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Translocation of non-ionic synthetic polymers through lipid membranes

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Polymers with balanced hydrophilicity can passively translocate through biological membranes without damaging them. In the case of synthetic polymers there are only few reports of translocation using charged polymers. For non-charged polymers translocation phenomena were predicted theoretically but not verified experimentally. Especially these polymers are expected to show weak interactions with bio membranes and are interesting candidates for drug delivery applications.

We have synthesized such balanced amphiphilic polymers which contain alternating low MW hydrophobic and hydrophilic units. We studied translocation properties of the polymers using Pulsed Field Gradient (PFG) NMR and their interactions with lipid membranes using Neutron Reflectometry (NR) and Small Angle Neutron Scattering (SANS). The PFG NMR results show a strong dependence of the translocation rate on polymer molecular weight and hydrophobic block length. The first NR and SANS measurements show that the polymers are partially solubilized in the hydrocarbon part of the bilayer, and the effect is more prominent for less hydrophilic but still water soluble polymers.

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