

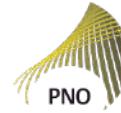
## A definitive solution for a chronic disease

The BRAV3 project aims to obtain a **long-lasting treatment for ischemic heart disease (IHD)**, an incurable malady that affects millions of people worldwide. BRAV3 develops an innovative device that will constitute a lifetime therapy for IHD: the **biological ventricular assist device (BioVAD)**. To reach this goal, the project harnesses the potential of three different disciplines: **computational modelling, 3D printing and regenerative medicine**.

## About the project

BRAV3 gathers 14 partners from **6 states of the European Union** and from different disciplines, including **3 university hospitals, 4 universities, 3 technological research centres, 3 SMEs and 1 international company**.

## Partners



Regenerative medicine to obtain a one-shot treatment for ischemic heart disease

## Contact

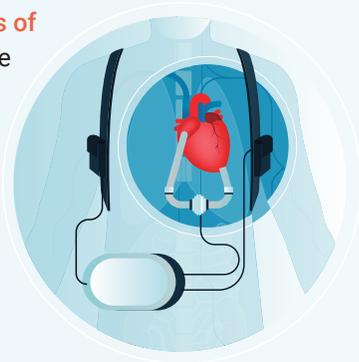
[www.projectbrave.eu](http://www.projectbrave.eu)

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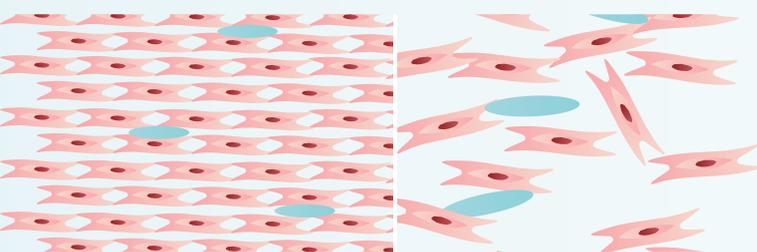
## A lifetime burden

Ischemic heart disease (IHD) is the **leading single cause of death in the European Union** nowadays, for both men and women. IHD originates when the arteries of the heart can't deliver enough blood to this organ. When this supply decreases, part of the heart tissue dies.

IHD leads to a **chronic loss of cardiac function** and, in the worse scenario, the patient's death. Currently, ventricular assist devices (VADs) can provide patients with transitory functional support to damaged hearts, but they are **not a long-lasting solution**. Nowadays, **IHD patients eventually need heart transplantation**.



The main reason for the loss of cardiac function in IHD lies in the **complexity of the heart's structure**. The cardiac muscle fibres must have a specific alignment to create the adequate contraction of the organ. **When IHD strikes, the heart's 3D geometry is affected, and this has a direct impact on heart contraction and pumping**.



Healthy tissue

Ischemic tissue

## A lasting functional support

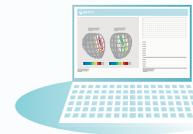
The BRAV3 project focuses on design to provide a personalised restoration of the heart 3D structure: The Biologic Ventricular Assistance Device (BioVAD).

The BioVAD is a scaffold that is placed over the injured area and provides it with two benefits. It **adds new cardiac tissue** to the damaged heart and physically **guides cardiac cells** into the adequate disposition to achieve an adequate pumping. The goal is to produce a device that can eventually integrate within the patient's heart and restore their cardiac function.

### Our workflow

#### Computational analysis of the heart

BRAV3 will use computer modelling tools to delve into the **relationship between cardiac geometry and the mechanics of the tissue**.

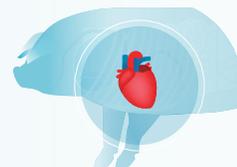


#### Scaffold manufacture

The project will create a **microfibre scaffold** using a novel **3D printing** technique: melt electrowriting. BRAV3 will combine this structure with **hydrogels** to improve its properties.

#### Production of cardiac stem cells

BRAV3 will obtain cardiac cells from **human induced pluripotent stem cells (hiPSCs)** that will be used to **seed the scaffold** and develop into **new functional cardiac tissue**.



#### Preclinical validation

This approach will be tested in pigs, a cardiology model which is similar to humans. This will **speed up the transition of this therapy** from the lab to the patients.

## Bringing benefits to patients, research, and society



**A lifetime therapy:** BRAV3 focuses on providing a **one-shot solution** for ischemic heart disease. BioVADs will supply new muscle to recover the cardiac function.



**A personalised treatment:** thanks to computational analysis, each BioVAD will be tailored to each patient's heart to fit them in terms of size and geometry.



**Speeding up translation:** BRAV3 will test its solution in **pigs**. By skipping smaller animals such as mice, **BioVADs will reach the clinic faster**.



**Easing the burden on healthcare systems:** the BioVAD will reduce the continuous medical assistance and medication that IHD patients require.



**Improving cardiology:** BRAV3 will shed light on the **development and physiology of the heart**. This may enable this therapy to **treat other cardiac conditions**.