This research involves determining whether vitamin D can alter messenger RNA synthesis for specific extracellular matrix proteins between intestinal cells that include claudin-2, claudin-12 and cadherin-17. These proteins are thought to play a major role in creating a barrier that prevents intestinal permeability to calcium in between cells. Changes in these proteins by vitamin D would support the hypothesis that vitamin D may mediate intestinal calcium transport by a paracellular pathway, in addition to the already established transcellular pathway.

Before analyzing intestinal sections from vitamin D replete and vitamin D deficient mice, Ed first needed to optimize the polymerase chain reaction (PCR) system he was using by determining the best annealing temperature for each primer. Ed learned how to make cDNA from mouse intestine and use that cDNA in PCRs using varying temperatures to determine the most effective annealing temperature for each of the primer sets for claudin-2, claudin-12 and cadherin-17. He also determined the optimum cycle number for each set of primers. A manuscript on this work was submitted to The American Biology Teacher in December 2010 and the paper was accepted with revisions.

Ed continued the research by making cDNA from different sections of the intestine (duodenum, jejunum, ileum, cecum and colon). Ed used the cDNA to run PCRs to determine if there were any differences in the level of claudin-2, claudin-12 and cadherin-17, as well as the control GAPDH, in the duodenum of vitamin D deficient and vitamin D replete mice. Preliminary data from this work demonstrates, for the first time, that claudin-2 mRNA increases in response to vitamin D. This finding is novel, exciting and highly significant to understanding how vitamin D mediates intestinal calcium transport.

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