Improved nutrition for extremely low birth weight preemies

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At the neonatology ward of the Vienna General Hospital (Medical University Vienna), physicians compared two mixtures of intravenous lipids for nutrition with support coming from the FWF. The researchers found no amelioration with respect to bile-flow complications in extremely low birth weight preterm babies in incubators, but they did discover more mature brain waves.

In neonatology, complications are a daily occurrence. When babies are born long before term, their organs are not fully developed, rendering their health and bodily functions fragile. Respiratory insufficiency, brain haemorrhage, liver and intestinal problems as well as bacterial infections are some of the typical medical issues involved. In neonatology, medical staff need to be very alert, with iron nerves and great sensitivity. Despite the problems, preemies born as of the 23rd week of pregnancy usually survive the difficult weeks in the incubator without permanent damage. At the Division of Neonatology at Vienna's General Hospital (AKH), the pediatrician Andreas Repa and his team were supported by the Austrian Science Fund FWF in conducting the largest clinical study on intravenous nutrition to date, following stringent methodology (randomised and blind), on prematurely born infants with a birth weight of less than one kilogram. They compared two approved lipid emulsions for intravenous feeding with respect to a typical complication relating to bile-flow from the liver (cholestasis) in premature babies.

Baby steps from emulsion to breast milk

Babies in an incubator need to be gradually introduced to breast milk. In order to supply the premature infants with vital lipids, protein, sugar and electrolytes, they are fitted not only with a gastric tube but also with intravenous access. Initially, most of their nutrition is administered intravenously. "Over a number of weeks, the infants should become strong enough for the intravenous access to be removed, and they are then fed exclusively with breast milk via the gastric tube. If there are complications and the babies have to be fed intravenously for a long time, the risk of cholestasis, the retention of bile in the liver, rises", explains Andreas Repa. If the nutritional emulsion has to be administered over long periods, the type of lipids it includes could make a difference, runs the hypothesis of the team of researchers at the Medical University Vienna. In a study, the team headed by Andreas Repa therefore compared the emulsion based on soybean oil which has been used for many years with a preparation consisting of soybean oil, coconut oil, olive oil and fish oil. They wanted to find out whether this new preparation would have a positive impact on the incidence rate of cholestasis.

Study without additional blood sampling

"We did not even draw any extra blood samples beyond the prescribed regime", reports the pediatrician. Values relevant for the study were retrieved only from routine blood sampling and EEG measurements. Between 2012 and 2015, Andreas Repa and his team convinced more than 200 parents to let their preterm babies with a birth weight of less than one kilogram be part of the study: 100 babies received the soybean oil preparation, and 100 babies the mixed-oil emulsion, whereby neither the medical staff nor the parents knew who received what. Negative effects were precluded, since both preparations are approved for preterm babies. Whilst the composition was changed, the total amount of lipids administered intravenously remained constant in an attempt to reveal any unknown positive additional effects.

Significant effects in the brain, not the liver

The alternative nutrition showed no significant improvements as regards bile-flow complications. The EEGs, however, furnished a surprise result: "Babies who received the mixed preparation showed mature brain waves earlier. We presume the cause of this to be the higher DHA content. This Omega-3 fatty acid is massively transferred to the retina and brain of embryos in the mother's womb and helps these organs to mature", explains the principal investigator.

Based on the experience of the neonatology experts, one out of four preterm babies develops cholestasis. "The complication rate in the soybean oil-based control group did decrease in the course of the study and our number of cases was in the end too small to determine a statistically unambiguous result. In the control group, 16 percent of babies developed cholestasis, while it was 10 percent in the group which received the new product", describes Andreas Repa. The result of the accompanying EEG examinations was, on the other hand, statistically significant. Therefore, the neonatology division of the Vienna General Hospital has now switched to the new product, which also contains fish oil. In a follow-up study, Andreas Repa would like to take a closer look at any positive effects from the mix of fatty acids and is already looking for cooperation partners.

More information: Andreas Repa et al. A Mixed Lipid Emulsion for Prevention of Parenteral Nutrition Associated Cholestasis in Extremely Low Birth Weight Infants: A Randomized Clinical Trial, *The Journal of Pediatrics* (2017). DOI: 10.1016/j.jpeds.2017.11.012

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