Structural Changes of Alpha 1-Antitrypsin under Osmotic Pressure and in the Presence of Lipid Membranes

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Alpha 1-Antitrypsin (A1AT) is a glycoprotein that has been shown to have protective roles of lung cells against emphysema, a disease characterized by lung tissue destruction. Most known glycoproteins have been shown to play a role in cellular interactions but the exact role of the glycan chains is still under investigation. Previous electrophysiological measurements show that A1AT has a strong affinity to lipid bilayers perturbing the function of ion channels present in the membrane. We have performed contrast-matching small-angle neutron scattering (SANS) experiments to study the conformational changes of the glycosylated form of A1AT for different concentrations of the osmolyte poly(ethelene glycol) (PEG) and in the presence of two different lipid membranes: POPC and POPS. We also monitor the structural changes of the lipid vesicles in the presence of A1AT by SANS. Guinier fits were used as a first approximation to obtain the radius of gyration (R_g) of A1AT. Bragg peaks were used to study structural changes of lipid vesicles. We observed that the R_g of A1AT changes as a function of PEG concentration in solution and when in the presence of lipid vesicles. The deformations monitored through changes in A1AT's R_g in the presence of lipid vesicles are compared to the deformations of the glycoprotein observed under osmotic pressure and to the structural changes observed in the lipid vesicles.

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