



## CHAPTER TWO

# $^{31}\text{P}$ NMR Studies of Phospholipids

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## Contents

1. Introduction	28
2. Basics of $^{31}\text{P}$ NMR	30
3. $^{31}\text{P}$ NMR in Biomembranes	31
4. Nonoriented Phospholipid Systems	35
5. Phospholipid Mesophases	47
6. Oriented Bilayers	49
7. Temperature and pH Effects	50
8. Acidic Lipids	53
9. Cholesterol and "Rafts"	57
10. Phospholipid/Peptide Systems	72
11. Conclusion	72
Acknowledgments	85
References	85

## Abstract

$^{31}\text{P}$  nuclear magnetic resonance (NMR) can provide information on the composition of phospholipid (PL) membranes, lipid headgroup orientation relative to the bilayers normal, and the phase state of PL systems. Interaction of the membrane with ions, drugs, other small molecules and peptides may lead to lipid phase change and lamellar phase disturbances, which can also be revealed in  $^{31}\text{P}$  NMR spectra. Traditional  $^{31}\text{P}$  NMR spectroscopy has been used for years, mainly to study lipid phase state. In the last few years, however, its utility has been extended by a number of solid-state methods in field-cycling spectroscopy. Membrane mimicking systems have been complemented with bicelles, which are more convenient for studying peptide structure in lipid-peptide interactions. Another challenge is the study of ordered membrane domains (rafts) induced in the presence of cholesterol or certain proteins. As a result, recent work has refined the structure of PL headgroups and elucidated membrane responses to interactions with peptides and other molecules. Selected examples of such fascinating investigations are presented here.

**Keywords:**  $^{31}\text{P}$  NMR, Cholesterol, Lipid rafts, Lipid bilayers, Lipid mesophases, Lipid/peptide systems, Phospholipids