From Agropolis International Thematic File
Directory n° 15 - October 2012 - 48 pages
“From Brazil to Europe: 10 years of Labex Program, EMBRAPA’s laboratory without walls”
Agrifood technologies

Brazil is a major global player for several staple food products and an exporter of manufactured food products. One of EMBRAPA’s priorities is thus to enhance the competitiveness of Brazilian agriculture via the added value of agricultural products while ensuring food security and safety. Agrifood technologies was an obvious choice as a Labex-Europe research theme because of EMBRAPA’s long-standing tradition of excellence with respect to food processing and security.

Labex-Europe has contributed to food technology research through four researchers:

The first researcher, Dr Regina Lago, a fat and oil specialist, collaborated with the joint research unit Agropolymer Engineering and Emerging Technologies (CIRAD, UM2, INRA, Montpellier SupAgro), whose overall aim is to gain greater insight into the functionalities of plant products and their constituents so as to enhance their food and nonfood performances. The Brazilian castorbean plant, Ricinus communis, was selected due to its biofuel potential or as a source of vegetable oil of high quality and value for industrial chemistry.

Then, Dr Heloisa Filgueiras, a postharvest physiology specialist, was the first Labex-Europe researcher posted outside of Montpellier. After a brief collaboration with Patrick Varoquaux (INRA), she worked at the University of Avignon and INRA on a joint interest project entitled the ‘Effects of vegetable conservation pretreatments under modified atmospheric conditions’. A research partnership was established with the Laboratoire de Physiologie des Fruits et Légumes (UAPV), with Huguette Sallanon as scientific correspondent, to improve the quality of vegetable products ‘from farm to fork’ by developing the entire Fruit and Vegetable sector. There were two research focuses: studying the response of plants and their fruit to environmental conditions, and enhancing postharvest fresh fruit and vegetable conservation. The work spanned a broad range, from mangoes to endives, with the aim of studying possible alternatives to chemical conservation of minimally processed vegetables. The objective was to control metabolic processes in order to hamper enzymatic darkening and senescence while preserving the functional constituents.

Lastly, two scientists took charge of the Agrifood Technologies theme in Dijon. Dr Rosires Deliza joined the team of the Centre des Sciences du Goût et de l’Alimentation (CNRS, INRA, University of Burgundy) which studies food behavior and its control. The proposed approach involved comparative sensorial physiology. Her work, carried out in collaboration with Dr Sylvie Issanchou, dealt mainly with assessing consumer reactions to new food products with improved nutritional qualities. Their work included participation in the TrueFood project*, partially sponsored by the European Commission, and the use of advanced experimental economics tools.

Concomitantly, Dr Amauri Rosenthal worked with the Laboratoire de Génie des Procédés Microbiologiques et Alimentaires (INRA, AgroSup Dijon) headed by Prof Patrick Gervais. The aim was to study the effects of high pressure and microwaves on bacterial spores, which represent a major challenge in food processing as outbreaks of these organisms could lead to a public health hazard. This research generated insight into the role of the spore water content on cell viability and spore inactivation mechanisms.

* www.truefood.eu
Agrifood Technologies

COMMENT

Regina Lago

"BECOMING A MEMBER OF A LABEX TEAM IS AN IMPORTANT CHANGE OF LIFE. We are senior scientists with a family and career and therefore have much to gain, but we also leave much behind."

We provided support for a CAPES-COFECUB project coordinated by the Agricultural Instrumentation Center (EMBRAPA). We worked on the castorbean plant which became very popular a year later in Brazil on account of its bioenergy and fine chemistry potential. The results led to publications even after my return to Brazil. A student (University of Rio de Janeiro) worked on the project for 6 months and a patent request was submitted (see Publications, p. 38-41). A doctoral student (University of Campinas) received training from the Lipid research team at the Institut des membranes in Montpellier.

