



Susanna Kariluoto<sup>1</sup> Youna Hemery<sup>2</sup> Fabien Saubade<sup>2</sup> Aynadis Tamene<sup>3</sup> Kaleab Bave<sup>3</sup>

Christèle Humblot<sup>2</sup>

University of Helsinki, Finland

UMR 204 Nutripass, France

Laurencia Ouattara/Songré<sup>4</sup> Fatoumata Ba/Hama<sup>4</sup> Vieno Piironen<sup>1</sup>

<sup>1</sup>Department of Food and Environmental Sciences

<sup>2</sup>Institut de Recherche pour le Développement (IRD),

<sup>3</sup>Center for Food Science and Nutrition, College of Natural Sciences, Addis Ababa University, Ethiopia

<sup>4</sup>Department of Food Technology, Applied Science and Technology Research Institute, Burkina Faso

CONTRIBUTION OF FERMENTED CEREALS TO FOLATE INTAKE IN EUROPEAN AND AFRICAN COUNTRIES

INTRODUCTION

Suboptimal folate intake poses significant societal burden not only in developing but also in many industrialised countries. Especially in countries where mandatory folic acid fortification is not practised, even a moderate increase in vitamin content of foods consumed regularly may significantly improve folate intake.

FoIEA (*Contribution of cereal-based fermented foods to folate intake in European and African countries*), a joint 3-year project within ERAfrica scheme, was launched at the end of 2014. The objective of FoIEA is to enhance folate contents of cereal foods through fermentation and to estimate the bioavailability of the produced folate.

In this poster we present the FoIEA project and introduce some preliminary results on fermented African cereal foods.

## FoIEA PROJECT

The partner institutions include

- France: Institut de Recherche pour le Développement (IRD) – UMR 204 Nutripass (the coordinator)
- Burkina Faso: Institut de Recherche en Sciences Appliquées et Technologies, Département Technologie Alimentaire
- Ethiopia: Addis Ababa University, College of Natural Sciences, Center for Food Science and Nutrition
- Finland: University of Helsinki, Department of Food and Environmental Sciences
- South Africa: University of Pretoria, Department of Human Nutrition, Faculty of Health Sciences

Project workpackages are presented in Fig. 1. In WP1 the contribution of cereal-based fermented foods (CBFF) to folate intake among the target populations – young children and women of childbearing age – will be estimated for Finland, Burkina Faso, and Ethiopia, representing different nutritional contexts.



Figure 1. Project scheme.

WP2 focuses on the potential of folate production by microorganisms, especially lactic acid bacteria, in model foods – rye bread, ben saalga (pearl millet gruel), and injera (teff flatbread; Fig. 2)– with a combination of metagenomic and classical microbiological approaches.



Figure 2. Ben saalga (A) and injera (B).

In WP3, folate contents and compositions of CBFF will be determined. In addition, the bioaccessibility and bioavailability are studied using both *in vitro* and *in vivo* methods. In WP4 folate-producing bacteria will be used to produce CBFF with improved folate content. The consumer acceptability will also be tested.

## RESULTS

Folate analyses of ben saalga and injera have revealed a great variation both among and between production units (Fig. 3 & 4). The folate content of ben saalga is low, mainly owing to washing, sieving, and cooking steps in the process. However, folate production was observed in some cases.



Figure 3. Total folate contents (ng/g fresh weight) in ben saalga from 10 production units in Ouagadougou, Burkina Faso. The error bars represent standard deviations among 5 days.

Microbiota of ben saalga has genetic potential for folate production. The work is continued also for other model foods, and we expect to find several folate-producing lactic acid bacteria.



Figure 4. Folate contents (dry matter) in teff flour (relative amount = 1), fermented dough, and baked injera from 5 production units in Addis Ababa, Ethiopia. The error bars represent standard deviations among 3 days.

The folate content of teff was moderately high, ca. 600 ng/g on dry matter basis. In some fermentations folate contents were doubled, thus, microbes isolated from those fermented doughs will be studied in more detail.

## CONCLUSION

The FoIEA project investigates the capability of microorganisms to increase folate content in cereal products. Finally, the potential of fermented cereal foods in improving folate intake among target populations will be evaluated.

