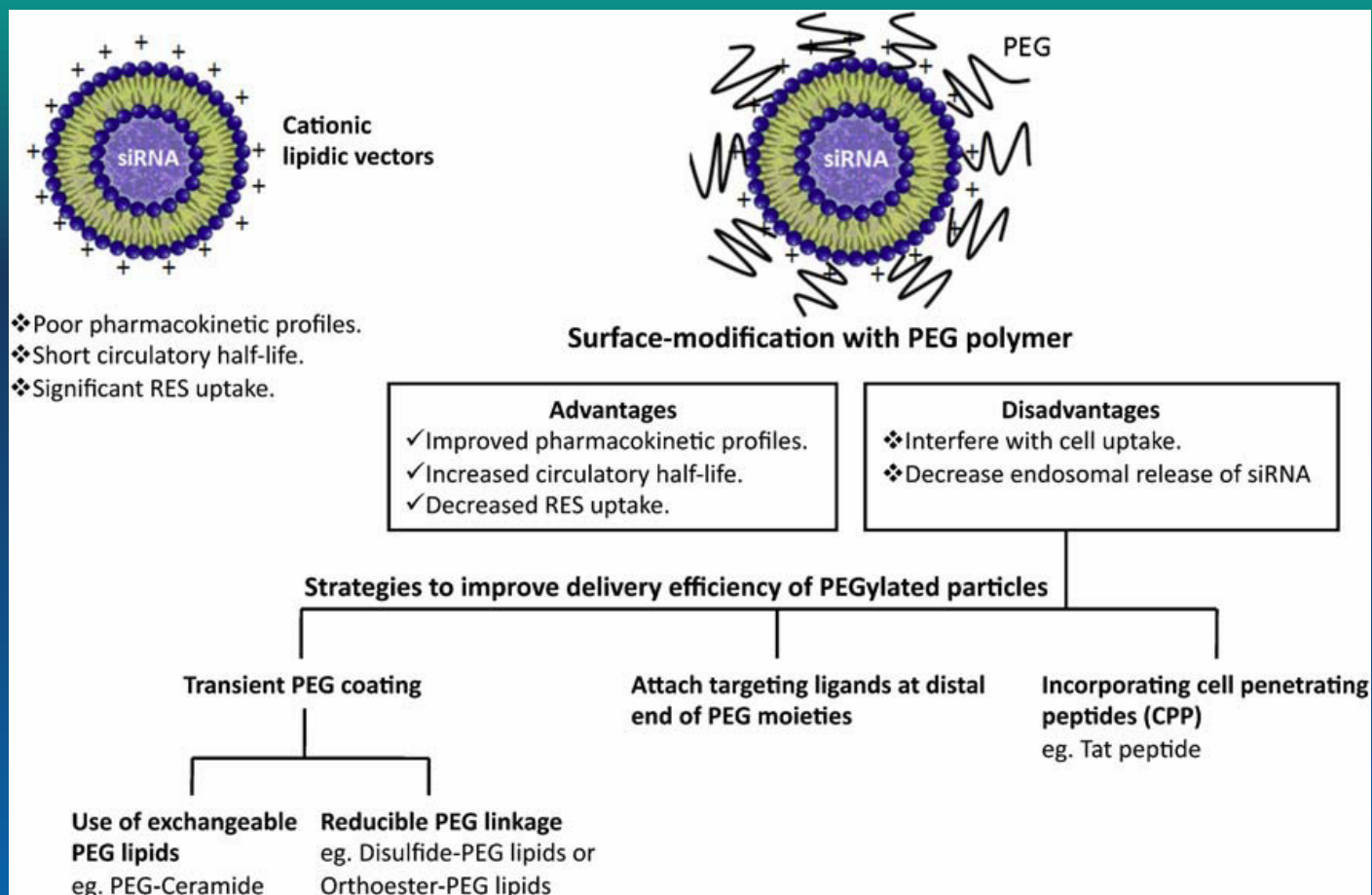
# Lipidic Systems for In Vivo siRNA Delivery



- Formulation strategies for preparation of siRNA (small interfering) -loaded PEGylated lipid particles