At that time, the centre did not have sufficient research potential with respect to oils and fats and the impact of my stay could have been more significant. After my return to Brazil, I focused more on international relations and became Director of the EMBRAPA Food Technology Center in April 2008. I still have links with the IATE joint research unit. We presented a joint project at the Conselho Nacional de Desenvolvimento Científico e Tecnológico. I was invited to Paris by the Association Française pour l’Étude des Corps Gras to give a talk on castor and jatropha oils. Two researchers specializing on oils and fats were hired to be able to develop joint projects and establish closer relations with CIRAD and other French teams in the sector.

Contact: Regina Lago, lago@ctaa.embrapa.br

* CAPES: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brazilian Ministry of Education / COFECUB: Comité Français d’Évaluation de la Coopération Universitaire et Scientifique avec le Brésil

INTERVIEW

Pierre Villeneuve and Michel Pina

are researchers at the Agropolymer Engineering and Emerging Technologies joint research unit which hosted a Brazilian researcher for 3 years.

►Did you work in collaboration with Brazil in general and with EMBRAPA in particular before a Labex researcher joined your team?

Not with Brazil in general. However, before the arrival of the Labex researcher, the IATE joint research unit conducted a contractual study in collaboration with Prof Daniel Barrera-Ardatano of the University of Campinas on sugarcane bagasse development.

►What conclusions do you draw from the experience? What has this collaboration contributed to your team?

This experience was a source of mutual enrichment, especially on account of Regina Lago’s in-depth understanding of the chemistry of fats and oils.

►Now that the Brazilian scientist has returned home, is there any follow-up and/or consequences in terms of partnerships between your team and Brazilian institutions?

We are still in contact and exchanges with Prof Regina Lago are ongoing. However, no concrete initiatives are currently under way due to our current focuses of research, especially with respect to castorbean plants, which is no longer one of our priorities.

Contact: Pierre Villeneuve, pierre.villeneuve@cirad.fr et Michel Pina, pina@cirad.fr

Brazilian scientist hosted

Regina Lago (EMBRAPA) stayed for nearly 3 years at the IATE joint research unit (October 2002-October 2005) to identify new plant enzyme sources isolated from Brazilian biomass (development of a castorbean lipase extraction process) and processing castor oil to generate lipid derivatives of high nutritional value.

Contact: lago@ctaa.embrapa.br

Host laboratory

IATE Agropolymer Engineering and Emerging Technologies joint research unit (Montpellier SupAgro/INRA/UM2/CIRAD):
78 permanent scientific and technical staff
Director: Hugo De Vries,
devries@supagro.inra.fr
http://umr-iate.cirad.fr

Scientific correspondents:
Stéphane Guilbert, guilbert@supagro.inra.fr
& Pierre Villeneuve, pierre.villeneuve@cirad.fr
**INTERVIEW**

**Huguette Sallanon**

is Director of the Sécurité et qualité des produits d’origine végétale joint research unit which hosted a Brazilian researcher for 3 years.

**Did you work in collaboration with Brazil in general and with EMBRAPA in particular before a Labex researcher joined your team?**

No, we had no previous collaborations with Brazil.

**What conclusions do you draw from the experience? What has this collaboration contributed to your team?**

This collaboration was highly rewarding. We were very lucky, as a laboratory, to host a scientist with such long-standing research experience. Heloisa Filgueiras boosted our insight on postharvest aspects of fruit crops, especially tropical fruit. We were thus able to develop research on pre-prepared mango processing, co-supervise several doctoral theses and were awarded several Franco-Brazilian cooperation tenders. We developed many exchanges with other Brazilian partners and hosted eight confirmed researchers, post-doctoral fellows and doctoral candidates from Brazil for stays of a few weeks to several months. Heloisa Filgueiras’ stay was highly beneficial for us, both scientifically and culturally. The entire laboratory has discovered Brazil, stayed there and everyone hopes to return. We would all have liked her to stay longer and the laboratory was sad when she returned to Brazil.

