About 1-2 cases for every 1000 live full-term births (9 for premature infants) and even up to 75 babies for every 1000 newborn babies in developing countries suffer from HIE (Hypoxic-Ischaemic Encephalopathy). HIE is a disease caused by lack of oxygen that neonate's brain receives due to the birth complication. Approximately 1 million newborns worldwide die from HIE and about the same number of children may survive with significant long-term neurological disabilities.

For quite a few years, neonatologists were not able to offer any reliable method of HIE treatment. Only recently, has the effective method of treatment been proposed, namely the therapeutic mild hypothermia (lowering of the body temperature) of the infant. Because the brain is the organ most vulnerable to hypoxia, specialists lower brain temperature by cooling either neonate's entire body (so-called *whole body cooling, by coolong matress*) or just the head (so-called *selective brain cooling, by cooling cap*).

The hypothermia has been applied to infants for some years, although neonatologists are still seeking for the answers to questions regarding improvements of thetherapy, i.e.:

- Which cooling system (*whole body cooling* or *selective brain cooling*) is more effective and safe?
- How should long therapy last?
- How deep brain cooling is possible and safe?
- How to perform the most dangerous stage of therapy, which is a rewarming?

Moreover, it would be very helpful if doctors could control the temperature inside the brain, which is practically impossible to measure directly. But based on the very specialized technical knowledge and experimental data it is possible to model this temperature with high accuracy. All of this issues are directly related to following disciplines: medicine. statistics, heat and mass transfer and engineering sciences.

Therefore the interdisciplinary, high qualified research group was proposed to carry out the tasks of:

- Design and manufacture of measurement device that will be used for planned, unique experiments,
- Execute the diagnostic and follow – up medical examinations of patients,
- Prepare the computational model of the newborn's body and the cooling device,
- Make a statistical analysis of the measured values and the validation of the numerical simulations.

These actions are planned to use all available methods to fill significant gaps in knowledge due to hypothermia therapy of HIE. From the medical perspective, the novelty lies in the coupling of the medical effects of these therapies with their technical parameters. It is also the very interesting and challenging engineering task. Great advantage of the proposed research team is long lasting cooperation and experience regarding to hypothermia.

Hopefully, all of these in a long-term perspectives will profit in the protection of neonates health and life.