DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Surface adsorped peptide films (SAPFs) on arbitrary inorganic and organic substrates, such as tissues, are promising candidates for an intermediate layer modulating "mutual stickiness", a.k.a. adhesion, of various biological objects, including various kinds of cells. Thus, it is interesting to use them in tissue bioengineering, e.g., as promoters of various scaffolds, as well as in treatment of many diseases, including cancers. However, for better characteristics of SAPFs and obtaining understanding of the links between their structure and adhesive properties, one needs to perform a substantial basic science research.

Our **research objective** is to **understand the influence of surface adsorption on the structure changes in selected peptides forming monolayers on an arbitrary substrate. In addition, we would like to address how those structural changes modify adhesive properties of the peptide films at relevant experimental conditions**.

Because it is still very challenging to infer the SAPFs structure, we propose a novel bio-nanomechanical approach, i.e., to infer their structure from the knowledge of their nanomechanical properties. In order to do so, we propose to combine experimental measurements of the so-called mechanical signatures (MSs) with computational modelling and their analytically obtained counterparts. The MS will comprise calibrated normal and lateral molecular stiffnesses and corresponding normal and lateral damping coefficients for the peptides within the film. The experimental data will consist on atomic force microscopy (AFM) measurements of MSs for several well characterized SAPFs. Those data will be connected to the structure of SAPFs via analytical models and computer simulations. Local adhesive properties of SAPFs will be measured also via AFM techniques and modelled via computer simulations. All computer simulations will be designed and performed in their major part by a World class specialist in this field and our leading foreign collaborator on this grant, prof. K. Kuczera from the University of Kansas, KS, USA.