# PRESS RELEASE

## European BIOSID Project

BIOSID
bioartificial pancreas

SEVENTH FRAMEWORK PROGRAMME

*Type 1 diabetes*

## A step forward to the clinical validation of the MAILPAN® bioartificial pancreas

**Coordinator**

CEED
CENTRE EUROPÉEN D'ÉTUDE DU DIABÈTE

**Partners**

Defymed

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BIOSID
bioartificial pancreas

# Summary

Press release

# Type 1 diabetes
# A step forward to the clinical validation of the MAILPAN® bioartificial pancreas

Strasbourg, 12th June 2017 | BIOSID is an European project coordinated by the European Diabetes Study Center (for Centre européen d'étude du Diabète or CeeD) and initiated by a CeeD spin-off, the start-up Defymed (developer of the MAILPAN® bioartificial pancreas). The BIOSID consortium, which brings together five other expert bodies, has culminated in a positive outcome thanks to results which will soon be possible to put into use.
Funded by the European Commission via the 7th Framework Programme for Research and Technological Development (FP7), BIOSID has helped to overcome several technological barriers to progress for the bioartifical pancreas MAILPAN®, thus speeding up its development.
**MAILPAN® is now on track to achieve its primary goal: application in humans. Something that could see the hopes of more than 40 million insulin-dependent diabetics across the world become a reality!**

## Type 1 diabetes: treatments to be improved

**Despite constant scientific and medical advances, today diabetes is still incurable.** To take care of themselves, type 1 diabetes patients are forced to inject themselves each day with the insulin they need to regulate their blood sugar properly (since their body no longer produces it), either by injection (syringe or pen) or by pump – and this **for lifetime**.
Although **whole pancreas transplant** and **pancreatic islets transplantation** (or islets of Langerhans) allows these patients to receive a more **physiological** treatment (in the short or medium term), **these solutions still come up against numerous limitations**. Due to the very low number of available pancreas donors, but also to potentially toxic anti-rejection treatments, these procedures are reserved for extreme and unstable cases of type 1 diabetes, which represent only about 100 people in France for example. **But nearly 40 million people worldwide currently suffer from this type of diabetes and its prevalence is constantly increasing.**

## The MAILPAN® device, an alternative that carries hope for patients

**Originally developed by the CeeD, with Defymed in charge since 2011, MAILPAN® (standing for "MAcroencapsulation of PANcreatic Islets") is thought to offer an optimal alternative for diabetic patients in comparison with current treatments.**

Smaller than a CD, the MAILPAN® takes the form of a pouch or pocket designed to be implanted into a patient's abdomen. This is designed to contain insulin-secreting cells in order to replace the patient's pancreatic islets and respond autonomously to their body's insulin needs.
If the MAILPAN® project is successful, patients would find themselves significantly or even completely freed from the constraints of multiple daily insulin injections: **their everyday life would be greatly improved. Such a device aims to reduce the severe hypoglycaemia episodes, thus the risk of complications related to the disease**. **As it does not require in theory any anti-rejection treatment,** the bioartificial pancreas would be a solution that could be **widely deployed in patients and even applicable in other fields of treatment.** A truly **ground-breaking innovation, the MAILPAN® would make SMEs involved in the BIOSID project more competitive worldwide**.

## BIOSID project genesis

BIOSID has a track record of more than 15 years of research relating to the MAILPAN®: At the beginning of this project the CeeD developed and piloted two initial European programmes, FP4 and FP6, which were also funded by the European Commission. This led to the **creation of the Defymed start-up** which is now in charge of developing the MAILPAN®.
Starting in 1996, the prototype was developed by the CeeD in a series of stages that led to the creation of the Defymed SME in 2011.

