Phosphoinositides as key regulators of membrane organization

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Phosphoinositides are a class of minor phospholipids found in the cytoplasmic leaflet of the cellular membranes. Their inositol head group can be phosphorylated or dephosphorylated by kinases or phosphatases to generate seven distinct species. Phosphatidylinositol 4-phosphate (PI(4)P), a previously poorly characterized mono-phosphorylated phosphoinositide, has now been established not only as a critical regulator for many cellular processes, but also as an essential host factor for pathogens. A particular interest of our group is the emerging role of PI(4)P in the formation and function of membrane contact sites, the specialized membrane zones where the plasma membrane or membrane-bound organelles are closely apposed. We have shown that PI(4)P facilitates the formation of membrane contact sites between the endoplasmic reticulum and other membranes, and drives the countertransport of lipids between these membranes.

In this seminar, I will overview the principle of the lipid countartransport at membrane contact sites and discuss mechanistically how PI(4)P drives it. Our recent findings on the physiological properties of such lipid countertnraport system will be also discussed.