**TITLE**

## Metabolic pathways in thermophilic bacteria

**DESCRIPTION**

State of art:

Interest in thermophilic bacteria as live-cell catalysts in biofuel and biochemical industry has surged in recent years, due to their tolerance of high temperature and wide spectrum of carbon-sources that can be metabolized. However their direct employment as microbial cellular factories in the highly demanding industrial conditions has been especially hindered by uncompetitive biofuel productivity, and limitation in genome engineering tools. The recent advances of metabolic engineering and synthetic biology have enabled the fermentation of sugars to produce a variety of bio based bulk chemicals.

It has been recently reported an unprecedented pathway involved in the recycling of carbon dioxide by the hydrogen-producing bacterium *Thermotoga neapolitana* through the coupling of acetate and $CO_2$ with the concomitant production of lactic acid. The unprecedented pathway, called Caphnophilic ($CO_2$-requiring) Lactic Fermentation (CLF) offers the potential advantage of combining Carbon Capture (CC), energy production from renewable source and synthesis of highly added value products such as lactic acid.

Scope of the project:

This interdisciplinary PhD project will have the following aims:

- biosynthetic regulation in *Thermotoga*
- metabolic engineering of thermophilic bacteria to convert $CO_2$ and sugar-based substrates into chemicals

Research activities will include:

- Screening of natural and improved strains
- Fermentation
- Labelling experiments with stable and radiolabeled substrates
- Flux balance
- Genetic engineering
- Optimization of novel fermentation strains
- Transcriptomics and proteomics
- Bioinformatic
- Synthetic biology

The candidate should possess good knowledge in Biochemistry, Microbiology and Bioinformatics. More than basic expertise of molecular techniques is also required.

**SELECTION CRITERIA**

Eligibility Criteria

- Academic degree: Applicants shall have a master degree in **Biology**, **Biotechnology** or **Microbiology** or related fields, corresponding to the second level of studies.

- Mobility rule: There will be no nationality restrictions. Applicants can be from any Country. However, according to the mobility rule, at the time of the application deadline researchers should not have resided or carried out their main activity (work, studies, etc.) in Italy for more than 12 months in the 3 years immediately prior to the reference date. Compulsory national service and/or short stays such as holidays will not be taken into account.

- Research experience: Applicants shall, at the time of the application deadline, be in the first four years (full-time equivalent research experience) of their research careers and not yet awarded a doctoral degree.

Full-Time Equivalent (FTE) Research Experience will be determined from the date when a researcher obtained the degree which would formally entitle her/him to embark on a doctorate, either in the country in which the degree was obtained or in Italy, irrespective of whether or not a doctorate is or was ever envisaged.

Evaluation Criteria

Step 1 -Evaluation of documentation provided by the candidate: a) Academic record and training b) Research activities c) CV/motivation letter; d) Level of English; e) Reference letters.

Step 2 - Interview: a) Scientific knowledge in the field of interest; b) Research experience in the field of interest c), Motivation; d) English proficiency.

Supervisor

Dr. Giuliana d'Ippolito