New research reveals important role for parathyroid glands and their control of calcium

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(PhysOrg.com) -- A new University of Georgia study has revealed that one of the body's most misunderstood organs, the parathyroid gland, plays a vital role in controlling the amount of calcium in the body's blood system.

Led by Nancy Manley, a professor of genetics and chair of the interdepartmental developmental biology group at UGA, scientists have shown that the thymus, which had been proposed to serve as a "backup" source for parathyroid function, does not contribute to serum parathyroid hormone or PTH levels. They also have demonstrated that "physiologically relevant" thymic PTH comes from multiple small parathyroid clusters that form during the normal process of parathyroid gland development in an embryo.

Together the two findings, published recently online in the journal *PloS Genetics*, open the door for a new understanding of the role of these crucial glands in health.

"Many people have been found to have these 'extra' parathyroid glands, and before now, there was no clear source of origin for them," said lead author Manley. "Due to the important role of PTH in the regulation of physiological activities and associated disease problems in humans, it is very important to understand where it is produced and how it is regulated. This new research gives us important new clues to how this all works."

Most people understand that the thyroid, the butterfly-shaped gland in the throat, controls how quickly the body makes proteins and uses energy. The parathyroid glands, however, primarily regulate calcium levels in the bloodstream through the production of PTH, and their embryonic development is closely linked to that of another important organ, the thymus. While researchers had long thought that the parathyroid glands were the sole source of PTH production and secretion, this developmental link had led, in part, to an earlier conclusion that in the absence of the parathyroid glands, the thymus could act as an auxiliary source for PTH. Since the parathyroid glands are removed surgically to treat certain parathyroid diseases, this finding had important clinical implications.

Instead, according to the Manley team, "thymus-derived" PTH comes from these small clusters of parathyroid cells that develop at the same time the thymus does but get separated from the main parathyroid glands during development.

"Our data reveal two cellular sources of extra-parathyroid PTH," said Manley. "The first source is these `misplaced' parathyroid cells that arise during normal organ development. The second source is in medullary thymic epithelial cells or mTECs, but PTH from this source does not appear to have any endocrine function and probably serves as an internal control mechanism called a self-antigen that is important for preventing autoimmunity."

Complicating the understanding of PTH is the fact that the thymus does in fact produce some PTH, but none of it is secreted into the bloodstream, meaning it has no overall endocrine function.

Understanding the origin of PTH has clinical relevance, since it would be a natural candidate for stem cell therapy, Manley said. Since the parathyroids control the levels of calcium in the blood, they are also important in finding new therapies for osteoporosis.

Provided by University of Georgia