To ensure all the chances of success of this project, the **CeeD** and its spin-off **Defymed**, two French SMEs based in Strasbourg (France), have built a strong consortium uniting 5 other partners from complementary fields of expertise. In this case:

- the Department of Endocrinology, Diabetes and Nutrition from the **University Hospital Center of Montpellier** (CHU)- France
- the laboratory of Experimental Surgery of the **Catholic University of Louvain** (UCL) - Belgium
- the Nuffield department of Surgical Sciences from the **Oxford University** (NDS)- UK,
- **Univercell-biosolutions (formerly named Endocells)**, a French SME based in Toulouse-France
- **AvantiCell** (ACS), a Scottish SME- UK

The consortium's expertise includes encapsulation techniques, islet isolation, cell engineering, islet transplantation, islet preconditioning, surgical implantation, and medium formulation; items that are complementary and essential for the implementation of the present project.

## Positive results that it will soon be possible to put into use

With over 5 million euros of funding from the European Commission (FP7) over 4 years, **BIOSID has met the following objectives:**

- understanding the needs of insulin-secreting cells in the device;
- meeting these needs in order to improve their life expectancy in the bioartificial pancreas;
- testing the bioartificial pancreas, together with the insulin-secreting cells, in small and large animals in preparation for proceeding to the clinical phase with this device in humans.

BIOSID has made it possible to better **understand physical and chemical conditions present inside the MAILPAN®** device while developing various strategies aimed at reducing harmful effects on the cells, such as inflammation or hypoxia. These have included formulating **a novel culture medium, capable of substantially improving the survival and functioning of insulin-secreting islets/cells**.
BIOSID has also made it possible to **develop a new generation of insulin-producing human cell lines.**
Several fields of applications have already been identified for the future commercial exploitation of these various products.
At the same time, studies have helped to **support and confirm preclinical data on biocompatibility, safety and functioning of the MAILPAN® in small and large animals**. This is done in order to **meet regulatory requirements** in force for this type of medical device and thus ensure that the first implantation is without risk for the patient.

**Finally, the BIOSID project has made it possible to optimise the development of the MAILPAN®, as a future physiological solution for type 1 diabetes patients. Defymed continues to test insulin-secreting cells from different sources (supplied by international partners) in combination with the MAILPAN® on animals, in order to select the most suitable cells for the device. At the same time, the start-up will also go through all the regulatory steps to obtain an authorisation to proceed to the clinical phase with this combination.**

**Appendix 1**

# Diabetes: the state of play in 2017

## Where are we now?

**Regarded as one of the four top-priority non-communicable diseases[1], diabetes is a major public health problem and despite prevention efforts, the pandemic continues.**

In 2014, diabetes affected 422 million people worldwide, compared with only 108 million patients worldwide in 1980. In their initial forecasts in 1990, the World Health Organization (WHO) and the *International Diabetes Federation* (IDF) expressed concern about the risk that diabetes could affect 240 million people by 2025 ... The forecasts from these two bodies are all the more worrying because they predict 550 million diabetic patients for 2025 and 642 for 2040: **in the very near future, one in 10 adults will be affected by diabetes** – and this without taking into account the fact that almost 50% of diabetics worldwide are not diagnosed (40% in Europe).

**One person dies of diabetes in the world every 6 seconds:** the number of deaths attributable to diabetes is 3.7 million a year worldwide (43% of which before the age of 70) and this figure is expected to reach 5 million by 2025. By way of comparison, in the same year AIDS will have been responsible for 1.5 million deaths and malaria for 600,000 deaths. Furthermore, a recent study published in the journal *Plos One*[2] showed that the mortality statistics associated with diabetes were probably an underestimate. This work has in fact revised the position of diabetes in death upwards: this disease now accounts for the cause of death in 12% of cases in the United States, which is to say three times what was previously estimated.

It should also be taken into account that **diabetes exposes patients to complications**: it multiplies the risk of amputation by 8, the risk of dialysis for end-stage renal failure by 9, and the risk of myocardial infarction or stroke by 2. Diabetes remains the leading cause of acquired blindness in adults and can have a dramatic impact on the quality of life of diabetics, especially in cases of severe neuropathy.

