A synthetic approach to bacteriochlorin derivatives using natural chlorophyll *a* pigment

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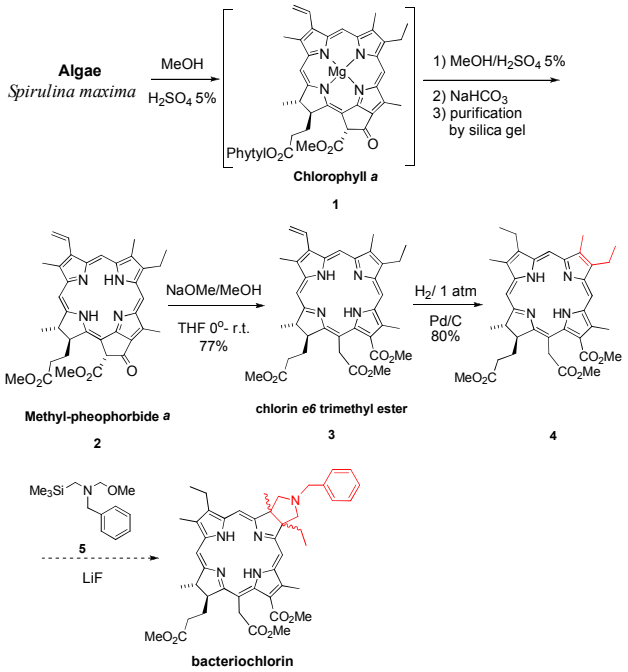
INTRODUCTION

Bacteriochlorin derivatives are tetrapyrrolic macrocycles that differ from porphyrins and chlorins only in the reduced state of the β-pyrrolic positions. These differences are sufficient to modify the electronic spectra of the bacteriochlorins, obtaining an adequate Q-band >730 nm compared to porphyrins (last Q-band around 630 nm) and chlorins (last Q-band around 650 nm).[1] Compounds with absorption bands greater than 700 nm have been suggested as better photosensitizers to be applied in photodynamic therapy (PDT) treatments, since they have strong absorption of penetrating light (>700 nm). PDT is a very innovative technique for the treatment of skin cancer, several malignant tumors, viral, bacterial and dermatological diseases. In this work, we present studies on the extraction and synthesis of new photosensitizers based on natural models such as *chlorophyll a* (**1**) (Scheme 1).

RESULTS AND DISCUSSION

The pigment **1** was extracted from algae *Spirulina maxima* using a 5% solution of H_2SO_4 in MeOH and converted to methyl-pheophorbide (**2**) in one step (12h). After basic quenching and purification by silica gel, the pigment **2** was obtained with high purity in 0.5% yield.[2,3] Compound **2** was converted to **3** using stoichiometric quantities of MeONa in MeOH (retro-Dieckmann reaction) at 0℃→rt. The pigment **3** was obtained in 77% yield after purification by silica gel. Then, compound **3** was hydrogenated (H_2/Pd, 1atm, 4h) furnishing **4** after simple filtration on celite (80% yield).[4] Now, we are starting the studies using compound **4** as dipole in a 1,3 dipolar cycloaddition with the azomethine ylide of **5**. According to recent literature about chlorophyll derivatives, the opposite double bond (compound **4**, highlighted in red - scheme 1) is well activated for regioselective additions.



Scheme 1. Synthesis of bacteriochlorins.

CONCLUSION

Extraction and synthetic transformations of *chlorophyll a* (**1**) are described. Compound **4** was successfully prepared, and the 1,3-dipolar cycloaddition will be studied.

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