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| UMR408 SQPOV | ***Implanteus* Graduate School**<br>Academic Year 2021 - 2022<br><br>**Proposal of M1 Internship** |  |

***Title:*** *Coloring properties of anthocyanins and analogs*

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**Context**

Anthocyanins are natural phenolic pigments widely distributed in fruit and vegetables, where they express deep red, purple and even blue colors depending on pH and environment (e.g., binding to metal ions and other natural phenols). Anthocyanins and even simpler analogs could be developed as colorings for food and non-food applications. To that purpose, two main challenges must be met:
a) set up simple protocols to prepare anthocyanins and analogs, as well as anthocyanin-rich plant extracts, b) define the conditions for optimal color expression, in particular by drawing inspiration from the color-stabilizing mechanisms at work in nature.

**Objectives**

The topics that will be addressed during this internship are:
a) Devising simple routes to anthocyanins

- The chemical synthesis of simple anthocyanin analogs with improved solubility in various media from hydrophilic to lipophilic. The synthetic pathways must be kept very simple (2-3 steps) to permit upscaling for applications.
- Anthocyanin-rich extracts from deeply colored vegetables, such as eggplant (in collaboration with partners of Bejaia University, Algeria). The main task will be to characterize the extracts' composition by liquid chromatography coupled to high resolution mass spectrometry.

b) Investigating the potential of anthocyanins as colorings
The color of anthocyanin analogs and anthocyanin-rich extracts will be studied over time at different pHs. The influence of iron ions (formation of colored iron complexes) and of other natural phenols (copigmentation) will be assessed.

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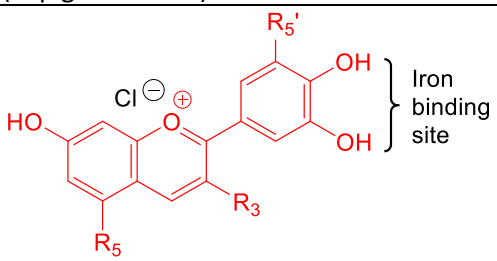
|  | - $R_5$ = OH, $R_3$ = $R_{5'}$ = H: a red sorghum pigment already synthesized in the lab<br>- $R_5$ = $R_{5'}$ = OH, $R_3$ = O-β-D-Glc: an eggplant pigment<br>- $R_5$ = $R_{5'}$ = H, $R_3$ = S-R: synthetic analogs (coupling with natural thiols) with tunable hydrophilic/lipophilic balance (ongoing work) |

**Prerequisite skills:** Sound foundation in chemistry (organic, physical, analytical).

**Main competences:** Mechanisms of natural color expression and stabilization; a range of analytical methods, including UV-visible spectroscopy and UPLC coupled to UV-visible and mass spectrometry detectors.