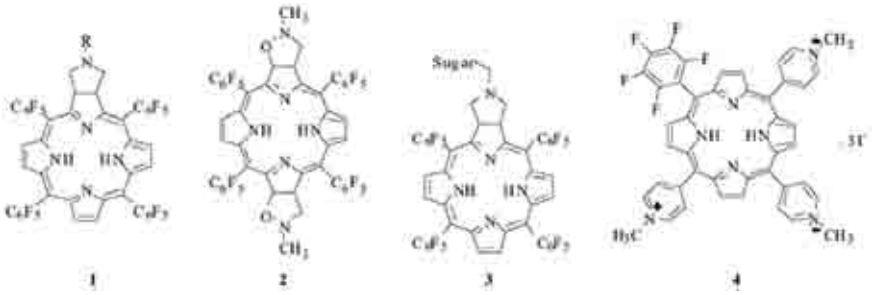
organic synthesis. new products with potential applications

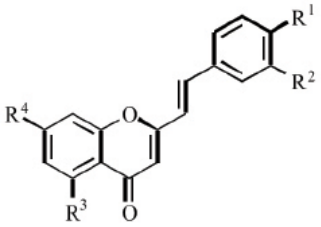
organic chemistry research group

department of chemistry & QOPNA, university of aveiro



A) Structural features and amphiphilic properties are required for a new porphyrin derivative to be considered as a photosensitizer (PS) in photodynamic therapy (PDT). In such way chlorins and bacteriochlorins, as well as certain cationic and glycoconjugate derivatives, have been targets for several research groups. We have been able to establish that certain porphyrin macrocycles can act as dienophiles or dipolarophiles in cycloaddition reactions; in such way novel chlorins and bacteriochlorins and some glycoconjugates and novel cationic derivatives can be obtained. In collaboration with other groups the new products have been assessed as photosensitizing agents in PDT or in the photoinactivation of microorganisms. In particular, the action against antibiotic resistant bacteria, mainly the Gram (-) ones, is of great significance. It is also possible to photoinactivate microorganisms present in water samples, including sewage ones. Such potential applications have been patented.

B) Inflammatory processes are complex physiological responses, which involve an increase in vascular permeability as well as overproduction of reactive oxygen and nitrogen species. If these reactive species overcome host defense systems, damage in inflammatory sites can occur, contributing to chronic diseases. In order to control these diseases, anti-inflammatory substances possessing antioxidant properties need to be used. Polyphenols have important biological properties. The similarity of 2-styrylchromones with flavones and their known biological activities led us to develop new synthetic methods for this type of compounds and to design novel molecules presenting antioxidant, anti-inflammatory, and anti-norovirus activities. 2-Styrylchromones were starting materials, throughout cross-coupling reactions, for the development of a novel group of polyhydroxy-2,3-diarylxanthones, which already demonstrated potent antioxidant activities. Biological applications of these compounds gave rise to a European patent application.



R^1, R^2, R^3, R^4 = H or OH

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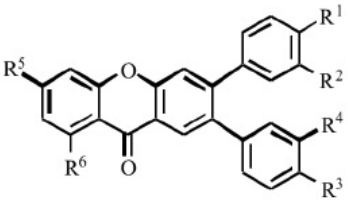

$R^1, R^2, R^3, R^4, R^5, R^6$ = H or OH

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mass spectrometry approaches to study breast cancer

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Breast cancer is the most common cancer in women and represents a major public health problem. Although early detection and recent advances in treatment have reduced the mortality rates, most breast cancers develop resistance to therapy. Therefore, it is necessary to identify novel therapeutic targets as well as markers of disease progression and resistance to therapy. Our lab is currently focused on two lines of research:

1) Extracellular matrix and estrogen signalling: Most breast cancers express estrogen receptors (ER) and depend on estrogen to grow. These cancers are treated with endocrine therapy, by blocking estrogen synthesis and ER action with antagonists. ERs are ligand activated transcription factors, subjected to a myriad of posttranslational modifications (PTMs) including phosphorylation. Such modifications alter ER affinity for a ligand and ER transcriptional activity. In addition, hyperactive kinase pathways which target ER are often associated to endocrine resistance. Our aim is to identify modulators of such signalling pathways in the extracellular matrix (ECM) of endocrine sensitive and resistant tumours and associate their expression to ER PTMs. For this purpose, extracellular matrix proteins were extracted, separated by