

UC San Diego Medical Center Studies Mystery of Mother's Milk

New Program Looks at Life-Saving Qualities of Human Milk for Tiniest Infants

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"Breast is best" is a mantra every new mom hears with when it comes to feeding her newborn. Human milk is known to boost brain development, prevent life-threatening infections, decrease allergies, and promote stronger bones and a higher IQ. But what's a mother to do when her premature infant weighs only ounces and is not able to swallow the milk?

To answer this question, researchers at UC San Diego Medical Center have launched a comprehensive program to study how breast milk can be fed to premature infants and to identify the ingredients that give human milk its life-boosting qualities. Called Supporting Premature Infant Nutrition (SPIN), the new program is focused on the provision, analysis, and research of human milk to improve nutritional and neurodevelopmental outcomes in preterm babies. The program is believed to be the first of its kind in the United States.

"UC San Diego Medical Center is a 'Baby Friendly Hospital' which means we encourage breastfeeding as the preferred method of infant nutrition for our newborns," said Neil Finer, M.D., director of neonatology at UC San Diego.

"We are now applying this same model of care to our smallest, most vulnerable infants. The goal is a better understanding of human milk to achieve healthier preemies who are breastfeeding when they leave our hospital," explained Finer who oversees the recently expanded 49-bed regional neonatal intensive care unit in Hillcrest.

SPIN is a multi-faceted study to examine the chemistry of breast milk, how to best handle and preserve the milk, and how to offer maternal support for milk production in the Neonatal Intensive Care Unit (NICU). Team members include neonatologists, gastroenterologists, intensive care nurses, lactation and nutritional experts.

"Babies born prematurely are in a nutritional crisis," said Jae Kim, M.D., Ph.D., neonatologist and gastroenterologist at UC San Diego Medical Center. "The baby is in a doubly difficult situation of dealing with life outside the womb while having a highly immature gastrointestinal system. This can lead to major bowel dysfunction or failure. While this is a critical time to care for infant, this is also a pivotal time to help mom make breastfeeding a priority for the long-term health of their child."

"Breast milk can save infant's lives," said Lisa Stellwagon, M.D., pediatrician and director of SPIN at UC San Diego. "While premature infants may not be capable of breastfeeding in the short term, we are identifying strategies and techniques to provide the infants the milk and to make the milk available in the long run. The data collected from this study will be shared globally with hospitals that would like to adopt similar programs for premature infants."

Pumping for Preemies The NICU is a complex medical environment where the priority is on saving the lives of premature, sometimes critically ill infants. While the focus is on emergency respiratory, pulmonary, and nutritional interventions, the act of breastfeeding may be ignored or overlooked.

The SPIN program at UC San Diego Medical Center has set up a supportive environment where mothers are encouraged to pump milk around the clock. Frequent pumping keeps up the milk supply until the preemie achieves a coordinated sucking and swallowing reflex. For the mothers, this means pumping the milk every two hours, twenty-four hours a day. Support includes ergonomic assessments of the mother's feeding positions, educational flashcards with breastfeeding tips, emotional and nutritional support, and education for fathers or life partners.

Borrowing from the Dairy Industry Once the milk is pumped, the liquid is labeled with the family name and a unique identification number and scanned into a database. The SPIN program is developing quick and simple methods of measuring the nutritional content of human milk using a special near-infrared analyzer that is traditionally used in the dairy industry to determine the nutritional content of cow's milk. The analyzer in UC San Diego's NICU has been calibrated for human milk. Daily milk samples are now being analyzed for nutritional values such as calories, fat, protein, and lactose to help the medical team determine the ideal amount of nutrient supplementation to add to mother's milk.

"Human breast milk is considered human tissue and is full of carbohydrates, lipids, vitamins and minerals. There are approximately 300 components to breast milk including small biologically active compounds that aid in the formation of the gastrointestinal tract," said Kim. "The contents vary dramatically from mother to mother and feeding to feeding depending on the baby's needs."

Following identification, the SPIN team evaluates the best way to get the milk into the baby. Different aspects of manual feeding are tested such as the optimal size of the syringe and temperature of the milk. Knowing the exact chemistry of the milk, it can be accurately fortified to aid the child in his or her growth. Supplementation is currently done with both cow- and human-based milk fortifiers.

"We plan to look for correlations between the mother's diet and the nutritional characteristics of the breast milk. We may be able to identify certain foods and supplements that aid in the infant's growth and development," said Stellwagon.

Improving Infant Survival Infants born prematurely sometimes develop an infection called necrotizing enterocolitis (NEC), the most common life-threatening gastrointestinal emergency in the newborn period. NEC causes intense inflammation and acute intestinal necrosis or death. Approximately 7% of the smallest preemies develop this infection and 1/3 of these babies die. NEC compromises 1-5% of all NICU admissions and affects 10% of infants born at less than three pounds.

"Fortunately, breast milk contains enzymes that help protect against NEC," said Kim, an expert in short bowel syndrome and intestinal failure. "Babies born at one pound have their intestinal development in place but all things attributed to function are either at the earliest phase or have not kicked in at all. Breast milk has growth factors that affect the ability of the gut to grow and can get the digestion process on track to prevent this dangerous infection."

Boosting Brain Capacity "Every second counts for the growth rate of infants, especially in the first days when babies are gaining up to 20 grams per kilogram of weight per day," said Kim. "The brain increases 5% in size every 48 to 72 hours. Adequate and extra nutrients can improve brain growth which is something the SPIN program is measuring."

With the SPIN program, the brain development of the infants is calculated by either measuring the circumference of the infant's head or performing MRI exams. These infants will receive developmental testing during follow-up visits to the NICU.

"Human milk provides benefits that are both nutritional and neurological," said Stellwagon. "In our life time, we will not be able to replicate its biological complexities. Until that day, the best thing for all newborns is breast milk. The SPIN program will help us learn how and why for preemies."

The SPIN Team Members of the SPIN team include Corey Anaka, R.N., Neil Finer, M.D., Samme Fuchs, R.N., Jan Hebert, R.N., Jae Kim, M.D., Ph.D., Terry Lawson, R.N., IBCLC, Laurel Lee M.S., RD, I.B.C.L.C., Linda Levy, R.N., Tom Moore, M.D., Donna Posin, OTR/L, M.P.A., Lisa Stellwagen, M.D., Yvonne Vaucher, M.D., M.P.H, Alison Wolf, R.N. M.S.N., P.N.P., Amy Yates, R.N., and Liz Zborowski.

Background The U.S. has one of the highest pre-term birth rates in the world with 12% of babies being born before 37 weeks gestation, according to the Centers for Disease Control. According to the March of Dimes, premature births have been escalating steadily over the past two decades. In 2005, more than 525,000 infants were born prematurely, the highest number ever reported for the U.S. The rate of premature birth increased almost 35 percent between 1981 and 2005 (9.4 to 12.7 percent).

The UC San Diego Medical Center labor and delivery service, specializing in high-risk pregnancies, and the Neonatal Intensive Care Unit, are nationally recognized centers of excellence providing the highest level of care available for pregnant women and newborns. UCSD Medical Center became accredited as a Baby Friendly Hospital in 2006; one of a handful of academic hospitals to achieve this prestigious award.

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