## The financial impact

Due to the cost of insulin and other associated drugs and/or devices, diabetes is **a financial burden for patients and their families but also incurs direct costs to society.**

Diabetes also has **indirect consequences** on the national health care systems and economy through:

- the loss of earnings associated with decreased productivity;
- the degenerative complications caused by diabetes, such as blindness, kidney failure or cardiac problems. Indeed, even if it is possible to live with diabetes today, the patient's general state of health is usually severely impaired.

**The cost of diabetes to society naturally reflects the seriousness of this chronic disease.** It accounts for between 5 and 20% of the health budgets of the developed countries (on average, 12.5%).

[1]Resolution 66/2. Policy statement of the General Assembly High-level Meeting on prevention and control of non-communicable diseases. Sixty-sixth session of the United Nations General Assembly. New York, United Nations, 2011.

[2] *Deaths Attributable to Diabetes in the United States-Comparison of Data Sources and Estimation Approach,* Stokes A, Preston S, Plos One, Jan 2017

Currently estimated at $673 billion worldwide, it is forecast to cost $802 billion in 2040 ($156 and $174 billion respectively in Europe, for the same dates) (source: IDF Diabetes Atlas).

## Barriers to the efficacy of treatment

To be fully effective, the treatment used by a diabetic has to be complemented by high-quality dietary and general health management measures, in the form of a balanced diet and regular physical activity. For the most part, patients find that implementing and above all maintaining these measures over time is a very negative experience, and one in which the doctor often gives only very limited support.

More and more medicines, including but not restricted to **insulin,** require **self-injection by pen or pump, often involving multiple daily injections.** In the non-diabetic subject, insulin is secreted very precisely according to their needs- which is not the case when a diabetic receives the same hormone as a treatment. The patient therefore has to monitor their capillary blood glucose by taking sample drops of blood, which is also essential in order to give advance warning of any complications.

***A diabetic who treats himself for 20 years, with 3-4 insulin injections and the same number of glucose checks every day, will have jabbed himself with a needle nearly 50,000 times.***

Diabetes can lead the diabetic - like many patients with a chronic condition - to become veritably **de-socialised,** or even to lose touch with the frame of reference of **family life.** The majority of diabetics experience deterioration in their **quality of life** due to **difficulties with social and professional integration, destabilisation of their family situation, constraints of everyday life, functional repercussions of diabetes** and **oppressive burden of the treatment.**

Hence the specifications of what is to **become the treatment for diabetics** in years to come, namely a treatment that is the most **automated** possible:

- reducing the patient's **burden of decision-making**;
- avoiding both **chronic hyperglycaemia** and **hypoglycaemia**;
- forestalling the risk of **chronic complications** related to hyperglycaemia;
- **avoiding having to display** the chronic affliction from which the patient suffers to all and sundry;
- Finally making it possible to have a high quality **social, professional and family life**.

**Finally, the MAILPAN® bioartificial pancreas should satisfy both medical and social expectations of type 1 diabetic patients while also acting to positive effect on the indirect consequences of the disease.**

**Appendix 2**

# Focus on type 1 diabetes

## A disease on the rise

For nearly 20 years now, the prevalence of type 1 diabetes has been increasing by 3 to 4% a year worldwide. It has also been found that the onset of this disease is occurring earlier and earlier, particularly in children under 5 years of age; in fact it is one of the most common endocrine and metabolic disorders in children. In 2015, figures from the *International Diabetes Federation* (IDF) indicated that children with type 1 diabetes numbered over half a million worldwide. Various reasons for this increase have been suggested, such as diet, exposure to endocrine disruptors, increased maternal age etc. The main cause of this exponential increase is thought to be environmental changes interacting with the genome.

## What is the nature of this disease?

**Type 1** or insulin-dependent **diabetes** is a chronic autoimmune disease characterized by the progressive destruction of the islets of Langerhans (pancreatic cells) which are responsible for the secretion of insulin. It is this hormone, insulin, which regulates blood sugar levels. As their body no longer manufactures it, patients are thus forced to inject themselves with insulin throughout their life in order to control their blood glucose. Without insulin, patients cannot survive their illness. They must also monitor their blood sugar, keep to a healthy diet and practice physical activity. Failure to continuously monitor and control diabetes most often leads to the development of complications (affecting the heart, blood vessels, nerves, eyes and kidneys) in the medium and long term, which places a heavy burden patients and those around them.

