Séminaire

INSTITUT Charles SADRON
UPR 22 - CNRS - STRASBOURG

Mardi 22 mars 2022 à 10h30
Amphithéâtre Henri Benoît et visio

Jean-Baptiste Fleury

Saarland University - Germany
Experimental Physics and Center for Biophysics

Are there physical interactions between plastics and lipid membranes ?

Estimated millions of tons of plastic are dumped annually into oceans. Plastic has been produced only for 70 y, but the exponential rise of mass production leads to its widespread proliferation in all environments. As a consequence of their large abundance globally, microplastics are also found in many living organisms including humans. While the health impact of digested microplastics on living organisms is debatable, we reveal a physical mechanism of mechanical stretching of model cell lipid membranes induced by adsorbed micrometer-sized microplastic particles most commonly found in oceans. Combining experimental and theoretical approaches, we demonstrate that microplastic particles adsorbed on lipid membranes considerably increase membrane tension even at low particle concentrations. Each particle adsorbed at the membrane consumes surface area that is proportional to the contact area between particle and the membrane. Although lipid membranes are liquid and able to accommodate mechanical stress, the relaxation time is much slower than the rate of adsorption; thus, the cumulative effect from arriving microplastic particles to the membrane leads to the global reduction of the membrane area and increase of membrane tension. This, in turn, leads to a strong reduction of membrane lifetime. The effect of mechanical stretching of microplastics on living cells membranes was demonstrated by using the aspiration micropipette technique on red blood cells. Beyond this example, we discuss the possibility of the existence of a new physical interaction between a micro-nanoplastic and a lipid membrane.

J.B. Fleury and V.A. Baulin, PNAS, 118, 31, (2021) e2104610118

Les personnes souhaitant rencontrer JB Fleury sont priées de prendre contact avec Fabrice Thalmann.