SHORT TERM SCIENTIFIC MISSION (STSM) – SCIENTIFIC REPORT

The STSM applicant submits this report for approval to the STSM coordinator

Action number: FA1403
STSM title: Data integration to study flavonoid metabolism
STSM start and end date: 08/01/2018 to 16/03/2018
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PURPOSE OF THE STSM/

(max.500 words)

Flavonoids hold an important part of human diet, as they are present in a variety of foods consumed daily. Flavan-3-ols (also referred to as flavanols) are a structurally complex subclass of flavonoids that differ considerably not only in their structural and functional properties, but also in their metabolism and bioavailability, while their effects on numerous diseases, have been consecutively considered in scientific research.

Flavanols are derivatives of flavans and include catechin, epicatechin gallate, epigallocatechin, epigallocatechin gallate, proanthocyanidins, theaflavins, thearubigins. The purpose of this mission was to create an illustration of the metabolic fate of flavan-3-ols that would allow the research community to better evaluate key compounds as well as enzymes involved. The uses of such illustration could be various; however, our purpose was to initiate the interest in such work and to present its potential.

This mission included the following steps to the end of the illustration of the pathway based on existing literature.

1 Curation of new and previous literature searches,

2 Use PathWhiz and/or Pathvisio to illustrate molecules, reactions and pathways,

3 Use existing pathway and molecular interaction resources (KEGG, Reactome, STITCH etc.) to add additional links.

In particular, published English literature based upon work from COST Action POSITIVe, supported by COST (European Cooperation in Science and Technology) and from the PubMed, Science Direct and Google Scholar databases was searched in order to extract information on flavanol metabolism. The relevant articles were identified and reviewed. Public databases such as PubChem, PhytoHub, ChEBI and KEGG were used for identification of structures and synonyms of the compounds. PathVisio was used for the illustration of the pathway and its publication in WikiPathways.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

(max.500 words)

During this mission, I have worked on data integration regarding the metabolism of flavonoids. My first task that was carried during the first 3 weeks of this mission was to read and extract information on the flavanols' metabolism from 13 papers. After becoming familiar with the metabolic fate of flavonoids in general and flavan-3-ols in particular, I started documenting the information found in literature in an existing spreadsheet (Developed within WG1) modified for the purposes of this mission. The main focus of the first step documentation was on:

-The reactions that took place within the pathway

-The compounds

-The documentation of literature information

Within the next 3 weeks the same work was carried for an additional 13 papers but during that time, the focus also included:

-Documentation of synonyms for all the compounds found in the pathway as well as adding their Identification Codes to databases, such as PhytoHub and PubChem

-Documentation of the mediating elements for the reactions within the pathway. (Specification, when available in literature, whether a reaction was microbiome-mediated or carried by enzymes)

During the last weeks of this mission, I became familiar with the use of illustrating tools Pathwhiz and Pathvisio. At that time my tasks included:

-Compounds' entry into the Pathvisio system. All the compounds found in the pathway were added in Pathvisio including synonyms, database ID and reference.

-Drawing of the reactions

-Colour-coding the reactions as microbiome-mediated (Red arrows), carried by enzymes (Green arrows), involving both (Pink arrows), not clear via the literature search (Black arrows).

-Adding know enzymes in the pathway (including references)

-Uploading the pathway in wikiPathways. In addition, during the last week of this mission the grantee performed a short presentation of the work carried in this mission in the Department meeting of the Host Institute (Norwich Medical School, University of East Anglia) promoting the initiatives taken from this Action, intriguing the interest on both the subjects of interindividual variability of plant bioactives and metabolic pathway visualization and assisting in on-going efforts in the illustration of the metabolic pathway of proanthocyanidins.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

(max. 500 words)

This work resulted in the illustration of the flavan-3ols metabolic pathway in a public tool available to the research community. The importance of this work has 4 main aspects:

1) The pathway is now available to the research community to amend through wikiPathways by adding links as research on the flavan-3-ol metabolism evolves. (https://www.wikipathways.org/index.php/Pathway:WP4238)
2) This proposed pathway is based on 26 papers; therefore, it can provide accurate information regarding the metabolic fate of flavan-3-ols and also a different way of evaluating the key compounds.
3) For the purposes of this mission a revised version of existing spreadsheet was developed (including commonly used names of all compounds, synonyms, Identification Codes to publicly available databases, extensive literature references, information regarding the nature of conversions – microbiota-mediated or enzyme-mediated-, tissues and food sources) which will assist in future work on developing pathways.
4) The search in literature resulted in the finding of compounds and synonyms missing from Phytohub and are to be added in an effort to improve current knowledge of the scientific community.
5) Through this mission the opportunity of adding a direct link between WikiPathways and PhytoHub is under consideration.

Furthermore, for the purposes of future development of this pathway as well as other metabolic pathways, a paper is under drafting in order to present the steps taken for the illustration of a pathway in Pathvisio.

FUTURE COLLABORATIONS (if applicable)

(max.500 words)