Anti-fouling surfaces for hemocompatible devices inspired by extracellular matrix protein

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Non-specific protein adsorption leads to undesirable phenomena such as platelet adhesion and thrombosis upon contacting the surface with blood in biomedical applications including cardiovascular implants, biosensors, and bioanalytical devices. It is well published that hydrophilic polymers such as polyethylene glycol (PEG) indicate the resistance of protein adsorption, however, the synthetic polymers are generally restricted for external usages. The major structural protein in the extracellular matrix, collagen plays an essential role in providing a scaffold for cells. The backbone forming the triple helical structure occupies most of the collagen molecule and is supporting the specific interaction between active sites such as Arg-Gly-Asp sequences and cell surface receptors. The collagen triple helical structure consists of three left-handed polyproline-II helices (PP-II) having Gly-Pro-Hyp repetitive sequences. Hence, we built a hypothesis that the oligo-proline which forms PP-II and is not including any functional group might not possess any biological function resulting that it works as an anti-fouling biomolecule. In this lecture, the anti-fouling properties of oligo-proline immobilized surfaces, in particular, their hemocompatibility will be shared and discussed.