Characteristics of transport of selenoamino acids by epithelial amino acid transporters

Abstract:
Selenoamino acids are the main form of organic selenium derived from the diet. They are efficiently absorbed in the intestine and reabsorbed in kidney, but the transporter proteins that mediate their cellular uptake have not yet been identified. We here describe the transport pathways of selenoamino acids and derivatives, including selenomethionine, methylselenocysteine, selenocystine, selenobetaine and selenocystamine. Transport studies employed the Xenopus laevis oocyte system expressing the amino acid transporters SIT1, b(0,+)-rBAT, B(0) or PAT1 and intestinal Caco-2 and renal OK cell lines that possess a multitude of amino acid transporters. Our results suggest that the major route for the uptake of selenomethionine is the system b(0,+)-rBAT in Caco-2 cells and B(0) in OK cells. Affinity of selenomethionine or methionine for these transporters did not differ, but for SIT1 selenomethionine shows a higher affinity than methionine. Methylselenocysteine displayed a higher affinity than cysteine for all transporters tested and in both OK and Caco-2 cells, system B(0) seems to be the primary uptake route. Selenocystine is taken up well by the b(0,+)-rBAT system, while selenobetaine is a low-affinity substrate only for SIT1 and PAT1. Selenocystamine was not transported by any of the transport systems investigated. When cells were exposed to selenoamino acids, intracellular selenium levels in OK...
cells considerably exceeded those in Caco-2 cells, indicating effective renal reabsorption capacity. In conclusion, selenoamino acids but not the seleno-derivatives selenobetaine and selenocystamine, are effectively transported by various intestinal and renal amino acid transporters and are thus available for selenium metabolism and therapeutic approaches.