Towards better cell membrane mimics: cholesterol-containing supported lipid bilayers on TiO_2

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Cell membranes are based on fluid bilayers containing various lipids. They exhibit complex transverse and lateral organization. Lipids are asymmetrically distributed across the membrane. Specifically, charged and interactive lipids such as phosphatidyl serine (PS) are enriched in the cytoplasmic leaflet while non-interactive zwitterionic lipids are enriched in the extracellular leaflet.[1] This asymmetry has physiological consequences in processes such as blood coagulation, cell-cell interactions, and apoptosis.[2] Supported phospholipid bilayers (SLBs) are a popular cell membrane model. However, most SLBs contain maximum of two components. Models containing realistic lipid mixture are scarce. We have previously shown that we can prepare asymmetric SLBs composed of low-melting PC and PS on titanium dioxide (TiO_2), the oxide of an widely used implant biomaterial, titanium.[3] We have now extended this work and are able to prepare asymmetric SLBs composed of low and high-melting PC, cholesterol, and PS. Mixtures of low and high-melting PC and cholesterol have been used to capture membrane lateral phase separation. Our SLBs are thought to mimic the composition and transverse distribution of lipids in the cell membranes. They also have applications in biomaterial and biosensor research.

References

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