GERMAN DESIGN AWARD WINNER 2022

CARL.
A HEARTBEAT AHEAD

With innovative power and science.

CARL. the world's first mobile system
to control extracorporeal circulation in resuscitation.

WWW.RESUSCITEC.DE

Shifting the limits.

Saving time for resuscitation without neurological sequelae.

Currently, the time frame for successful resuscitation is tight as it is assumed that – due to the acute oxygen deficiency – all organs and particularly the brain are irreversibly damaged within a few minutes after cardiac arrest.

But recent findings implicate that this assumption is not true: The organs and also the brain can survive much longer as yet defined without the supply of oxygen. Nevertheless, after a cardiac arrest the entire body is in a special state that must be understood very precisely and treated on a patient-specific basis.

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From vision ...

Based on current research results, we have developed a novel therapy concept for emergency medicine. The new procedure relies on a controlled and personalized bridging of the body's own circulation. The basic function of this technique is listed under the term "Extracorporeal Cardiopulmonary Resuscitation (eCPR)" in the guidelines of the European Resuscitation Council (ERC) as a therapeutic option for patients who suffered a cardiac arrest.

... to an innovative system.

The therapeutic approach of a controlled reperfusion of the whole body cannot be realized ideally with the currently available medical devices. Therefore, we have developed a system that enables us to put the vision of a patient-individual resuscitation into reality.

CARL is primarily designed to preserve brain function during and after resuscitation. For the first time in the history of medicine, we are therefore potentially in the position to push the boundaries of resuscitation.

Back to life.

Winning time and quality of life.

CARL stands for "**C**ontrolled **A**utomated **R**eperfusion of the who**L**e body" during a state of acute heart and/or lung failure. This innovative approach aims to restore cardiac function while preserving the performance of the brain.

> "The new therapy is based on extracorporeal circulation, through which the organism damaged by the cardiac arrest is additionally treated. During a CARL Therapy – and this is new – numerous values are measured that provide information about the patient's condition. The patient's treatment is targeted accordingly by adjusting the flow, composition and temperature of the blood to his or her individual needs."

Univ. Prof. Dr. Dr. h. c. Friedhelm Beyersdorf
Founder & Initiator I Resuscitec GmbH
Former Medical Director of the Clinic of Cardiovascular Surgery
Medical Center I University of Freiburg

> "With the newly developed CARL Therapy, we hope to be able to shift the previous limits of resuscitation. It is the first personalized therapy that takes into account the individual condition of a cardiac arrest patient and in this way helps to prevent cell and organ damage of the kind that occurs after blood flow is restored."

Prof. Dr. Georg Trummer
Clinic for Cardiovascular Surgery
Department University Heart Center
Medical Center I University of Freiburg

Controlled. Targeted. Personalized.

CARL Therapy has the potential to significantly improve the prognosis after cardiac arrest. This is because the new procedure considers the specific pathophysiology, which causes several cell damages and, consequently, organ damage due to the acute oxygen deficiency.

To mitigate these damages, CARL Therapy employs an extracorporeal circulation thereby systematically controlling and adjusting the physical and biochemical conditions in a patient-individual manner.

This is achieved by the addition of specified substances, by a precisely dosed supply of oxygen and by cooling the whole body immediately down to about 34 °C. The corresponding blood values are being monitored continuously and adjusted during this procedure whenever required, so that the organism is enabled optimally to recover from the consequences of ischemia.

> "In order to establish CARL Therapy in clinical practice, numerous innovative approaches in the field of medical technology were required. The visionary challenge was to be able to automatically control and thus monitor both the physical and biochemical perfusion conditions during extracorporeal circulation, and to do so during emergency operations both in and outside the hospital.
>
> We have risen to this challenge – and today we have reached the point where our innovative system can start its journey into the clinics."

Prof. Dr.-Ing. Christoph Benk
Managing Director I Resuscitec GmbH

CARL Controller.

Innovation in our genes.

Mobile perfusion system with powerful, automated dual pump control to generate high pulsatile blood flow. Comprehensive personalized sensor system with continuous venous and arterial blood gas analysis and plug-in fiber optic catheter for invasive blood pressure monitoring. Preconfigured, compact perfusion set for quick and easy system start-up.

Three products, one purpose: Saving lives.

CARL Cooler.

Cool in possibilities.