It affects people of any age, this disease most commonly develops before the age of 20. Symptoms may appear abruptly, and usually consist of constant thirst, weight loss, impaired vision, severe fatigue, abundant urine etc.

**Although type 1 diabetes can now be treated, this disease cannot be prevented and has no cure. Except for transplantation of insulin-secreting cells, there is currently no treatment capable of continuously normalising glucose levels in a stable fashion. The use of the MAILPAN® in association with insulin-secreting cells could offer these patients a new and optimal solution.**

**Appendix 3**

## Bioartificial pancreas MAILPAN®

The BIOSID consortium has made it possible to speed up the development of the MAILPAN® and to ensure that this treatment – that offers such hope – could have every chance of success.

**In comparison with current treatments for type 1 diabetes, the MAILPAN® bioartificial pancreas is thought to be able to offer numerous advantages that could significantly improve the quality of life of many diabetic patients.**

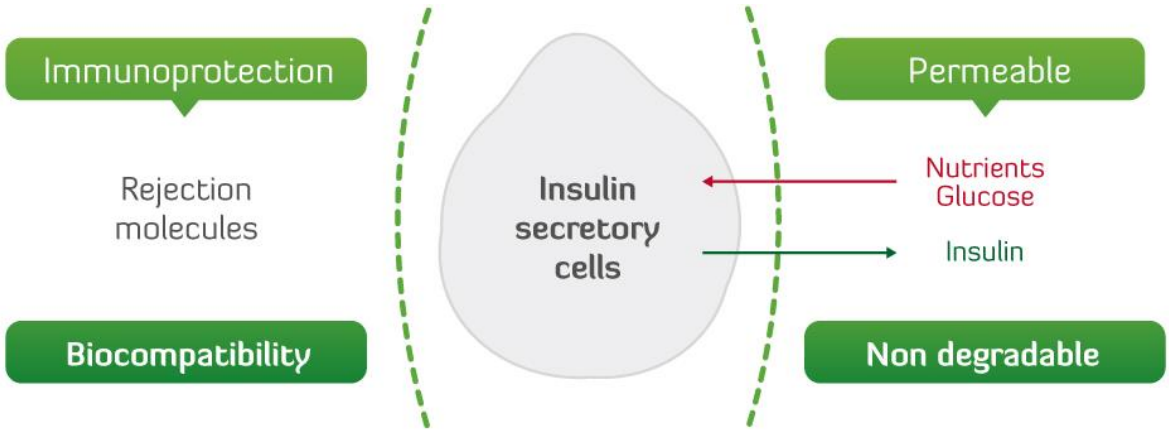
**MAILPAN® prototype**

**Three functions are essential for the bioartificial pancreas:**

- Protect the transplanted cells from the recipient's immune system
- Protect the recipient from the transplanted cells
- Maximize the function of the transplanted cells

### The innovative features of the MAILPAN® medical device

- The development of a bioartificial pancreas would be based on an effective immuno-isolation of insulin-secreting cells based primarily on their encapsulation using artificial membranes impermeable to molecules involved in the rejection but permeable to glucose, insulin, oxygen and nutrients.
  Therefore, no immunosuppressive therapy would be required. This physiological solution would allow cellular therapy to become a widely deployed reality.




**Principle**

- **The MAILPAN® would control the patient's blood glucose physiologically:** the patient no longer needs external insulin input.
  - ⇨ **The expected benefits would be a reduction of severe hypoglycemic episodes on one side, and a reduction of chronic hyperglycaemia determining long-term complications of diabetes on the other side.**

- Choosing to implant the MAILPAN® into the patient's abdomen would make it possible to **render the system simpler and more unobtrusive**.


