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（For JSPS Fellow）

Form B-5

Date（日付）
16/7/2014 （Date/Month/Year：日/月/年）

Activity Report -Science Dialogue Program-
（サイエンス・ダイアログ事業 実施報告書）

- Fellow's name（講師氏名）: Cristina Andrés-Barrao （ID No. P13087）

- Participating school（学校名）: Nagano Prefectural Suwa Seiryo Senio High School

- Date （実施日時）: 14/07/2014 （Date/Month/Year:日/月/年）

- Lecture title（講演題目）: （in English） Amazing Vinegar

（in Japanese） 素晴らしい酢

- Lecture summary（講演概要）: Please summary your lecture 200-500 words.

Vinegar is a natural fermentation product that used world-wide, since the ancient times. Although the birth of vinegar is lost in records of ancient history, it is generally believed that it can not be distinguished from the origin of agriculture and wine fermentation. In Japan, commercially produced vinegar became very popular during the Edo period (AD 1603-1868).

Vinegar can be produced from any fermentable source, from vegetable (rice, malt, onion, tea, sugarcane, wheat...) but also fruits (grape, apple, plump, kaki...) but also animal sources as honey or whey. And it has a very wide spectrum of applications in daily life, not only as salad dresser or in the preparation of pickles, but also as cosmetic and cleaning agent, as supplement for weight loss diets, as well as other many beneficial effects for the human health.

Due to its composition, vinegar may be consider a diluted solution of acetic acid, although small amounts of ethanol are present, as well as traces of many other chemicals conferring the specific organoleptic properties. The acidity of the final product depends on the specific raw material used, ranging from 4-7% for the most common table vinegars.

Commercial vinegars are produced nowadays by two main methodologies, (i) traditional static surface, in wood barrels or in glass or ceramic pots, and (ii) industrial submerged, in big fermentors. It is the product of the natural oxidation of ethanol into acetic acid by widespread microorganisms in nature called acetic acid bacteria (AAB).

AAB are Gram-negative and mainly characterized by incompletely oxidize sugars or sugar alcohols to their correspondent organic acid. The transformation of ethanol into acetic acid takes place in the periplasmic spaces of the cells, by the sequential action of two enzymes: alcohol dehydrogenase and aldehyde dehydrogenase. But acetic acid is able to diffuse to the inner cell and is cytotoxic for the most part of microorganisms. Some mechanisms conferring AAB their natural resistance to acetic acid have been described, among them the exportation to the exterior by specific transporter and the metabolism through the TCA cycle.

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Some of the main results from my previous research in *Acetobacter pasteurianus*, showed 3 proteins specifically induced by action of acetic acid: DnaK, GrpE and thioredoxin. Another protein involved in the production of capsular polysaccharides (CPS), dTDP-dehydrorhamnose reductase (RfbC), was repressed during the process. The decrease in the expression levels of RfbC was consistent with electron microscopy (EM) observations. Additionally, analysis of EM micrographs from bacteria of the genus *Gluconacetobacter* directly harvested from high-acid vinegars, showed these bacteria do not have the CPS described previously in *Acetobacter* sp.
These results link with my current research in Japan: the study on the mechanisms of fermentation characteristics of AAB in genera *Acetobacter* and *Gluconacetobacter*. In this work, we are going to apply 2 main approaches: 1) RNA-Seq analysis of the differentially expressed genes during ethanol oxidation, in *A. pasteurianus* NBRC 3283 and *Ga. xylinus* NBRC 3288, and 2) comparative analysis of the whole-genome sequences of 16 AAB strains of both genera.

- Language used（使用言語）: English

- Lecture format（講演形式）:
  - ◆Lecture time（講演時間） 60 min（分）, Q&A time（質疑応答時間） 10 min（分）
  - ◆Lecture style（ex.: used projector, conducted experiments）
    （講演方法（例：プロジェクター使用による講演、実験・実習の有無など））
    PowerPoint presentation + small experiments + vinegar tasting
  - ◆Interpretation（ex.: assistance by accompanied person, provided Japanese explanation by yourself）（通訳（例：同行者によるサポート、講師本人による日本語説明））
    Assistance by accompanied person
  - ◆Name and title of accompanied person（同行者 職・氏名）
    Tokyo University of Agriculture, 2nd year Master Student, 松原様
  - ◆Other note worthy information（その他特筆すべき事項）:

- Impressions and opinions from accompanied person（同行者の方から、本事業に対する意見・感想等がありましたら、お願いいたします。）: