# Resum de Tesi Doctoral

DNI/NIE/Passaport: **36110819Z**

Nom i cognoms: **Ángela Rodríguez Abalde**

Títol de la tesi: **Anaerobic digestion of animal by-products. Pre-treatments and co-digestion**

Unitat estructural: **Departament d'Enginyeria Agroalimentària i Biotecnologia**

Programa: **Enginyeria Ambiental**

Codis UNESCO: **330800** **330807** **330810**

(Mínim 1 i màxim 4, podeu veure els codis a http://doctorat.upc.edu/gestio-academica/impresos/tesi-matricula-i-diposit/codis-unesco)

Resum de la tesi de 4000 caràcters màxim (si supera els 4000 es tallarà automàticament)

The meat sector is one of the most important industrial sectors in Europe and it is associated with the generation of large quantities of animal by-products not intended for human consumption (ABPs). The increasing demand of renewable energy sources and reuse of wastes require good technological solutions for energy production such as anaerobic digestion (AD), which is included in the current European regulation as one of the allowed methods to valorize ABPs. Due to their composition, with high fat and protein content, ABPs can be considered good substrates for the AD process, according to the high potential methane yield. Although, slow hydrolysis rates and inhibitory process have been reported, with a suitable pre-treatment to improve particulate materials solubility and/or co-digestion process of several complementary materials the anaerobic digestion can be improved. Hence, the aim of this thesis was to evaluate the feasibility of different ABPs for anaerobic digestion. Emphasis was placed on the effect of pre-treatments on the organic matter, methane yield and methane production rate. Within this scope, thermal (pasteurization and sterilization) and high pressure pre-treatments (200, 400 and 600 MPa) were applied. Thermogravimetric and spectroscopy techniques (DTG-MS and FTIR), where used to determine the effects on the organic matter. The effects on the methane yield and methane production rates, including the disintegration parameters, were obtained by means of batch test with different inoculum to substrate ratios (ISR).

The suitability of ABP for anaerobic digestion was confirmed with samples from different origin (poultry and piggery slaughterhouses) but the results showed that methane yield depends on the substrate composition (amount of proteins, fats and carbohydrates), especially when a thermal pre-treatment is applied. The thermal pre-treatment produced some inhibitory nitrogen-related compounds when there was a high carbohydrate and protein concentration and also affected the methane potential rate. On the other hand, thermal pre-treatments (pasteurization and sterilization) increased the methane production rate and methane production yield in the case of a waste with high protein and fat concentration. The results of the disintegration kinetics determination underline these positive effects on the methane production rate being increased in the after pasteurization. The high pressure pre-treatments were tested with piggery ABP without obtaining any effect on the methane production or methane production rate. The study and optimization of the co-digestion of pasteurized ABP with pig slurry was reported, including the glycerin addition. It showed to be feasible and glycerin addition resulted in an improvement of the methane production. Changes in the microbial composition were followed by means of denaturing gradient gel electrophoresis (DGGE) and it was demonstrated that the microbial community of the *Eubacteria* domain was more sensitive to operational changes than the *Archaea* domain.

In conclusion, this study contributes to the understanding of the anaerobic process of ABP mainly related to the effect of the thermal pre-treatments and the optimization of the co-digestion process.

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