**Now that the Brazilian scientist has returned home, is there any follow-up and/or consequences in terms of partnerships between your team and Brazilian institutions?**

Yes, we have remained in contact with Heloisa Filgueiras and with other Brazilian researchers with whom we have had exchanges. A professor from our laboratory is currently on a trip to Brazil, which is now a preferential country for the development of UAPV’s international relations and, of course, we hope to continue this partnership.

**Contact:** Huguette Sallanon, huguette.sallanon@univ-avignon.fr

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**Brazilian scientist hosted**

Heloisa Filgueiras (EMBRAPA) spent 3 years (November 2005-July 2008) with the Fruit Physiology team of the Sécurité et qualité des produits d’origine végétale joint research unit (INRA/UAPV), and then with the research team of the Laboratoire de Physiologie des Fruits et Légumes (UAPV) to study possible alternatives to chemical conservation of minimally processed vegetables.

**Contact:** heloisa@cnpat.embrapa.br

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**Host laboratories**

SQPOV joint research unit

Sécurité et qualité des produits d’origine végétale (Plant product safety and quality) (INRA/UAPV)

49 scientific and technical staff

Director: Catherine Renard, catherine.renard@paca.inra.fr

http://tinyurl.com/unrsqpow

Scientific correspondent: Patrick Varoquaux (retired)

Laboratoire de Physiologie des Fruits et Légumes (Fruit and vegetable physiology laboratory) (UAPV)

10 scientific and technical staff

Director: Huguette Sallanon, huguette.sallanon@univ-avignon.fr

http://agrosciences.univ-avignon.fr/fr/mini-site/miniagro/recherche.html

Scientific correspondent: Huguette Sallanon

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**COMMENT**

**Heloisa Filgueiras**

My arrival in June 2005 to replace Régina Lago was Labex-Europe’s first experience in posting a scientist outside of Montpellier in the Sécurité et qualité des produits d’origine végétale joint research unit (INRA/UAPV). The research project was then focused on the interface between in natura and processed foodstuffs and on possible alternatives to chemical conservation of minimally processed vegetables.

As the internal reorganization of INRA changed the priorities of the Avignon center, Labex agrifood technology activities were moved to the Laboratoire de physiologie des fruits et légumes (UAPV). The initial line of research was then strengthened, as a consequence of more rigorous requirements concerning the presence of residues and a study was conducted on the use of chlorine in the food industry.

The UAPV team initially did not know EMBRAPA well and had little international experience despite its high scientific level. This partnership also coincided with the launching of the Pôle Européen d’Innovation Fruits et Légumes (European Innovation Cluster for Fruits and Vegetables) and the end of all INRA research (Avignon center) on in natura. Despite this, the fact that EMBRAPA was present enabled UAPV to strengthen its image as a research institution and to establish closer links with the agricultural research cluster in Montpellier (especially with CIRAD via the Qualisud joint research unit). Its partnership was strengthened with the Université Blaise Pascal (Clermont-Ferrand, France). Through the project, relations were developed with the Dutch Universities of Radboud (Nimègue) and Wageningen (WUR) and, through the latter, with the European laboratory LaserLab Europe (Italy). In addition, five Brazilian scientists (from the EMBRAPA agricultural instrumentation and food industry centers, São Paulo State University, Jaboticabal, Ceará Federal University) were invited by UAPV to set up, in its Fruit and Vegetable Physiology Laboratory, methods and technologies developed and/or adapted in Brazil.

**INTERNATIONAL RELATIONS HAVE BEEN ONGOING WITH SEVERAL EMBRAPA CENTERS AND BRAZILIAN UNIVERSITIES SINCE MY RETURN.** A project to promote Brazilian tropical fruits (CAPES/WUR) made it possible to continue research by scientists from EMBRAPA and different Brazilian and European universities until 2010 (Fluminense Federal University, Paraiba Federal University, two WUR laboratories, the European LaserLab platform).