Mobile hypothermia device for rapid therapeutic cooling in the context of extracorporeal circulation. Up to Δ 4 °C cooling capacity within a few minutes.

CARL MOX.

Change in the air.

Mobile oxygen supply for controlled oxygenation and decarboxylation in the extracorporeal circuit. Resource-saving using room air by means of blower technology. Precise control of O_2 concentration (21-100%) and CO_2 elimination (up to 12 l/min gas flow). Sufficient battery power (approx. 4 h), also for out-of-hospital use.

From the clinic – to the people.

New options for resuscitation.

CARL Therapy and CARL System are the result of decades of clinical research that culminated in the foundation of the innovative medical technology company Resuscitec GmbH.

An interdisciplinary research team of physicians and perfusionists at the Medical Center - University of Freiburg has found that it is possible to resuscitate patients even after a prolonged cardiac arrest without significant sequelae.

The new approach focuses on the so-called “sudden cardiac death”, which, until today, can only be treated conditionally – even under optimal conditions. The survival rate for in hospital cardiac arrests lies at 20%, but only 10% of all patients survive an out-of-hospital cardiac arrest and can get subsequently discharged from the hospital. And the few survivors often suffer from severe and persistent damage to the brain. This is where CARL comes in.

*We always use the masculine form in our texts when referring to persons so as not to impair the flow of reading. However, the masculine gender explicitly represents all genders.

Mobile system, profound support.

The users of our system can count on us at all times, be it in the clinic, during transportation, in an emergency in the home environment or in the open air. Should you have any question, please feel free to make use of our service portal.

CARL. Service: +49 761 557769-0 | info@resuscitec.de

Mission accepted.

CARL saves lives.

CARL has already proven itself in practice. Patients requiring resuscitation yet owe the new system a successful new start into life.

37 year old woman resuscitated after long-term cardiac arrest without neurological damage.

CARL can still help, even after a timespan beyond all positive prognosis. Thus, a young woman and mother was resuscitated with a controlled reperfusion of the whole body in a situation in which further resuscitation attempts seemed hopeless. And CARL achieved what has been considered a medical exception: The patient survived the prolonged cardiac arrest without any brain damage and returned to an active life after a very short time in hospital.

Mid-forty discharged unaffected from hospital after cardiac arrest and resuscitation.

Thanks to CARL, a dedicated teacher also found his way back to a fulfilled life. His heartbeat suddenly stopped during a visit to his doctor. Despite immediate medical care, first aiders failed in restoring the Mid-forty's circulation until he was finally connected to the CARL System. The circulation was stably bypassed, and the occlusion of a coronary artery was treated immediately. A few weeks after treatment, the patient showed no neurological limitations and is now fully fit for work again.

Woman collapsed after cardiac arrest and was resuscitated without affected brain function.

The new method also benefited a woman who collapsed during gardening. Although her husband reacted quickly and called the ambulance immediately, it took about two hours before the patient, still without own circuit, was connected to the CARL System. Thanks to the personalized extracorporeal circulation it was possible to diagnose and treat the cause of the cardiac arrest. The woman could get discharged without any loss of brain function – after only 21 days of hospitalization.

A new chapter in the history of resuscitation.

Chronology.

Since 2005

Development of CARL Therapy and CARL System and proof-of-principle via animal model in the research department of the Clinic for Cardiovascular Surgery, Department University Heart Center of the Medical Center - University of Freiburg

2010-2012

Founding of Resuscitec GmbH as a spin-off of the Medical Center - University of Freiburg

Funding of the company via the „KMU innovativ“ program of the Federal Ministry of Education and Research

2014

Clinical proof of concept for the CARL Therapy in the course of an application observation at the Medical Center - University of Freiburg