**Simulation: the implantation of a MAILPAN®**

- Thanks to the MAILPAN® in case of success, the patient would need only simple, routine visits to a diabetes unit 2 to 4 times a year to replace the transplanted cells - which is done **without surgery**. The old cells would be replaced with new ones as needed, by means of a simple emptying/re-filling procedure carried out through the input and output ports placed under the skin.
  Moreover, this device would have no electronic components and would have the advantage of **functioning completely independently,** requiring little or even no action on the part of the patient.

- The MAILPAN would offer the possibility of using **insulin-secreting cells of any origin** (islets isolated from human donors, porcine islets or even stem cells) some of which are available in **unlimited quantities** and which could not be transplanted in "free" form, that is to say outside of a medical device.

**Appendix 4**

## Project history

**The CeeD of Strasbourg initiated this project in 1996** based on an innovative concept of a bioartificial pancreas, called MAILPAN® (macro-encapsulation of pancreatic islets) to design an implantable device for macro-encapsulation of insulin-secreting cells in humans. This work was conducted in partnership with STATICE (Besancon) and with the Centre de Transfert de Technologie du Mans (CTTM).

This project involved the validation and integration of multiple technological steps, of which the first two were funded by the European Commission, via:

- The BARP project (Bioartificial Pancreas) developed within the 4th PCRD framework (1996-2000) which resulted in the **validation of the concept of islet immunoprotection** by encapsulation using semi-permeable artificial membranes.


- The BARP+ project developed within the 6th OCRD framework (2004-2007) which **defined the system materials** and **validated, in the small (rat) and/or large animal (pig),** the expected **features**: filling capacity, biocompatibility, implantation and function.


At this stage, it was then necessary **to change the system for a qualified medical device** for its placement on the market. **To do this, the Defymed start-up was born in march 2011, with the support of SEMIA, incubator for innovative businesses in Alsace** accredited by the Ministry of National Education, Research and Technology.

**Since its foundation, Defymed was rewarded several times, receiving in particular:**

- The national competition award for the creation of innovative technology companies in the "Emergence" category and the Innovation Award for the Alsace Region (2010)
- The national competition award for the creation of innovative technology companies in the "Creation-Development" category of the Ministry of Higher Education and Research (2011)
- First prize winner of the “Tremplin Entreprise” contest of the French Senate in the category “Life Sciences” (2011)
- Laureate of the “Universal Biotech” contest (2011)
- Winner of the “Fond’Action Alsace” price in the category “Talent of the future”
- “Innovative companies” label obtained of the French Bioclusters (2012)
- Winner of the Fast 50 Deloitte-In Extenso prize (2014)
- First laureate of the « Inventer demain » Award (2015)
- Special award from INPI and gold medal with the jury mention at the 44th international inventions tradeshow in Geneva (2016)
- Winner of the Medstartup- Galien Awards 2016 – Category ” Best Innovative trial design leading to quicker and better therapeutic outcome” (2016)

**Appendix 5**

# Description of the 7 partners

## About the CeeD

**The European Diabetes Study Center (in French, Centre européen d'étude du Diabète - CeeD) was created in 1991 by Professor Michel Pinget, current president of the CeeD but also professor emeritus at the Strasbourg University.**

**Structure of translational research, the CeeD combines physicians and researchers to respond via laboratory research to questions from health care teams and to patient's expectations.**

Its main objectives are to:

- develop new prevention and treatment models for patients;
- initiate and drive innovative projects alongside the best European research teams, in permanent interaction with the hospital teams;
- inform and massively educate on this serious public health problem;
- promote and develop scientific exchanges at all levels of medicine and research.

### Role in the BIOSID project

BIOSID project **coordinator**, the CeeD has extensive coordination experience through the 2 European projects, BARP (4th FPRD) and BARP+ (6th FPRD), which gave rise to the current MAILPAN® bioartificial pancreas prototype. The BARP+ project was recognized as a "Success Story" by the European Commission. During these two projects, 3 patents protecting the MAILPAN® were filed and numerous scientific publications in international journals.

