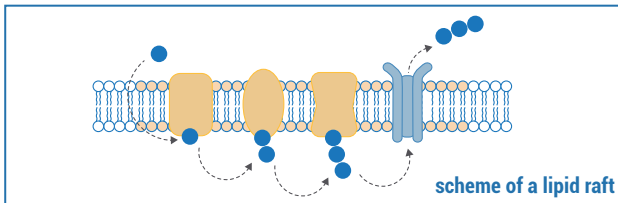


Rafts4Biotech in a nutshell ◀◀◀

Rafts4Biotech (R4B) is a European research project that aims to optimise bacteria for the industrial production of pharmaceuticals, cosmetics and food-related compounds.

Bacteria are widely used in biotechnology, however, the performance of these microorganisms in the demanding industrial conditions is limited by the toxicity of some compounds and the complex metabolic interactions that occur within the bacterial cells.

The R4B's strategy relies on confining the production of these compounds to specialised areas of the microbe's membrane called **lipid rafts**. These recently-discovered regions present an ideal setting to avoid interferences with bacterial metabolism and viability, thus increasing productivity.



Using ***B. subtilis*** and ***E. coli*** as models for both gram positive and negative bacteria, R4B will engineer synthetic lipid rafts in these microorganisms to host the production of antibiotics and vitamins, or the degradation of food pollutants. Moreover, these modified strains will be used as **standardised microbial chassis** platforms to fit other biotechnological needs.

To ensure that this novel and versatile technology is successfully transferred from the lab to the market, the project gathers a team of experienced academic and industrial partners that aim to make real impact in the European biotechnology industry.

The Project in numbers ◀◀◀

R4B

9 EU countries

Spain
Czech Republic
Germany
France
Netherlands
Austria
Switzerland
Italy

4 years

7,5 M€ funding

12 partners

Research centres and
universities
SMEs

rafts
4biotech

Synthetic bacterial lipid rafts
to optimise industrial bioprocesses

CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

CNB
CONSEJO NACIONAL DE INVESTIGACIONES CIENTÍFICAS

FNUSA
ICRC
FACULTAD DE CIENCIAS QUÍMICAS, BIOLÓGICAS Y FARMACÉUTICAS

Universitätsmedizin
GOTTINGEN

enGenes

GEORG-AUGUST-UNIVERSITÄT
GOTTINGEN

university of
 groningen

enantis

NAICONS

Institut Pasteur

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Biosyntia

scienseed

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The Project ◀◀◀

SIMULATION AND VALIDATION

to study key enzymatic pathways

Using mathematical modelling and simulations R4B will study the stoichiometry of relevant enzymatic pathways and validate them experimentally using microfluidic chip devices.

CONSTRUCTION OF SYNTHETIC LIPID RAFTS

in optimised bacterial chassis

A complete molecular toolbox will be developed in order to construct synthetic lipid rafts, to host relevant industrial bioprocesses.

SCALE UP

from the lab to industrial settings

To facilitate the translation of the Rafts4Biotech technology into industrially-relevant scenarios, a stepwise scale up plan will be followed until reaching an industrial pilot setting. This will allow to test and optimise the performance of synthetic lipid rafts in industrial conditions.

GENETIC OPTIMISATION

by eliminating non-essential genes

In order to optimise the performance of *E. coli* and *B. subtilis* in industrial settings, genes that do not play a relevant role in industrial growth and production will be eliminated to establish a first line of microbial chassis.

CHARACTERISATION

of the engineered microbial chassis

To characterise the metabolic robustness of the newly engineered raft-harboring microorganisms and optimise the performance of the synthetic lipid rafts, a transcriptomic, proteomic and metabolomic analysis will be performed.

INDUSTRIAL EXPLOITATION

to boost European competitiveness

A comprehensive business case and exploitation strategy will be developed in order to translate this scientific breakthrough into a competitive biotechnological tool.

Study cases ◀◀◀

PHARMA SC

Producing novel antibiotics to fight resistant infections



To meet the current social demand of a new generation of effective antibiotics, R4B will apply the raft technology to the development of high value-added lipophilic antimicrobials that inhibit cell division by interfering with cell wall synthesis. This type of antimicrobials are otherwise hard to produce due to their inherent toxicity to bacterial cells, thus R4B will offer new possibilities to fight multi-drug resistant bacterial infections.

COSMETIC SC

Implementing biochemical pathways of commercial value



Makeup and hair or skin products are highly demanded cosmetics found in almost every household. They contain molecules like natural pigments and vitamins. Conventionally, these molecules have been produced by chemical synthesis but this often shows low yields and high production costs.

R4B will implement the raft-based technology into the production of β -carotene and vitamins A and B, replacing chemical-based production by sustainable bioprocesses that operate at lower temperatures and require less energy.

FEED SC:

Improving microbial chassis to enhance the degradation of pollutants



One of the priorities of the food industry is to ensure the quality and safety of all its products. Thus, the control and elimination of food pollutants is a major concern for this sector. Among this pollutants we find TCP, an industrial solvent used as a cleaning and degreasing agent, that has become a widespread contaminant of food and drinking water sources because of its high persistence and difficult elimination.

As standard technologies for remediation of TCP are costly and not very effective, R4B will engineer new microbial chassis with synthetic lipid rafts capable of successfully degrading TCP.