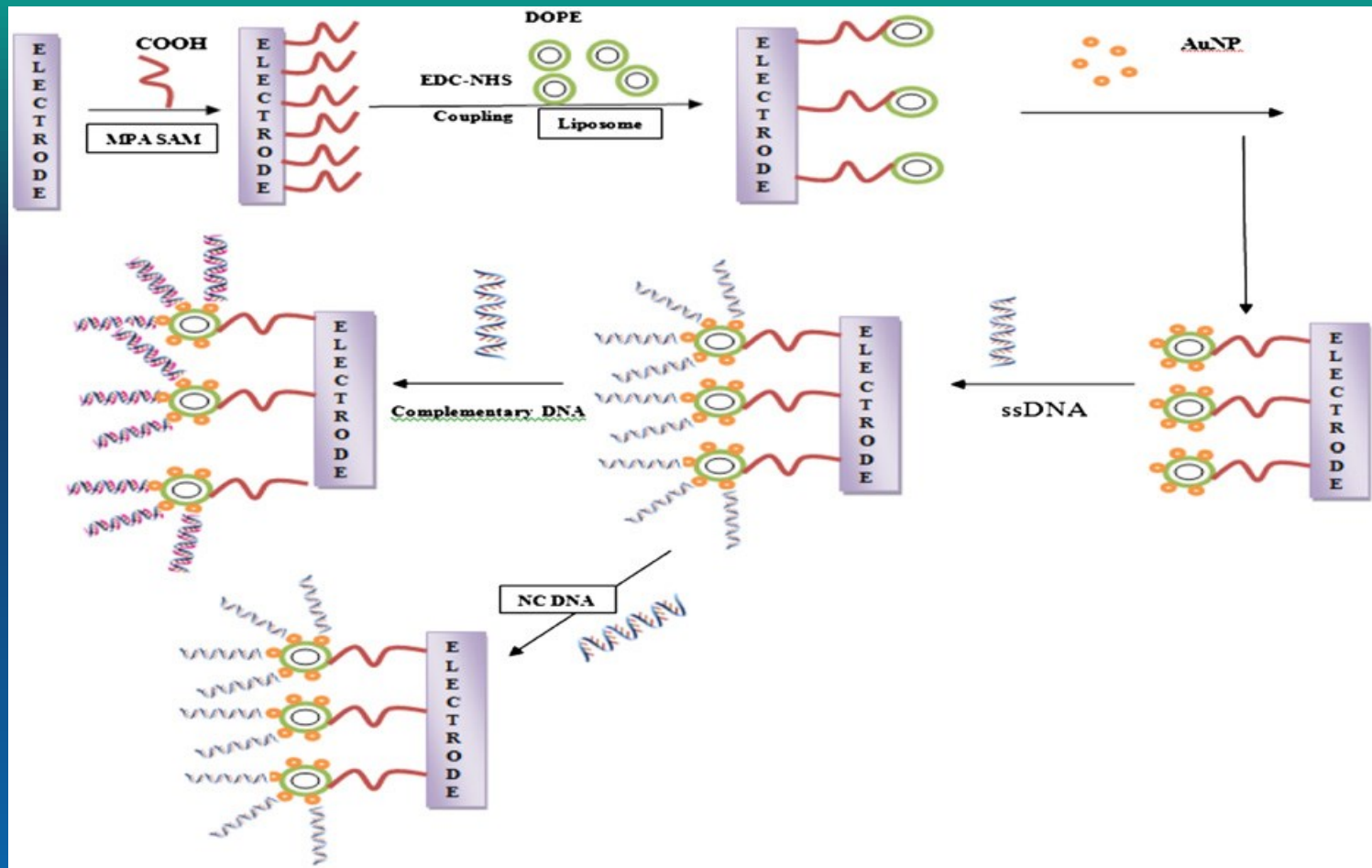
Sherry Y. Wu, A. J. McMillan The AAPS Journal, Vol. 11, No. 4, 2009