Labex Europe enabled UAPV to become part of the Franco-Brazilian doctoral school and to draw up the agreements required for joint thesis supervision. The partnership activities of EMBRAPA and CIRAD have been followed up by a postdoctoral position and visits by EMBRAPA researchers and Brazilian partner institutions. I also participated in the UAPV Master’s and Doctoral programs on Produce Quality Management and in several steering committees for doctoral students.

**Contact:** Heloisa Filgueiras, heloisa@cnpat.embrapa.br

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I became involved in different European research projects right after my arrival at the Centre des Sciences du Goût et de l'Alimentation (CSGA). The TrueFood project was aimed at gaining further insight into consumers’ perceptions, expectations and attitudes concerning innovations in traditional product manufacturing processes and their willingness to pay for them (e.g., using high hydrostatic pressure to lower the salt content in Serrano ham).

Experimental economics tools, combined with sensorial analysis, enabled an assessment of consumers’ willingness to pay for low-fat, low-salt chips (CSGA partnership with the Alimentation et Sciences Sociales research unit and six private French laboratories). French consumers’ attitudes towards foreign meat were also studied in a project (partnership with the Purpan Engineering School). The ongoing VinPest project is aimed at understanding consumers’ views concerning pesticide use in wine production (collaboration with the École de Commerce de Dijon, Institut de Management du Vin, Bureau Interprofessionnel des Vins de Bourgogne, Bureau Interprofessionnel des Vins de la Bourgogne, Universidad de la Republica, Uruguay).

This research is being continued through a Brazilian postdoctoral fellow. Labex also enabled me to submit several proposals after my return to Brazil.

My participation in European projects improved Brazilian research networks, including those of different EMBRAPA research centers and universities. Coorganization of the 6th Ibero-American Sensory Analysis Symposium (2010) and the 10th Sensory Science Symposium (2013, Brazil), highlights the cooperation capacity of Labex. Dr Sylvie Issanchou and I have visited several EMBRAPA research centers, which has given rise to new collaboration opportunities. I have established contacts through the INRA network, especially with the INRA Clermont-Ferrand-Theix center, supplying information derived from the Brazilian scientific community conducting research in the human nutrition field and open to capacity building opportunities.

Contact: Rosires Deliza, rodeliza@ctaa.embrapa.br

* Traditional United Europe Food: www.truefood.eu

INTERVIEW

Sylvie Issanchou is a researcher at the Centre des Sciences du Goût et de l’Alimentation which hosted a Brazilian researcher for 2 years.

► Did you work in collaboration with Brazil in general and with EMBRAPA in particular before a Labex researcher joined your team?
Prior to Rosires Deliza’s stay, my team and I had no collaborations with EMBRAPA or generally with Brazil.

► What conclusions do you draw from the experience? What has this collaboration contributed to your team?
This experience was highly positive. It is obviously very interesting for a team to host an experienced researcher in terms of both the research and international outreach. Rosires Deliza was involved in different team projects, focusing on the issue of consumer acceptance of innovations. We benefited from her experience in this field, especially with respect to quality-oriented approaches. She was also involved in attracting other researchers to our laboratory.

► Now that the Brazilian scientist has returned home, is there any follow-up and/or consequences in terms of partnerships between your team and Brazilian institutions?
Yes, there is a promotional follow-up in the form of publications on the research projects in which Rosires Deliza participated during her stay. Moreover, Rosires Deliza is still involved in an experimental assessment of consent to the reduction of pesticide use in wine production (VinPest project funded by the French Ministry of Ecology, Sustainable Development and Energy), a project that kicked off during her stay and will continue until late 2013.

