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FACULDADE DE CIÊNCIAS E TECNOLOGIA UNIVERSIDADE NOVA DE LISBOA

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Monoliths for Antibody Purification

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2008 - Graduation in MIEQB, FCT
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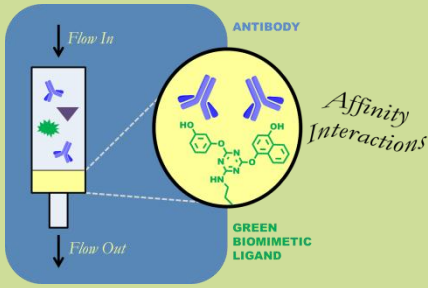
2010 - Prémio Gulbenkian Estímulo à Investigação: "Selective Immunoaffinity devices: a new alternative to blood treatment"

Objectives

In the last years, the global antibody market has grown exponentially due to increasing applications in research, diagnostics and therapy. This led to the need of developing novel platforms for purification of large quantities of antibodies with defined clinical and performance requirements.

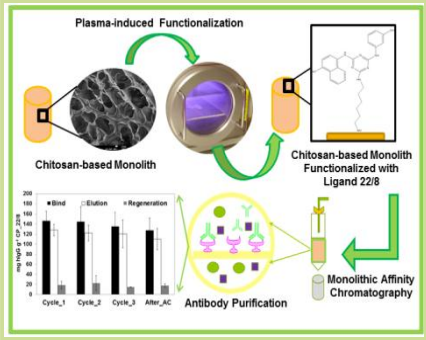
The main goal of this work is the development of an integrated strategy to produce affinity supports, highly specific for antibody capture and elution. The new approach will consist on the production of 3D porous structures with controlled morphology and further functionalization with specific ligands, using alternative solvents and more sustainable technologies.

The affinity monoliths presenting high porosity, rapid mass transfer, attractive surface areas and chemical flexibility for ligand attachment, will be evaluated as alternative purification platforms to purify antibodies from crude extracts.



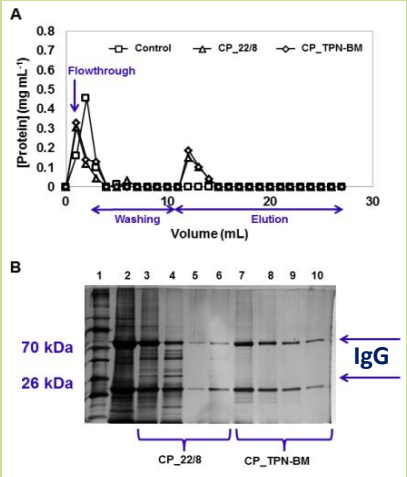
Methodology

- Preparation of different 3D porous structures using different renewable materials by freeze drying method and supercritical carbon dioxide-assisted phase inversion methods.
- Detailed morphological, mechanical and physico-chemical characterization of 3D porous structures (monoliths).
- Synthesis and optimization of new biomimetic ligands through green and sustainable procedures for further immobilization onto natural based monoliths.
- Affinity ligand validation by modeling computational studies.
- Evaluation of modified natural monoliths as affinity supports for antibody purification.



Expected Results

- The affinity chitosan-based monoliths present high binding capacities (150±10mg of antibody per gram of support), and are able to recover 90±5% of the bound protein with 98% purity directly from cell-culture extracts [1].
- The biomimetic ligand (TPN-BM) was synthesized following a new greener and sustainable procedure that overcome the limitations of ligand 22/8, known as artificial Protein A [2].
- The TPN-BM functionalized monoliths present high binding capacity (170±10mg antibody per gram of support), and are able to capture monoclonal antibodies directly from mammalian crude extracts in 85±5% yield and 98% of purity.
- Monoliths may well prove to be the ideal bespoke chromatographic medium that will take complex bioseparations from the research bench to sustainable large-scale industrial processes [3].



1: calibration proteins 2 : loading 3 and 7: flowthrough 4 and 8: Washes 5, 6, 9,10: Elutions

[1] T. Barroso et al. RSC Adv., 2012, 2, 11285–11294, [2] T. Barroso et al. Green Chem., Submitted., [3] T. Barroso et al. Biotechnol. J. 2013, in press

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