2014

Certification of the company according to EN ISO 13485

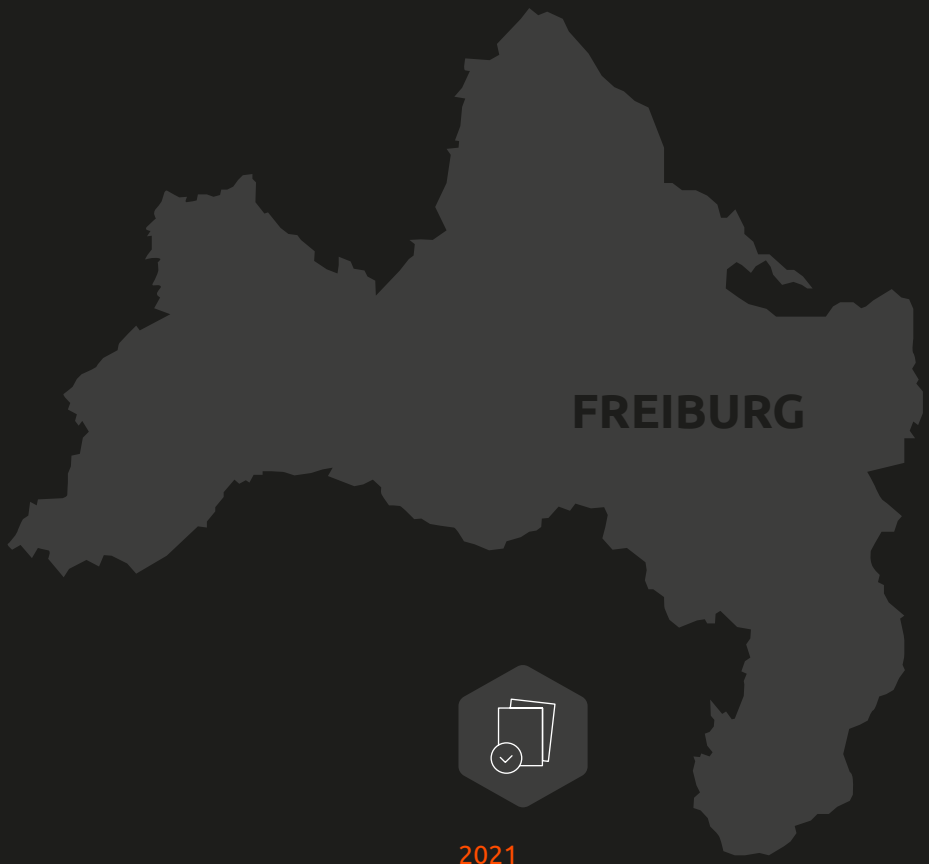
2016

Start of the EU-funded research project CIRDinnova in cooperation between the Medical Center - University of Freiburg and Resuscitec GmbH and two European clinics

2017

Move to the company premises in the BioTechPark Freiburg

The company is awarded the Freiburg Innovation Prize.



2017-2020

Diverse publications about the effectiveness of the CARL Therapy

2020

CE-Approval of the CARL System

Start of the Post Market Clinical Follow-Up Study (PMCF) in four European centers

2021

First case reports from the PMCF study, demonstrating the potential of CARL Therapy and CARL System

Nature publication on the basics of the CARL Therapy in *Nature Reviews Neuroscience*

2021

Launch of the new brand identity

Establishment of the CARL Academy

Start of the FDA approval process and preparation for the US market entry

2022

Sales launch for the CARL System in Europe

Start of production and scale-up

Changeover to MDR

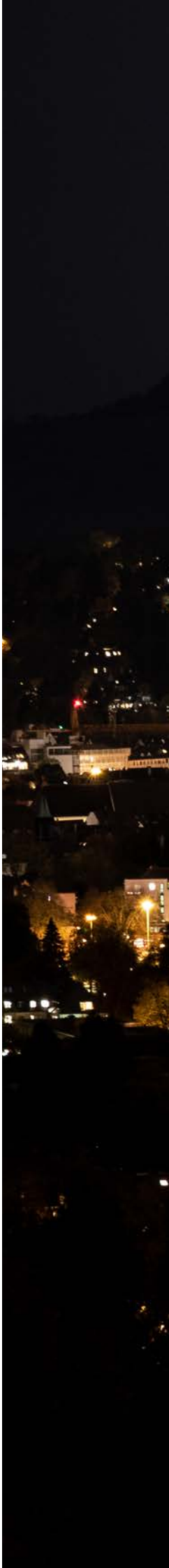
Life is our mission.

About us.

Resuscitec GmbH is a medical technology company. We develop and distribute innovative products for emergency medicine.

Our work serves to restore patients' health after cardiac arrest. To this end, we have developed and approved the world's first mobile system for controlled, targeted and personalized restoration of circulation outside the hospital.

With our products, we contribute substantially to saving lives. The task of providing physicians, perfusionists and qualified specialists with the CARL System as an efficient tool for the treatment of patients requiring resuscitation is our company's top priority.



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