Contact: Sylvie Issanchou, sylvie.issanchou@dijon.inra.fr
INTERVIEW

Patrick Gervais is the Director of the Laboratoire de Génie des Procédés Microbiologiques et Alimentaires (now the Procédés Microbiologiques et Biotechnologiques research team). His research was focused on bacterial spore resistance to microwaves and high pressure in dehydrated foods and shed new light on the role of the internal spore water content on cell viability and potential inactivation mechanisms on technological development. Brazilian students were involved in this research via the CAPES/BRAFAGRI* program. The International Food Safety Group, linked with the International Commission of Agricultural Engineering, was founded and organized its first workshop entitled ‘Food sanitary security: advances and trends’, with around a hundred participants from all continents.

Because of the presence of Brazilian researchers, discussion meetings were held on scientific cooperation opportunities and new research proposals concerning new food conservation technologies and the encapsulation of bioactive molecules. The 2nd workshop was held in Valencia (Spain, 2012) and another is planned for 2013 in Brazil.

I participated in Labex-Europe in the team of the Laboratoire de Génie des Procédés Microbiologiques et Alimentaires (now the Procédés Microbiologiques et Biotechnologiques research team). My research was focused on bacterial spore resistance to microwaves and high pressure in dehydrated foods and shed new light on the role of the internal spore water content on cell viability and potential inactivation mechanisms on technological development. Brazilian students were involved in this research via the CAPES/BRAFAGRI* program. The International Food Safety Group, linked with the International Commission of Agricultural Engineering, was founded and organized its first workshop entitled ‘Food sanitary security: advances and trends’, with around a hundred participants from all continents.

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The ‘brokerage events’ of the European Commission Biocircle™ project should also be mentioned. A research proposal in partnership with the Cyted*** program aimed at promoting Ibero-American native fruits as a source of functional ingredients was submitted by the University of Monterey (Mexico) and the Instituto del Frio (Spain) in order to facilitate cooperation and interaction between research groups working on functional foods in Latin America. As a Labex researcher, I also organized missions (scientists and Brazilian manufacturers in the fruit processing sector) in industries and European research institutions as an integral part of the Brazilian governmental innovation and technological development program**** which is aimed at creating technology parks.

Contact: Amauri Rosenthal, amauri.rosenthal@embrapa.br

Brazilian scientist hosted

Amauri Rosenthal (EMBRAPA) spent nearly 2 years with GPMA (2009-2011) to study bacterial spore resistance to thermal stress.
Contact: heloisa@cnpat.embrapa.br

Host laboratory

PMB research team
Microbiologiques et Biotechnologiques
(Microbiological and biotechnological processes)
(formerly the Laboratoire de Génie des Procédés Microbiologiques et Alimentaires)
(University of Burgundy/AgroSup Dijon)
20 scientific and technical staff
Director of PAM joint research unit:
Patrick Gervais, gervais@u-bourgogne.fr
www.umr-pam.fr
Scientific correspondent: Patrick Gervais

Comment

Amauri Rosenthal

I participated in Labex-Europe in the team of the Laboratoire de Génie des Procédés Microbiologiques et Alimentaires (now the Procédés Microbiologiques et Biotechnologiques research team). My research was focused on bacterial spore resistance to microwaves and high pressure in dehydrated foods and shed new light on the role of the internal spore water content on cell viability and potential inactivation mechanisms on technological development. Brazilian students were involved in this research via the CAPES/BRAFAGRI* program. The International Food Safety Group, linked with the International Commission of Agricultural Engineering, was founded and organized its first workshop entitled ‘Food sanitary security: advances and trends’, with around a hundred participants from all continents.

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Contact: Amauri Rosenthal, amauri.rosenthal@embrapa.br

* http://capes.gov.br/cooperacao-internacional/franca/capesbrafagri  
*** www.biocircle-project.eu  
**** www.cyted.org  
****** www.abdi.com.br/Paginas/Default.aspx

Inactivation of spores of Bacillus subtilis with different water activities by heat treatment at different pressures.
(A) 1 bar and (B) 5 bar (Tiburski, Rosenthal & Gervais, 2012, submitted).