# Lipidic Systems for In Vivo siRNA Delivery



- Strategies to enhance the delivery efficiency of PEGylated lipid particles

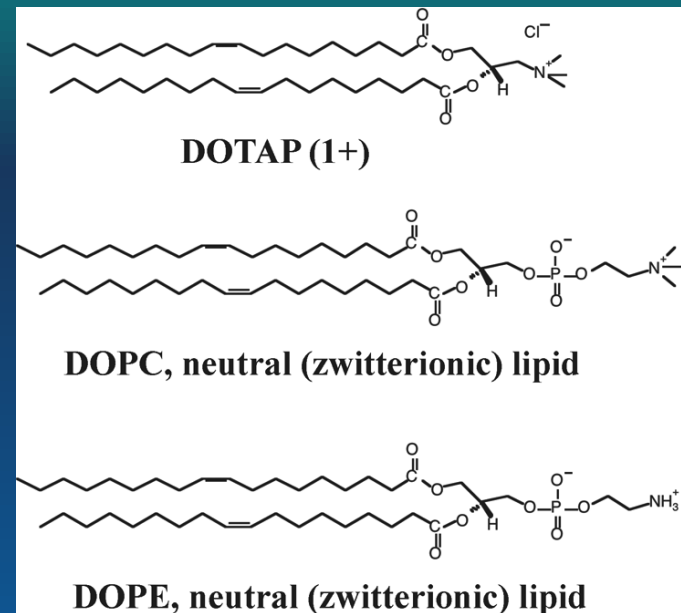
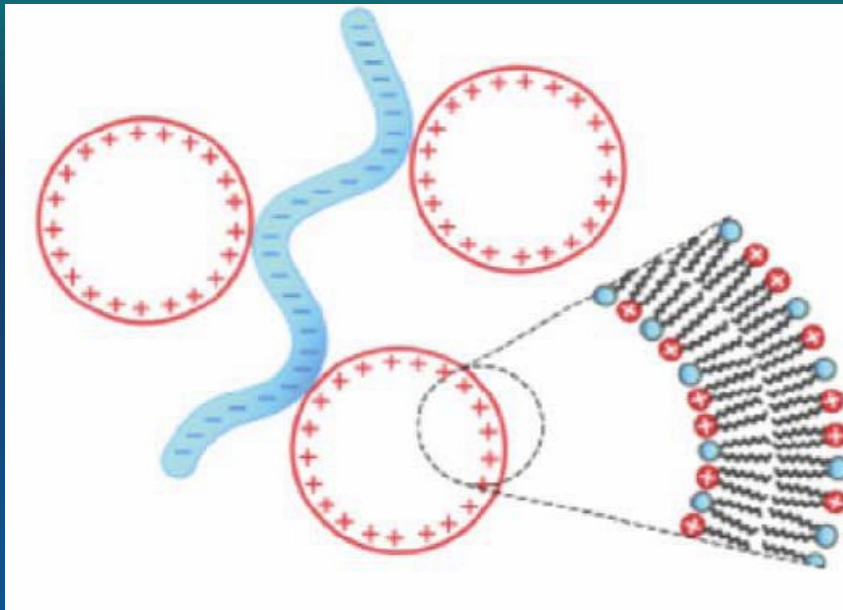
# Gold surface supported spherical liposome



- Formation of spherical DOPE (1,2-dioleoyl-sn-glycero-3-phosphoethanolamine) AuNP nano-composite and DNA detection

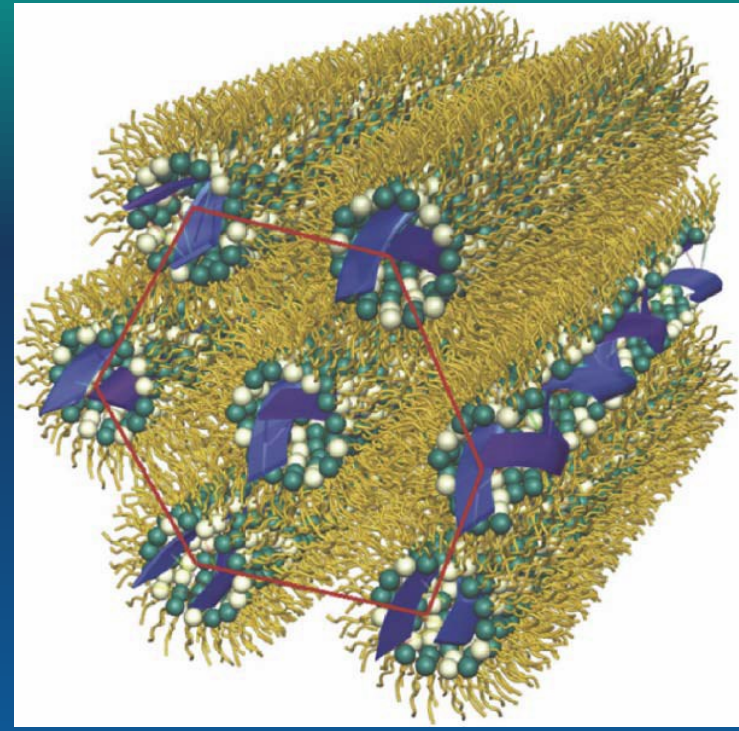
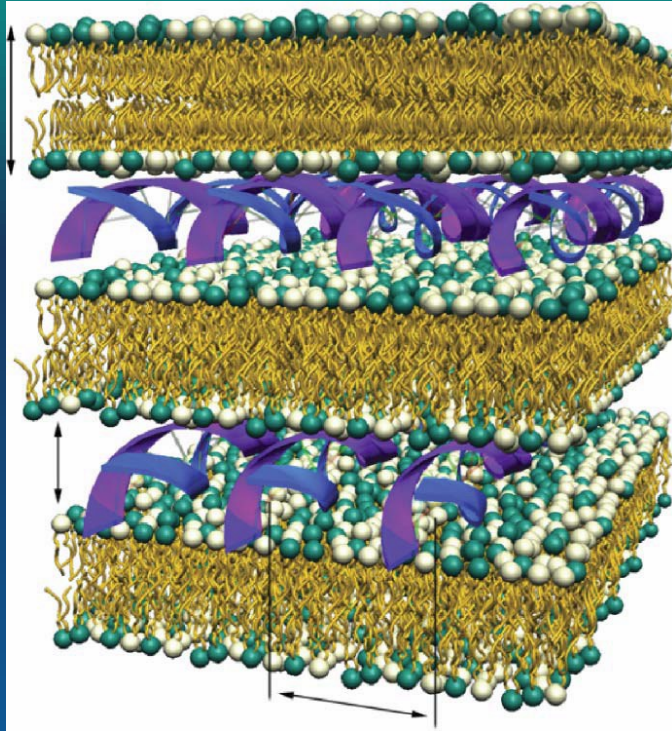


