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Funding clinical research that could save your life

New pathway for mother's thyroid hormone to reach her unborn baby

Scientists at the Royal Brisbane and Women's Hospital have made an important breakthrough in understanding how thyroid hormone is delivered from a mother to her unborn baby during pregnancy.

For the first 3 months of pregnancy the baby depends absolutely on a supply of thyroid hormone from its mother. Thyroid hormone and iodine are essential for normal fetal development to occur. In fact thyroid hormone deficiency, due to a lack of iodine in the diet, is the world's largest cause of preventable brain damage.

In Australia, around 2.5% of women will become thyroid hormone deficient during pregnancy meaning around 6500 unborn babies are affected every year. We know that low maternal levels of thyroid hormones can lead to many medical problems ranging from early miscarriage to stillbirth and has also been associated with childhood learning difficulties. Despite the widely accepted important role that thyroid hormone plays in pregnancy, scientists have struggled to find a mechanism which allows the mother's hormones to cross the placenta and enter fetal blood.

Researchers in the Conjoint Endocrine Laboratory, Royal Brisbane and Women's Hospital and Pathology Queensland have identified a placental protein that may prove crucial in the transfer of thyroid hormone to the baby. They have discovered that transthyretin (TTR), which binds strongly to thyroid hormone, is produced by placenta and secreted into the maternal blood in the placenta, where it increases uptake of maternal thyroid hormone back into the placenta by up to ten times.

Their work, which was funded by Queensland Smart Health and the Royal Brisbane and Women's Hospital Research Foundation, was recently published in a prestigious American medical journal and suggests that TTR provides a major pathway for transfer of maternal thyroid hormone into the fetal circulation and that the entry is highly influenced by levels of thyroid hormones present. Their discovery provides support for routine screening of pregnant women for signs of hypothyroidism and prompt initiation of thyroid replacement therapy.

The research group will now attempt to look at what factors influence thyroid hormone uptake by TTR and will particularly focus on the effects of maternal disease, drugs and environmental chemicals. Understanding the mechanisms involved in thyroid hormone transfer from mother to fetus will lead to improved pre- and post-natal care of affected mothers and babies.

Laboratory: Conjoint Endocrine Laboratory, Royal Brisbane & Women's Hospital and Pathology Queensland

Chief Investigators: Prof. Robin H Mortimer, Laboratory Head
Dr Kerry Richard, Senior Scientist

Published study: Carrier Mediated Thyroid Hormone Transport into Placenta by Placental Transthyretin
Kelly A Landers, Brett D McKinnon, Huika Li, V Nathan Subramaniam, Robin H Mortimer and Kerry Richard.
Journal of Clinical Endocrinology and Metabolism, doi:10.1210/jc.2009-0048

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