In addition to coordinating the project, the CeeD worked on understanding the needs of the islets in terms of viability and function. Thus, the CeeD mobilized its research teams in order to study the behavior of islets in the MAILPAN®.

www.ceed-diabete.org

## About Avanticell

**AvantiCell Science (ACS), a biotechnology SME based in Scotland (UK), specialised in cell culture technologies for human primary cells, including the design of culture environments adapted to the needs of each cell type. ACS supplies products built upon these technologies, and cell-based analysis services based upon them.** These products and services take advantage of ACS processes for additive manufacture of 3D cell culture models, and Cryotix™ cryopreservation technology which will allow advanced cell systems to be delivered to customers in user-friendly "plug and play" formats.

### Role in the BIOSID project

The ACS contribution to BIOSID was the development of a culture medium able to sustain insulin-secreting cells within the bioartificial pancreas, and to maintain their secretory function. ACS systematically tested a range of medium formulations, using its cell-based analysis platforms to evaluate effect on pancreatic islet ß-cell viability and glucose-dependent insulin secretion of media containing different combinations of protective agents. Cell-based analysis was performed under hypoxic conditions likely to reflect initial cell filling of the MAILPAN® device. The ultimate formulation arrived at through a series of incremental improvements was then used to commission the first commercial manufacture of culture medium customised for MAILPAN® use, creating the opportunity for scalable manufacture to industry-compliant quality standards.

This work was performed in close collaboration with project partners, and took advantage of the ACS network of collaborations built through participation in multiple European programmes, which gave access to other valuable, leading-edge cell-based technologies.

www.avanticell.com

## About CHRU Montpellier

**Coordinated by Professor Eric Renard, the Department of Endocrinology, Diabetes and Nutrition of the University Hospital Center (UHC) of Montpelier has over 20 years of experience in optimizing therapy for type 1 diabetes.** More specifically, this department contributes to a collaborative group for innovative technologies in drug infusion with the Association for Helping Patients Treated by Drug Infusion (AMTIM) dedicated to the clinical trials of innovative medical devices for the treatment of diabetes (implantable and external pumps and the artificial pancreas). The UHC of Montpellier is also experienced in the isolation of human pancreatic islets and in the study of mechanisms involved in the survival of islets, before and after transplantation in humans. The UHC of Montpellier has participated from 2003 in the GRAGIL network (Rhine-Rhone-Alps Geneva Group for the transplantation of islets of Langerhans). The UHC has been involved in several European programs (7th FPRD and others) and its experience in the conduct of such projects is a great advantage for BIOSID.

### Role in the BIOSID project

Its role in BIOSID will mainly focus on following tasks:

- the isolation of human pancreatic islets from donors,
- the understanding of the needs of insulin-secreting cells in the bioartificial pancreas, in partnership with the project partners, in order to improve the survival and function of these islets in the MAILPAN®.

www.chu-montpellier.fr

## About Nuffield Department of Surgical Sciences

**The Nuffield Department of Surgical Sciences at the University of Oxford, including the team led by Professor Paul Johnson, is a pioneering center in the isolation and clinical transplantation of human pancreatic islets.** The research is divided into 11 themes among which transplantation is one of the most developed. Their work on the isolation of pancreatic islets began in the 80s, for applications in research, while clinical application began in the 90s. This department has access to unique facilities for the isolation of human pancreatic islets under GMP conditions, with transplantation success that exceeds 70% of transplant patients.

