# Heat exchanger with laminarizer

## Development status

**Phase 3**

**Technology validation and implementing it in real environment**. Testing the technology outside of the laboratory and its adjustment to external conditions.

## IP protection status

The heat exchanger with Laminarizer is currently protected by a Czech patent, a Czech utility model (both granted) and by US patent, EU patent, and EA patent..

## Partnering strategy

*Collaboration, licensing, spin-off*

## Institution

UNIVERZITA KARLOVA
Centrum pro přenos poznatků a technologií

**Charles University**

## Challenge

Heat Exchanger with Laminarizer is a new plastic product with a promising commercial potential filling in the gap on the market - especially of healthcare and lab equipment products related to cooling and heating of fluids. The product has been primarily developed as a single use medical device in new method of dialyzing procedure as a support to patients with such kidney disorders. It is known that extracorporeal contact of blood with synthetic materials activates the coagulation mechanism and then coagulation occurs. Our device lowers to a significant extent the undesirable coagulation, which means a big potential for medicine. The basic prerequisite for the efficiency of this new principle is providing sufficient cooling and then heating of blood by means of the special heat exchanger. Preventing the natural blood coagulation could replace the current practice which uses other “anticoagulation” mechanisms (e.g. heparin), often with numerous undesirable effects.

## Description

The heat exchanger with laminarizer has been developed by the research team of the Institute of Biophysics at School of Medicine in Pilsen of Charles University. It enables an efficient and uniform cooling and/or heating of liquids, in particular of blood. It is primarily intended as a single use medical device in healthcare, but repeated use is possible in other fields, which additionally reduces usage costs. The heat exchanger comprises an elongated, substantially cylindrical housing, a plurality of capillaries, partitions, an inlet and an outlet of the cooling/heating liquid, a finishing element at each end, laminarizers and a temperature sensors. Temperature sensors constitute an integral part of the heat exchanger, enabling temperature measurement of the liquid at the input and output of the cooled liquid. The sensors are connected to a standard connector which forms part of the heat exchanger. It is produced from PVC certified for medical use and does not contain phthalates. The biocompatible plastics reduces production costs and therefore its final price (although the plastic does not offer the most ideal thermal features, a compensating solution has been applied using the specific

construction of the laminarizer). It allows flow cooling of liquids which do not react with PVC and stainless steel, for example cooling of flowing blood in specific extracorporeal applications. The coolant is distilled water, eventually also non-freezing mixtures that do not react with PVC. When using the standard heat exchanger, it is possible to achieve decrease in temperature of the flowing distilled water by 20 °C. More versions-standard, with increased efficiency and smaller size, are possible.

## Commercial opportunity

The current market does not offer a product with comparable features even though the demand is expected and its potential application can be rather wide. The device is created especially for healthcare and lab equipment products, but can be used also in pharmaceutical, chemical or food industry. Thanks to its patented construction, it is possible to prepare a customised version for any specific usage from the above-mentioned industries while adjusting size and volume. The commercial potential will significantly grow once clinical testing of the particular treatment method using the device will be completed. Patients with kidney disease are a numerous group, which could benefit significantly from this device. Nevertheless, it can also be used in other medical applications such as cardio surgery or neurosurgery or for cooling and heating of non-aggressive fluids in relatively small volumes and its potential use can be rather wide. Typically, this would be pharmaceutical, chemical or food industry.