Patrizia Perego

Full professor

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Education and training

Ph.D. degree in Materials Engineering
Milan Polytechnic - Milan - IT

Academic experience

2014 - ONGOING
Full Professor of Chemical Plants Polytechnic School
University of Genoa

2007 - 2014
Associate Professor of Chemical Plants
University of Genoa

1995 - 2006
Assistant Professor
university of Genoa

1993 - 1995
Adjunct Professor
University of Genoa

Research interests

Biotechnological Processes & Plants Research
With specific reference to fermentation processes, an intense research-activity was developed regarding the use of conventional reactors on suspended biomass and on immobilised cells, for the continuous production of biofuels from different agroindustrial residues.
One of the areas of research within the biotechnological food sector of DICCA deals with the influence of macro-kinetic parameters on biological processes in general and fermentation in particular, with the idea of understanding the limiting factors for bioprocesses in bioreactors.
A series of studies were carried out on bioprocesses, i.e. varying temperature, speed of rotation and viscosity, and the single effects were quantified in terms of variations in volumetric productivity. As regards the experimental evaluation of the effect of temperature on productivity, the study permitted the estimation of thermodynamic parameters of different bioprocesses (production of xylitol, clavulanic acid, etc).
In collaboration with the Department of Biochem. and Pharmac. Tech. at the

University of São Paulo (USP), a new branch of research has been developed regarding the photosynthetic production of microalgae among which are *Spirulina platensis* and *Chlorella vulgaris*. For this purpose, various photo bioreactor configurations have been tested using different nitrogen and CO2 sources.
In this context, it has also been developed a process of removal of CO2 from combustion flue gases from laboratory scale plant.
Further research in this area has regarded the production of different microalgae for the production of biodiesel.

Energy Sector Research

The research in this field is connected with the complete study of the properties of biomasses, that can have very different characteristics depending on their origins. After biomasses characterization, processes of gasification and pyrolysis were tested, evaluating the effects of composition of different biomasses (grape pomace, vegetable masses of different nature) as well as the effects of process variables (temperature, pressure, etc.) on the productivity and quality of reaction products.

Technology & Food Processing Plant Research

The scientific activities can be classified in the following sectors:

Technology of Food Preservation

'Mild Technologies' were studied and applied in food preservation processes to minimise the thermal damage in the various phases of the food production process. This study was developed in collaboration with SME in Liguria, focusing on the treatment with MAP of typical Ligurian products such as pesto sauces, walnut sauce, etc.

Optimisation of Industrial Processes

In collaboration with different industries studies were performed to optimise the production of biscuits, chocolate and snacks. Scaling-up the lab and the pilot scale results, an industrial plant has been developed for roasting of cocoa beans, drying of semolina pasta and another for the production of chocolate.

Optimisation of Processes for the Production of Probiotics

In collaboration with the USP (Brasil), a study project was done on the effects of different probiotic co-cultures and the use of different prebiotics to study the kinetics of acidification and post-acidification, the microbiological behaviour during the shelf-life of the product and the rheological properties of fermented milk. It was observed that the quantity of CLA was increased in the presence of milk enriched with maltodestrine and with the *S. thermophilus* and *L. acidophilus* co-cultures. Metabolic studies were carried out with the aim of optimising the best conditions of fermentation to obtain a product with the best texture, functionality and nutritional properties.

Agrofood Biotechnology

Utilization of agroindustrial residues for the biotechnological production of food flavourings and sweetener.

Development of Nutraceutical Products & Functional Foods

In recent years, attention has been focused on the extraction of high quality compounds from food residues. In the research team coordinated by Patrizia Perego, different techniques were studied for the extraction of

antioxidant compounds from agroindustrial residues through high pressure/temperature, ultrasound, microwave technologies, sub and supercritical fluids. The combination of ultrasound and microwave technologies allow full and fast extraction without degradation of the thermo unstable compounds. HPT extractions were carried out using an agitated reactor. The use of this instrument was an innovation in this field of work. Different operative parameters effects were studied for each extraction method and matrix analysed.

Biological Validation & Micro/Nanoencapsulation of Antioxidant substances

The antioxidants extracted with the technologies described in the above topic were subsequently validated biologically. In particular, research conducted by the BELONG centre involved *in vitro* assays to assess the anti-inflammatory and antiatherogenic activity of the extracts on endothelial cell lines, for possible use as dietary supplements. At the same time, the extracts were used as additives in the formulation of new probiotic products. To increase the bio availability of the antioxidant compounds, a study of micro and nano encapsulation was carried out on the extracts obtained using different techniques.

Production of Bioresorbable Engineered Biomaterials Research

This new research area is currently developed in collaboration with Harvard MIT Health Sciences & Technology, Cambridge Massachusetts USA for the production of scaffolds with synthetic and natural biodegradable and bioresorbable polymers for possible applications in the vascular field. To reduce the inflammatory effect of these prostheses, the scaffolds are enriched with micro/nanoencapsulated antioxidant compounds.