### Role in the BIOSID project

NDS worked closely with the CeeD to understand the needs of insulin-secreting cells in the bioartificial pancreas and provided the answers necessary for their survival in it. In addition, this public department intervened in the supply of MAILPAN® with human pancreatic islets for clinical trials and performed a part of these tests, at Oxford.

www.ox.ac.uk

## About Defymed

**Spin-off of the CeeD, Defymed is a French SME specialized in the design and development of innovative bioartificial medical devices. Defymed is, first, focused on an application for the treatment of type 1 diabetes.**

The first product designed by Defymed is a bioartificial pancreas intended to be implanted in diabetic patients in order to restore normal and stable blood sugar levels in the latter. This device named MAILPAN (macro-encapsulation of pancreatic islets) is in the form of a pocket having functions of a bioartificial pancreas, which once implanted will be filled with insulin-secreting cells. Defymed's strength is based on its network of national and international partners, including historical partners such as the CTTM (Centre de Transfert de Technologie du Mans) and STATICE. Defymed has a unique technology which enables it to shape these medical devices to respond to other therapeutic applications.

### Role in the BIOSID project

As owner of the bioartificial pancreas MAILPAN®, on which the BIOSID project is based, **Defymed is responsible for managing the exploitation and dissemination of the BIOSID project.** The team from the start-up also investigated the biocompatibility and function of the MAILPAN® device in preclinical phases in small and large animals, with a particular focus on the regulatory aspects related to these studies. Finally, Defymed was responsible for the design and manufacture of MAILPAN® adapted to the model used (small or large animals and humans) for the BIOSID partners.

www.defymed.com

## About Univercell BioSolutions

**Univercell-Biosolutions (UB), a French biotechnology SME, is specialized in designing unique human cell models which perfectly mimic native human cells function. Univercell-Biosolutions first success is the development of Endoc-BH1, a functional human beta cells which has been largely adopted all over the world by more than 200 laboratories from Academia and 10 international industrials to date.**

Univercell-Biosolutions, a pioneer in human cell differentiation and maturation technologies from stem cells and foetal cells, provides innovative cell models for drug development and enables the exploitation of these ground-breaking technologies by setting new standards for industrial production. Founded in 2010, UB introduced EndoC-βH1 cell line, the first ever available human β-cell line. UB's mission is to exploit the potential of stem cells (induced pluripotent stem cells and embryonic stem cells) and design functional human cell models for fundamental research and drug screening.

### Role in the BIOSID project

The Univercell-Biosolutions team has optimized culture conditions of the human Beta cell line Endoc-BH1 to understand for improving the functional robustness but also viability when coupled with the MAILPAN® device. This remarkable job has been done in close and efficient partnership with Defymed et UCL .To this end, Univercell-Biosolutions studied Endoc-BH1 cell line behavior and mortality yield during the preclinical phase. Furthermore, the Endoc-BH1 cells effectiveness and safety has also been deeply investigated by BIOSID partners using animal models.

www.univercell-biosolutions.com

## About UCL - Brussels

**The laboratory of experimental surgery of the UCL (Université Catholique de Louvain) in Brussels capitalizes on over 20 years experience in the field of transplantation (single cells and whole organs) and immunology in large animals.**

Directed by **Professor Pierre Gianello**, this laboratory is specialized in the encapsulation of insulin-secreting cells and in studying of this treatment in large animals. With an animal housing within a laboratory of an area over 600m$^2$, it provides the best conditions and equipment for experimental surgery and monitoring of animal metabolism, as well as facilities for biological analysis and immunological monitoring.

### Role in the BIOSID project

The UCL team intervened in the preclinical validation of the MAILPAN® device on large animals, in close collaboration with Defymed, as well as the isolation of insulin-secreting cells of animal and human origin. The preclinical validation allowed understanding the function of MAILPAN® associated with different cells, its integration, immune responses within and around the device, in order to obtain permission to enter clinical trials, via the European regulatory authorities. UCL developed its own large diabetic animal models which had been used for the implementation of the MAILPAN®.

