Launch of an industrial biotechnology infra-structure strategy: European recognition for the IBISBA project

On the 11th September in Vienna (Austria), ESFRI[1] will present the 2018 edition of the European Research Infrastructures Roadmap. Among the new infrastructure projects in this latest edition is IBISBA[2], an infrastructure project that aims to draw together European R&D strength to provide new support for the development of industrial biotechnology. Coordinated by the Inra, a French organization that is a world leader in agricultural sciences, IBISBA brings together 14 R&D operators from 9 European member states. The overarching aim of the IBISBA infrastructure project is to provide a novel environment that will accelerate the production of knowledge and the applications thereof. Building on scientific and technological excellence and synergy with industry partners, IBISBA will generate proofs of concept prototypes, new methods and standards and create an environment for the training of tomorrow's industrial biotechnology professionals.

IBISBA entered into a preliminary building phase in 2014 and has since been the focus of collective planning and concept building, performed by 14 partner organizations, located in 9 European member states. In 2017, French government authorities working with the IBISBA consortium submitted the IBISBA candidature to ESFRI. This candidature received strong political support from Finland, Italy, Spain, Greece and the Netherlands, and was backed by leading European research organizations in Belgium, Germany and the United Kingdom[3]. Recognition of the importance of the IBISBA project by ESFRI is an important step in the project's trajectory, since it confirms the scientific excellence and the strategic pertinence of the concept. Moreover, ESFRI recognition opens up a new development that will allow IBISBA to create services that aim to accelerate the preindustrial R&D phases of bioprocess development, thus supporting industrial biotechnology and promoting its role as a key enabling technology of the bioeconomy.

Industrial biotechnology, a cornerstone of the bioeconomy

It is widely recognized that Industrial Biotechnology is a Key Enabling Technology for the bioeconomy transition. This is because biocatalysts (enzymes, microroganisms etc) are exquisitely adapted for the conversion of biobased resources into a wide range of commercial products. Moreover, unlike chemical catalysts, workhorses of the petrochemical industry for the conversion of fossil-resources, biocatalysts handle oxygen-rich biomolecules, operate in aqueous conditions and in moderate (in terms of temperature and pH) reactions conditions. Moreover, when used alone or in synergy with chemical catalysis, industrial biotechnology holds the potential to address many of society's needs, converting biobased raw material into fuels, chemical building blocks, materials, cosmetics and pharmaceutical ingredients, and providing solutions, for example, for recyling.

The founding partners of IBISBA

[1] European Science Forum for Research Infrastructure. Created in 2002, ESFRI plays an central role in the definition of Europe's long term policy for large Research Infrastructure

[2] IBISBA is the acronym for Industrial Biotechnology Innovation and Synthetic Biology Acceleration

[3] [3] Le Forum stratégique européen sur les infrastructures de recherche (ESFRI) a été créé en 2002. Il a un rôle clé dans l'élaboration de la politique en matière d'infrastructures de recherche en Europe.

[3] IBISBA pour « Industrial Biotechnology Innovation and Synthetic Biology Acceleration »

[3] IBISBA partners are : VITO (Belgium), VTT (Finland), CEA, Inra, INSA Toulouse and the Université de Nantes (France), RWTH Aachen University and Fraunhofer IGB/CBP (Germany), Wageningen UR(The Netherlands), National Technical University of Athens (Greece), CNR and Università degli Studi di Napoli Federico II (Italy), CIB & CNB – CSIC and Universitat Autònoma de Barcelona (Spain), Manchester Institute of Biotechnology (The United Kingdom).

The origins of the IBISBA infrastructure project are diverse and draw upon Europe's rich landscape of scientific and technological infrastructure focused on industrial biotechnology. IBISBA also draws upon the experience of longstanding players in Industrial biotechnology, developing R&D in systems and synthetic biology, and in bioprocess and chemical engineering. Many of the partners are universities, but others are RTOs and research organizations. Together they combine a wide range of knowledge, significant infrastructure capability and a track record of successful synergy with private sector partners.

Recent R&D breakthroughs in industrial biotechnology [From a UK perspective]

Industrial Biotechnology is now entering a golden age of opportunity where bio-based chemical production processes are already delivering major economic impact. By building on developments in enzyme catalysis and harnessing the tools and techniques of synthetic biology we have the prospect to dramatically enrich and expand bio-based production routes.

At the University of Manchester, Industrial Biotechnology is an area of pioneering discovery, interdisciplinary collaboration and cross sector partnerships. Centred in the Manchester Institute of Biotechnology (MIB) there is a focus on the biological production of diverse high-value chemicals and materials, and the valorisation of waste through the development and application of key enabling technologies and synthetic biology in particular.

In 2014 Manchester received major investment from the UK Research Councils (UKRI) for the Synthetic Biology Research Centre, SYNBIOCHEM focused on fine and speciality chemicals production. This formed part of a National UK investment strategy to establish a comprehensive network of 6 Synthetic Biology Research Centre's (SBRC) alongside DNA foundries and training and innovation Centre's. This on-going strategy is aimed to ensure that the UK is positioned at the forefront of future sustainable IB and bio-manufacturing developments in the drive towards the global bio-economy. The IBISBA infrastructure project provides a superb opportunity to connect across Europe and benefit from the shared expertise and resources.

The creation of SYNBIOCHEM provided the opportunity to invest in major capital equipment (including robotic automation and MS analytics) that is supported by interdisciplinary technical experts. The Centre is supporting a large portfolio of fundamental research projects and working with academic and industrial collaborators to foster their translation into industrial processes. In SYNBIOCHEM automated "Build" capabilities are complemented by advanced computational methods for intelligent *in-silico* "Design" (modelling, design of experiments, data screening and machine learning) coupled with high-end "Test" analytical capabilities (for accurate identification and quantification of our chemical targets) which is transforming our capability to rapidly provide Design-Build-Test-Learn cycles for the engineering of biology.

From the offset SYNBIOCHEM has worked closely with industry partners to commercialise its research activity. These partnerships have provided new bio-parts and production platforms that are delivering new routes to antimicrobial compounds, drug precursor chemicals, flavours and fragrances (e.g. pravastatin, menthol and monoterpenes), new component enzymes for fuels production and biofuels (e.g. bio-propane).

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