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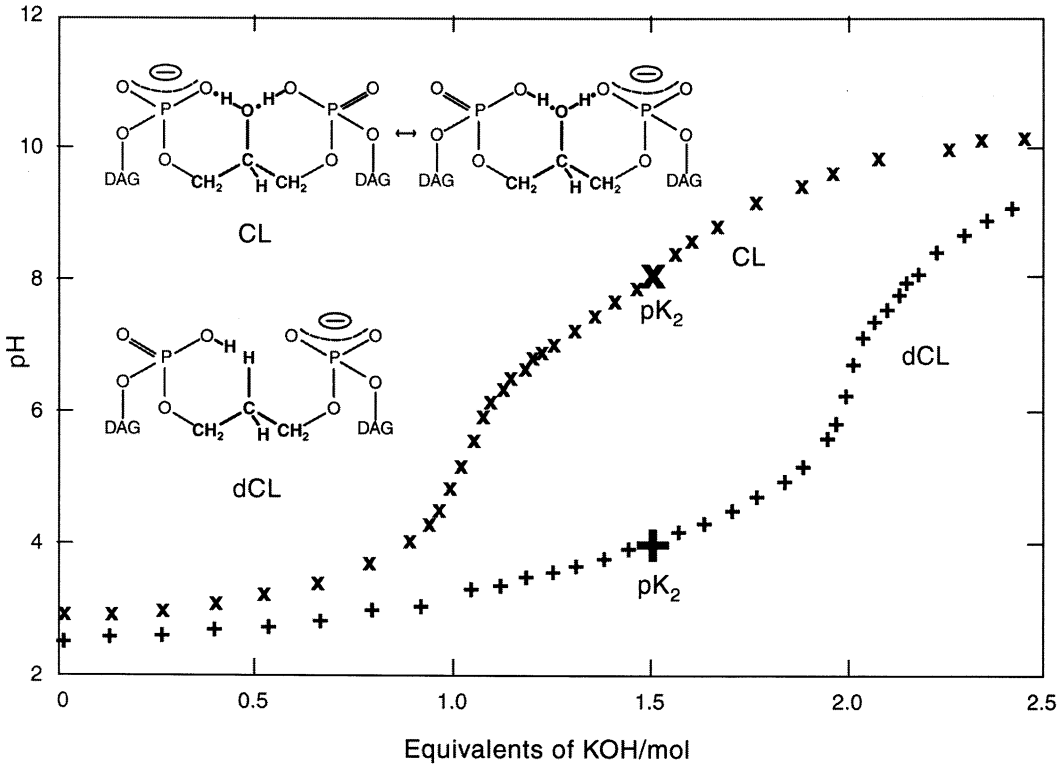
Abstract **The role of specific lipid structures in biological membranes has been elusive. There are hundreds of them in nature. Why has nature made them? How do they aid in the functioning of membrane proteins? Genetics with its 'knock out' organisms declares that functions persist in the absence of any particular lipid. Nonetheless some lipids, such as cardiolipin (CL), are associated with particular functions in the cell. It may merely expand the variety of culture conditions (pH, temperature, etc.) under which the wild-type organism survives. This article explores a unique role of CL as a proton trap within membranes that conduct oxidative phosphorylation and therefore the synthesis of ATP. CL's pK_2 (above 8.0) provides a role for it as a headgroup proton trap for oxidative phosphorylation. It suggests why CL is found in membranes that pump protons. The high pK_2 also indicates that the headgroup has but one negative charge in the neutral pH range. Data on the binding of CL to all of the oxidative phosphorylation proteins suggest that the CL may aggregate the oxidative phosphorylation proteins into a patch while it restricts pumped protons within its headgroup domain – supplying protons to the ATP synthase with minimal changes in the bulk phase pH.**

Key words:

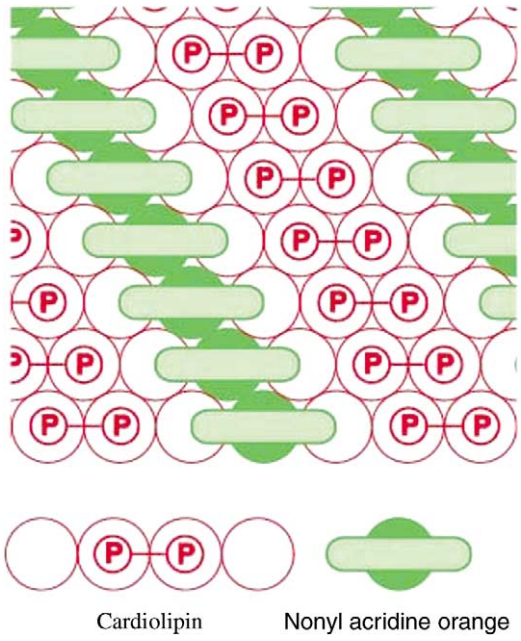
1. Introduction

E-mail address:

Abbreviations:



2. The chemistry of CL

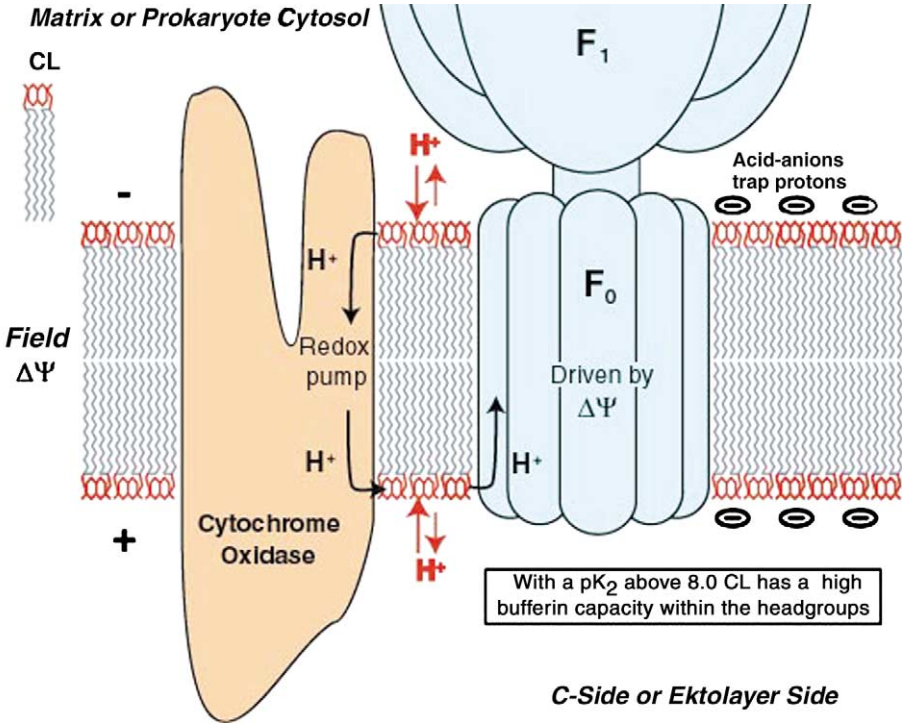


Escherichia coli *E. coli*-

(-)-

between

3. CL and the oxidative phosphorylation proteins



4. Protons at the bilayer surface

References