# Cationic liposome–nucleic acid complexes: liquid crystal phases



- Cationic liposome (CL) carriers of nucleic acids - gene delivery
- Formation of complexes - CL-nucleic acid complexes spontaneously assemble into novel liquid crystalline phases

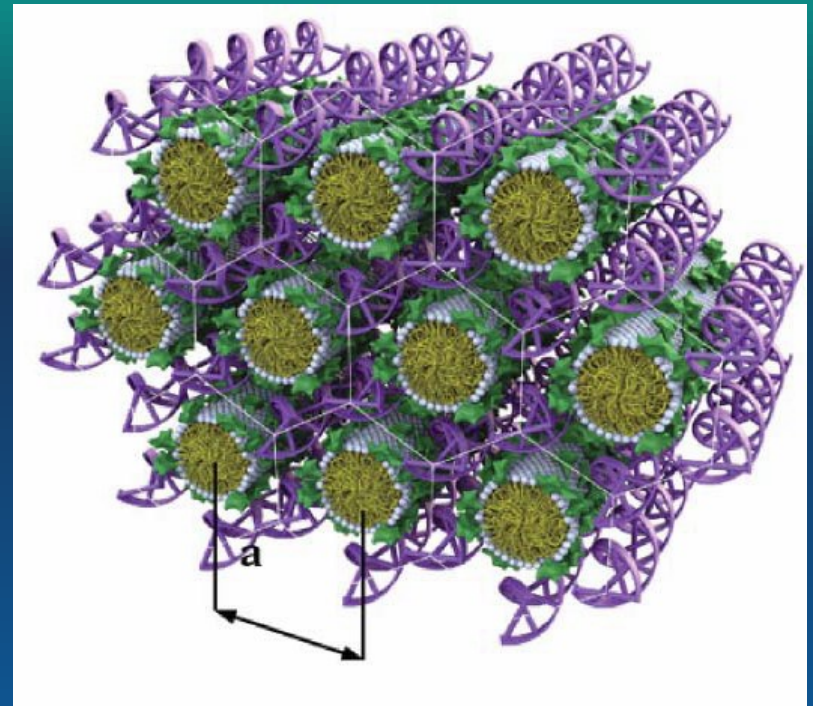
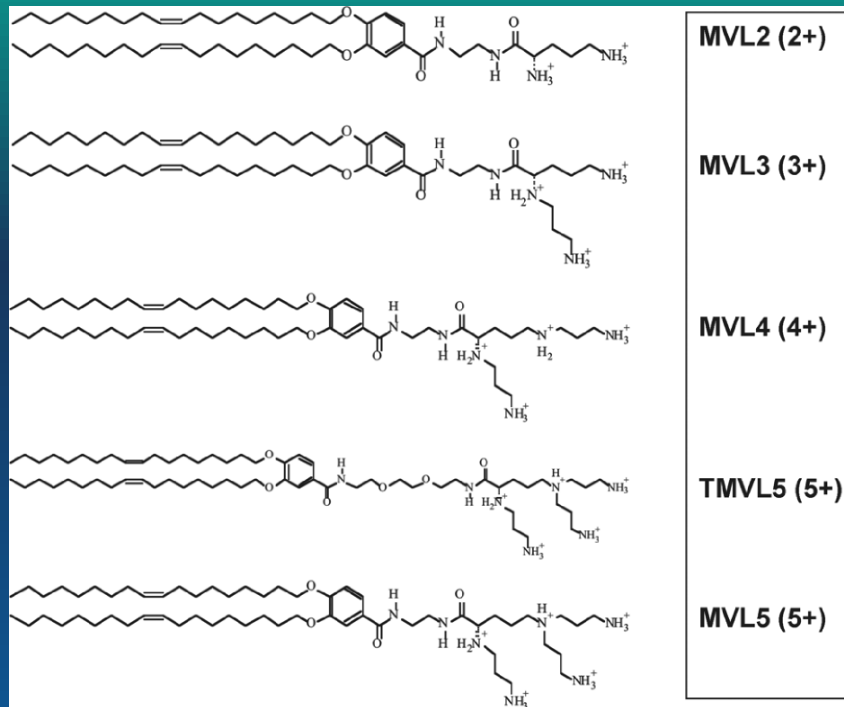
# Cationic liposome–nucleic acid complexes: liquid crystal phases



