Press information

Artificial "womb"

textile therapy for premature babies

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BÖNNIGHEIM (cb/ri) About 50,000 babies are born prematurely in Germany every year. Some of them need intensive medical care in incubators for weeks or even months. However, it has been known for some time that these premature babies miss the spatial confinement and prenatal sensory stimuli of the womb (uterus). This lack can have significant consequences for these babies later on: many of the children go on to suffer from sensory or motor deficiencies as they develop, which have to be treated. Now, a textile "artificial uterus" is to be produced that is intended to recreate the environment and sensory stimulation of a mother's womb in the incubator. To simulate the same sensations, scientists at the Hohenstein Institute in Bönnigheim are working on a research project (ZIM project KF2136730KJ3) to develop an "artificial uterus" that will provide sensory stimulation for premature babies.

The specifications for a medical product of this kind are demanding. Firstly, the material properties of the textile, such as its feel, elasticity and resistance, must simulate conditions in the womb as realistically as possible. The best combination of fibre and fabric structure must be chosen. The artificial uterus will also incorporate a mechanical textile actuator to provide the sensory and motor stimuli and sensation of equilibrium that will promote the development of the infant's brain. These earliest perceptions affect the whole of a person's subsequent life and are enormously important for the sensory-motor development of children born prematurely. From the medical point of view, these sensory impressions from the uterus should be provided to the baby immediately after its premature birth. Children born too early often find it hard to judge spatial distance, control their muscle tension or perform complex sequences of movements. The researchers are even going a step further in their project and incorporating the mother's heartbeat into the artificial uterus. It is well-known that the mother's voice and heartbeat have a soothing effect on the newborn child and also stimulate its development. There are currently no medical products available on the market that allow sensory integration therapy in baby incubators. The artificial uterus is therefore the first textile "therapist" of its kind, because until now incubators have only provided a constant temperature, the necessary humidity and a controlled oxygen supply.

With this "smart textile", the researchers from the Hohenstein department of Hygiene, Environment & Medicine are for the first time taking a new approach to treatments to prevent problems with the sensory-motor development of premature babies. To put

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the product concept into practice, the researchers, led by Prof. Dr. Dirk Höfer, are working with partners from industry, Beluga-Tauchsport GmbH (Scheeßel) and M. Zellner GmbH (Michelau in Upper Franconia). It is expected that the project, sponsored by the Federal Ministry of Economics and Industry, will result in the first prototype of an artificial uterus with motor and acoustic textile actuators being produced as early as next year, ready to be tested in practice by neonatal doctors specialising in the treatment of premature babies.

Thanks to modern medical technology, premature babies can survive from the 22nd week of pregnancy. For many premature babies, respirators, heartbeat monitors and pumps infusing fluids, nutrients and medication are their first experience of the world. © Fotolia.com

Until now, the spatial confinement and sensory stimuli that they miss from the uterus have not been available in incubators, meaning that important treatment time is lost. This can often lead to sensory and motor deficiencies requiring treatment during the child's later development. © Fotolia.com

The mother's heartbeat is also important. The sound of the heart beating in the womb gives the foetus a feeling of security and safety. Because the amniotic fluid stops the eardrum from vibrating, the foetus experiences sound almost exclusively through bone conduction. This acts like a frequency modulator on the resonance characteristics, affecting the pitch and intensity of sounds, so this must also be taken into account in the proposed product. . © Fotolia.com

It is hoped that an artificial uterus will give premature babies in incubators the same sensory stimuli and sense of security that they experience in their mother's womb. Scientists at the Hohenstein Institute are working with project partners from industry to develop a system providing this kind of therapy. © Hohenstein Institute