**Key for Homework 5 (the case of the mysterious T3/T4 ratio)**

A. What is monocarboxylate transporter 8 (MCT8)?

MCT8 is a membrane protein that can transport thyroid hormone across the cell membrane.

B. Does MCT8 transport T3, T4, both, or neither?

According to previous work by Friesema and colleagues (*Journal of Biological Chemistry* 278: 40128-35, 2003), MCT8 can transport both T3 and T4.

C. What does the deiodinase D2 do in cells targeted by thyroid hormone?

D2 converts T4 to T3 by removing one of the iodine atoms from the outer ring of the hormone molecule.

D. Are T3, T4, and TSH levels high, low, or normal in patients with MCT8 mutations?

T3 is high, but T4 is low. TSH tended to be toward the upper end of normal. (See Figure 1 of Friesema et al. 2004.)

E. All five of the patients studied were boys; none were girls. Is that just a coincidence?

This is not a coincidence. The gene for MCT8 is located on the X chromosome, so the disorder is sex-linked. XY individuals (boys) will have the disorder if their one copy of the gene is mutated, whereas XX individuals (girls) would not be affected unless both of their copies of the gene were mutated.