



HAL
open science

Design of New Sensitive Targeted pH Probes for Mitochondrial, Acidic and Cytosolic pHs Determination by ^{31}P NMR and EPR

Marcel Culcasi, Sophie Thétiot-Laurent, Sylvia Pietri

► **To cite this version:**

Marcel Culcasi, Sophie Thétiot-Laurent, Sylvia Pietri. Design of New Sensitive Targeted pH Probes for Mitochondrial, Acidic and Cytosolic pHs Determination by ^{31}P NMR and EPR. BIT's 8th Annual World Congress of Molecular & Cell Biology 2018, Oct 2018, Fukuoka, Japan. hal-03026210

HAL Id: hal-03026210

<https://hal-amu.archives-ouvertes.fr/hal-03026210>

Submitted on 26 Nov 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

BIT's 8th Annual World Congress of



Molecular & Cell Biology-2018

Time: October 16-18, 2018

Venue: Fukuoka, Japan

Website: <http://www.bitcongress.com/cmcb2018/>

Theme 303: Advanced Technologies for Molecular & Cell Biology

Title: Design of New Sensitive Targeted pH Probes for Mitochondrial, Acidic and Cytosolic pHs Determination by ³¹P NMR and EPR

Dr. Marcel Culcasi, Dr. Sophie Th  tiot-Laurent and Dr. Sylvia Pietri*

Aix Marseille University, CNRS, Marseille

France

Abstract

In the last decades, spectral techniques such as ³¹P NMR and EPR have become privileged strategies for the non-invasive study of the biological events affecting the energetic metabolism and free radical-related processes, respectively. Using NMR, the variations of the cytosolic pH can be monitored through the pH-dependent chemical shift (δ) behaviour of the endogenous phosphate (Pi) resonance peak. However, due to its neutral pKa and poor sensitivity, the Pi ³¹P NMR peak cannot precisely probe more acidic vacuoles participating in proton transport mechanisms, or alkaline organelles such as mitochondria. In our search for improved non-invasive pH probing at subcellular level, we recently developed a series of cell permeable α -aminophosphonates with pKa ranging 2–8 and showing a 4-fold improved NMR sensitivity ($\Delta\delta$ up to 11 ppm between the chemical shift of acidic and basic media) as compared to Pi. The same concept was applied to EPR pH measurement by using the ³¹P coupling constant a_P of persistent nitroxide free radical probes. This led to the design, synthesis and evaluation of a series of non-toxic pH-sensitive (Δa_P up to 3-4 Gauss between acidic and basic media) and stable β -phosphorylated nitroxides. The presentation will cover the design and the biological applications in vitro and in vivo of selected pH probes in normal and pathological situations.