- Left: Schematic of lamellar phase with alternating lipid bilayer–DNA monolayer of cationic lipid–DNA (CL-DNA) complexes
- Right: Schematic of inverted hexagonal phase of cationic lipid–DNA (CL-DNA) complexes. In this phase, cylinders consisting of DNA coated with an inverse lipid monolayer are arranged on a hexagonal lattice.

C.R. Safinya et al., *Liquid Crystals*, 38:11-12, 1715 (2011)

# Cationic liposome–nucleic acid complexes: liquid crystal phases



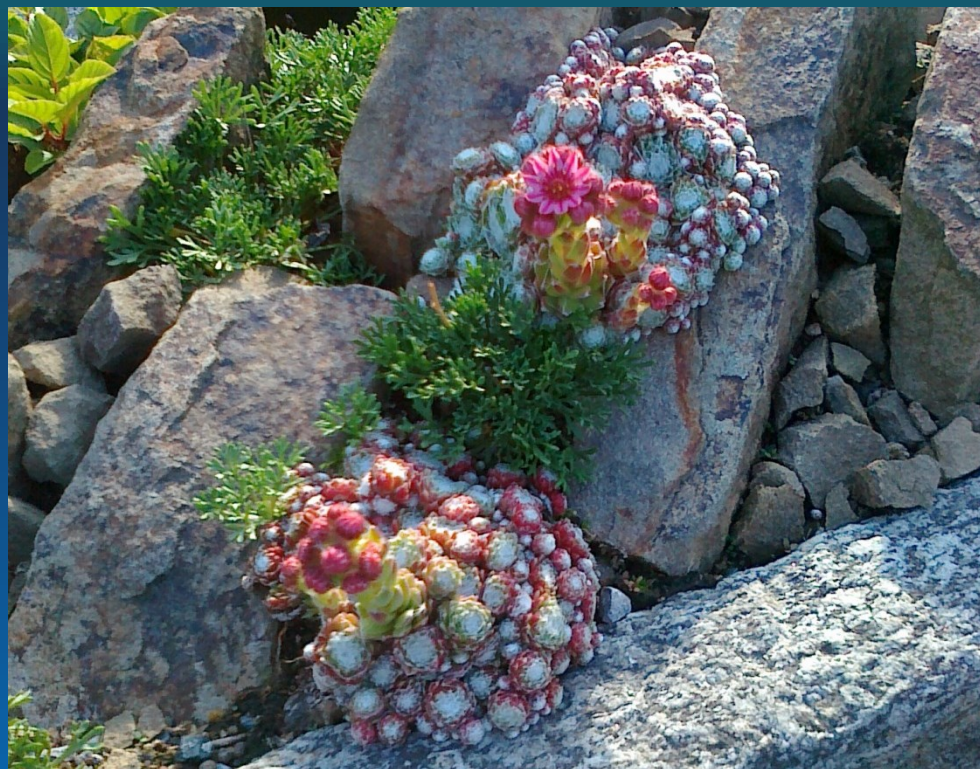
- Left: Chemical structure and maximum charge of custom-synthesised multivalent lipids (MVLs).
- Right: Schematic of CL-DNA complexes. In this phase, oppositely charged DNA chains surround cylindrical micelles arranged on a hexagonal lattice.

# Conclusion

- Liposomes and their complexes can be exploited for delivery of RNA and DNA to cells.
- It can be a useful tool for treatment of many diseases.
- There are still problems with gene therapy and many questions must be solved

# Acknowledgments

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