

MSc Defense

Iain Braithwaite

Date: Tuesday August 23rd, 2011

Time: 10:00a.m.

Location: Science Complex 1511

Title: Investigating the Molecular Order and Orientation of Cholesterol in Mixtures of Polyunsaturated Phospholipids

Abstract: Cholesterol is critical to ensure proper functioning of a membrane. Despite this, the movement of cholesterol within the cell is not fully understood. The molecular order of binary and ternary mixtures of polyunsaturated fatty acids with varying degrees of hydrocarbon chain unsaturation with 1,2-dimyristoyl-*sn*-glycero-3-phosphocholine (DMPC) and/or cholesterol was studied using ^2H NMR. The introduction of cholesterol into samples of 18:1PC, 18:2PC (unsaturated lipid/DMPC- d_{54} /CHOL, 75:5:20mol%) increased the $\text{C}-^2\text{H}$ bond order by $\sim 30\%$. Similar bond ordering was found for 20:4PC and 22:6PC samples, however, they were temperature dependent. A two-phase region (l_o - l_d) was found for 22:6PC:DMPC- d_{54} /CHOL (75:5:20mol%) for temperatures below 286.7K. The reorientation axis formed an angle of $78 \pm 4^\circ$ with respect to the C_3 - ^2H bond vector regardless of the lipid. The order parameter of cholesterol was temperature independent, and ranged from 0.69 ± 0.04 to 0.78 ± 0.04 depending on the lipid unsaturation. The reorientation axis of cholesterol was oriented at $\sim 17.5^\circ$ to the bilayer normal.

Advisor: James H. Davis

Chair: Rob Wickham

Examining Committee: Don Sullivan, Vladimir Ladizhansky