

Premature girl and boy babies may need different food to thrive – and breastmilk may differ for each sex

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Meeta Somairya feeding her preterm baby. Credit: University of Auckland

A major new Auckland study will investigate whether giving specially boosted nutrition to preterm babies in the first crucial days of life could prevent diseases later in life and help intellectual development. It will also look at whether this optimal nutrition may differ for boys and girls.

The study will help unlock the mystery of why premature birth affects health later in life. Every year, around 5000 babies are born prematurely in New Zealand. The vast majority survive, but they carry a greater risk

of problems with growth, learning, and adult diseases such as obesity and diabetes than babies born at term.

"Nutrition offers the simplest and least expensive way of improving long-term health outcomes for these babies," says lead researcher Professor Frank Bloomfield, director of the Liggins Institute at the University of Auckland. "It's the first step towards personalised medicine for preterm babies."

The clinical trial, the biggest ever on preterm nutrition, is the centrepiece of a research programme that received almost \$5 million from the Health Research Council last month. Researchers will also analyse mothers' breastmilk to see if milk produced for girl babies contains different nutrient or hormone concentrations to milk for boy babies.

"We know that preterm boys don't do as well as preterm girls," says Professor Bloomfield, who also works as a neonatologist at Starship Hospital.

"Currently boys and girls are fed the same. But boys and girls have known metabolic differences. Boy babies are bigger on average, some concentrations of amino acids are different in boys than in girls and yet there is very limited evidence as to whether we should be feeding girls and boys differently."

Preterm babies face many difficulties with feeding. They lack the fat stores laid down in the final weeks of pregnancy to sustain them until their mothers' milk supply comes in. They can't co-ordinate sucking, swallowing and breathing, so can't breastfeed safely, which tends to delay milk supply (suckling stimulates milk production). The more immature they are, the less their gut can tolerate milk feeds. Often the mothers are unwell and take longer to establish a good milk supply.

The standard practice in hospitals is to feed very preterm babies (born before 32 weeks) a sugar solution mixed with a special nutrient blend of proteins, minerals and vitamins intravenously (into their veins). There's good evidence that this improves growth and [intellectual development](#).

But for preterm babies born at 32-36 weeks, there's almost no evidence to guide doctors, and practice varies widely. One common approach is to give babies sugar solution intravenously while gradually increasing the amount of milk fed via a nasogastric tube down the nose into the stomach, finally shifting to breastfeeds when the baby matures.

"While waiting for mother's milk or for feeds to be tolerated, we don't know whether [sugar water](#) by itself is appropriate, or whether we should include other nutrients such as protein," says Professor Bloomfield.

"Also, some evidence suggests there could be a trade-off. Enhanced nutrition may be good for intellectual development but actually increase preterm babies' later risk of metabolic and heart disease by speeding up weight gain. We hope this study will show how and what to feed preterm babies to prevent this trade-off."

In the trial, called DIAMOND, the aim for all babies is to establish full feeds into the stomach with mothers' own milk as quickly as possible. While this goal is being reached, which can take many days in smaller babies, babies will receive just sugar water intravenously, sugar water plus protein intravenously, or human milk substitute via the stomach feeding tube.

Researchers will investigate the impact of these three feeding approaches on growth, body composition (e.g. lean and fat mass proportions), milk tolerance and gut microbes, which may influence later risk of obesity.

They will also look at whether letting preterm babies smell and taste milk before tube-feeds helps them feed normally earlier.

"Tube-feeding bypasses three important signals that help you regulate eating: smell; taste, and stopping eating when full," says Professor Bloomfield.

He explains that in a pilot study, very preterm babies had a cotton wool bud soaked in milk placed against their lips and in front of their nose prior to each tube-feed. They tolerated full feeds to the stomach earlier, and had their nasogastric tubes removed earlier, than babies in the control group who couldn't smell or taste the milk.

A team led by Professor David Cameron-Smith, also from the Liggins Institute, will analyse breastmilk of 190 mothers of preterm girls and boys in the trial.

"Breastmilk is very complex, providing all the required nutrients and hormones for growth and immune development," says Professor Cameron-Smith. "We know that there are differences in the composition of breastmilk mothers make for boys and girls. But almost nothing is known of [milk](#) mothers can supply premature infants.

"This research will help identify the critical ingredients that help stimulate feeding and are essential for health. We speculate that these ingredients will differ between premature boys and girls."

Researchers plan to recruit to the trial 530 babies and their families from Auckland and Middlemore Hospitals.

Alongside the human trials, researchers will investigate whether certain nutrients can protect the pancreas in preterm lambs, reducing later risk of diabetes.

"Getting the nutrition right at the outset promises to make a significant difference in the lifelong health and development of [preterm babies](#)," says Professor Bloomfield. "We're grateful for the HRC grant that's allowing Liggins Institute researchers to push the frontiers of this exciting field."

Provided by University of Auckland

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