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NOREPINEPHRINE AS NEW FUNCTIONAL MONOMER FOR MOLECULAR IMPRINTED OPTICAL BIOSENSORS: APPLICATIVE STUDY ON HUMAN AND CANINE BIOMARKERS

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Molecular imprinting gained increasing attention over the last two decades and today it represents a viable approach for the development of sensing platforms toward a wide panel of analytes, including biomarkers [1]. Over the years, various functional monomers have been exploited for the assembly of the polymeric network that embeds the selective cavities for the target. In this framework, dopamine has been widely investigated as monomer in non-covalent imprinting, however the uncontrollable surface morphology and the formation of precipitates during the polymerization may limit its applications. Like dopamine, norepinephrine (NE, or noradrenaline) is a neurotransmitter belonging to the family of catecholamines and it is able to easily self-polymerize in alkaline conditions, by forming adherent films on various type of surfaces, such as noble metals, metal oxide, glass and synthetic polymers [2].
In the last ten years polynorepinephrine (PNE) has been investigated in coating chemistry, while NE appears in few examples as template for molecular imprinting [3]. However, to the best of our knowledge, the only example of NE used as functional monomer for the development of a recognition element, consists in a solid phase polymer for the enantio-separation of some amino acids and other small molecules [4].
Two surface properties distinguish PNE from polydopamine (PDA): 1) the increased hydrophilicity due to the presence of the hydroxyl group in the benzylic position of NE; 2) the smoothness at the nanometer scale, given by the intermediate 3,4-dihydroxybenzaldehyde (DHBA) that reduces the surface roughness [5, 6]. In the context of molecular imprinting, the higher hydrophilic nature of PNE could reduce the non-specific adsorption of proteins thus favoring the selective binding of the target analyte.
Here we present the first example on the use of norepinephrine (NE) as functional monomer for imprinted optical biosensors, and possible application to molecular diagnostic i.e. the detection of human troponin I (TnI) and canine procalcitonin (PCT), crucial biomarkers for acute myocardial infarction (AMI) and sepsis, respectively. Moreover, we investigated the advantages of the epitope approach, in PNE imprinting, wherein only short peptides are printed, by overcoming the drawbacks of the whole protein imprinting (e.g. non-specific binging, instability, high cost). The imprinting of PNE has been performed on gold sensor chips and the efficiency of the relative optical biosensors has been investigated by SPR transduction. As result, PNE has proved to be a promising candidate for developing

biomimetic receptors by molecular imprinting with application to biosensing. It represents an interesting alternative to PDA, improving eventually the analytical sensor performances by reducing the non-specific binding of matrix components to the chip surface.

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