

# PERCAL



Chemical building blocks from versatile MSW biorefinery

<http://www.percal-project.eu>

## Summary

PERCAL will use Municipal Solid Waste (MSW) as a feedstock for developing intermediate chemical products, producing high yield with high purity, making it attractive for industry. These will be complementary to the bioethanol (existing PERSEO Bioethanol® technology), thus creating a cascade of valorisation from the MSW components.

**Type of Action:**  
Research & Innovation Action

**Value Chain:** VC4 – organic waste

**Start date:** 01 July 2017

**End date:** 30 June 2020

**BBI JU contribution:** € 2,518,517.64

PERCAL aims to produce three main compounds. Lactic acid, which can be used to make eco-friendly ethyl lactate. This can be used in cleaning products, in ink and for hot-melt adhesives for cardboard; succinic acid, as an intermediate building blocks for the production of polyols for the polyurethane industry as well as biosurfactants from the remaining fraction of the MSW fermentation.

The project should lead to four main innovations; new enzymatic cocktails to maximize hydrolysis of fermentable organic matter with low inhibitors production; high yield, specific and robust strains for each selected acid; extraction of fermentation by-products acting as inhibitors to succinic acid production via novel membrane electrolysis and optimised simultaneous saccharification and fermentation for lactic acid production followed by a downstream separation process. These should minimise issues of heterogeneous MSW composition.

## Objectives

PERCAL has set itself the following objectives

- To improve enzymes cocktails to maximize organic hydrolysis for a range of MSW compositions.
- To study the production and purification of Lactic acid from MSW using sequential and simultaneous saccharification and fermentation.
- To study the production and in-line purification of Succinic Acid from MSW using membrane electrolysis technology.
- To valorise the fermentation by-products, increasing the recovery from the organic content of MSW by 25 percent.
- To produce ethyl lactate solvents for use in cleaning products and inks by simultaneous esterification and product separation process.

## Expected impacts

- PERCAL intends to improve the yield of intermediate extraction/recovery from the organic content of MSW by 20 percent with respect to state-of-the-art or exceed 80 percent yield of intermediates
- It will also validate removal of inhibitors to a level where it allows cost-effective downstream processing, comparable to that obtained from lignocellulosic biomass. The difference in yield between them should not exceed 10 percent.
- In addition, PERCAL will make a number of environmental and socially important impacts. It will reduce the environmental impact of production by using environmentally friendly technologies. It will also contribute significantly to jobs in green chemistry in coming years.



• To produce lactic acid based hot melt adhesives for application in cardboard and labels.

- To produce polyester and polyether polyols for application in polyurethanes.
- To study integration of in-line control technologies to the PERSEO pilot plant to increase process control parameters, versatility and to maximise homogeneity of the fermentable feedstock.

## Project coordination

- Industrias Mecanicas Alcudia SA (Spain)
- AIMPLAS - Asociación de Investigación de Materiales Plásticos y Conexas (Spain)
- Leibniz Institute of Agricultural Engineering and Bio-economy e.V. (Germany)
- Agricultural University of Athens (Greece)
- Universiteit Gent (Belgium)
- Fundación CENER-CIEMAT (Spain)
- tbw research GesmbH (Austria)
- IRIS Advanced Engineering Ltd (Ireland)
- SO.F.TER. Spa (Italy)
- Hayat Kimya Sanayi Anonim (Turkey)
- Covestro Deutschland AG (Germany)
- Exergy Ltd (United Kingdom)

**Organisation name:** Industrias Mecanicas Alcudia SA (Spain)