www.uclouvain.be

## Appendix 6

## Presentation of the European BIOSID project financed by the European Commission

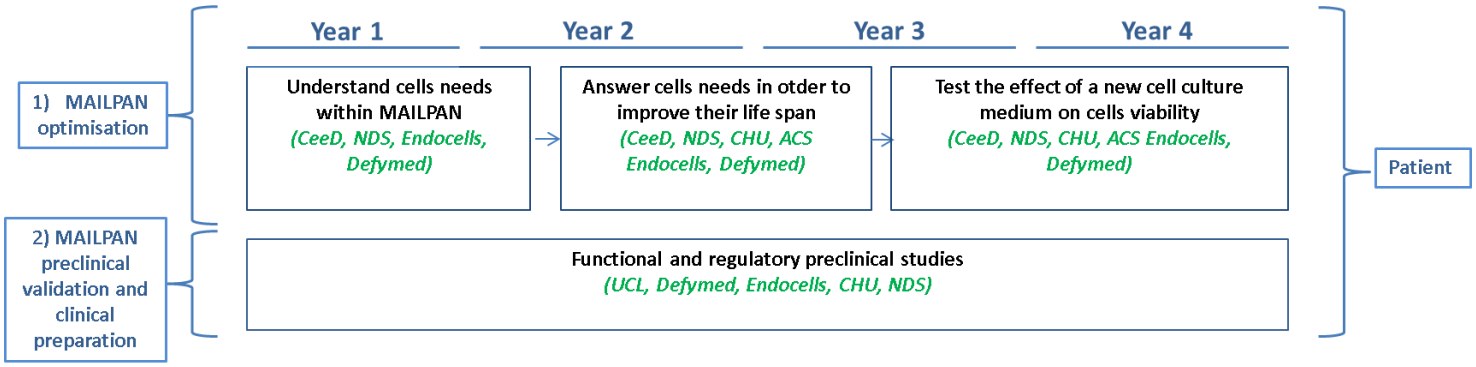
**The framework programme for research and development (FPRD)is the main financing tool for research in the European Union. Currently underway, the 7th covers the period 2007-2013 for a total budget of over 50 billion Euro, including nearly 6 billion allocated to health.**

### The strategy of the BIOSID program consists of two main components

1. **Understand the internal environment of MAILPAN® and develop new strategies in order to ensure the best conditions for the survival and function of encapsulated cells from year 1**. Therefore, a study of the environment of the cells in the MAILPAN® had been conducted in years 1 and 2. The ultimate goal was to formulate an innovative culture medium for cells, incorporating beneficial molecules for their survival and function in the MAILPAN®. The effect of this new culture medium has been tested for the survival and function of the encapsulated cells, in years 3 and 4. These various tasks will be carried out primarily by CEED, NDS, ACS, CHU and Univercells-Biosolutions, in close collaboration with Defymed.

2. Testing in parallel, from year 1, the existing MAILPAN® prototype (developed in the 6th FPRD), in the **preclinical phase**, in small and large animals, using different sources of insulin-secreting cells in order to enter into the human **clinical phase**. Among the encapsulated cells in the MAILPAN® are animal pancreatic islets or even genetically modified human cells. Thus, the MAILPAN®'s capacity, combined with the cells, to restore normal and stable blood sugar levels had been investigated. Finally, in order to obtain permission to enter human clinical phases, the MAILPAN®'s biocompatibility and safety had been validated in preclinical phases, in large animals. The various tasks of this component had been conducted mostly by the UCL, Defymed and Univercells-Biosolutions in close collaboration with CHU et NDS.

### Diagrams representing the main tasks of BIOSID inherent to each partner



**Appendix 7**

## BIOSID project results

As regarding dissemination activities, BIOSID project was valorised in several international meetings and media. We have noted:

- more than **28 press releases/interviews**
- participation in **20 congresses (40 presentations)**, where BIOSID partners have presented the BIOSID objectives and results
- **11 abstracts or 5 full-articles** on project results have been published in peer-reviewed scientific journals.

Furthermore, the project results will allow obtaining a short- or mid-term exploitation to SME partners of the project using a number of strategies (direct selling, licensing agreements, etc.).

Therefore, taken all together, the BIOSID project was considered by all project partners as a real success, that will contribute to the cell therapy field in order to become, one day, a largely deployed reality to patients, such as Type 1 diabetic patients.