Transfer of uranium throughout the entire gastrointestinal tract of the rat: In vivo and in vitro approaches

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Body of Abstract: The presence of uranium in environment, either natural or due to civil and military use, may lead to contamination of the public throughout the entire life mainly by chronic ingestion. The mechanisms of uranium transfer from alimentary bolus to blood are still not well known. In particular, few information are available on the different absorption sites along the gastrointestinal tract, the different cellular pathways (para- or trans-cellular), and the transporters implicated in the uranium absorption. In addition, the specific role of Peyer’s patches, the aggregated structure of Gut-Associated Lymphoid Tissue, in the intestinal transfer of uranium has never been determined. In fact, the transport of uranium through these structures specialized in antigen uptake from intestinal lumen may lead to major dysfunctions in mucosal immunity. Thus, different approaches have to be developed to determine the role of the different gastrointestinal structures and to apprehend the biological consequences of daily passage of uranium through these structures. These experiments include in vivo measurement of uranium in blood after in situ deposit of uranium (233U) in the different segments of the alimentary tract (buccal cavity, stomach, small intestine, colon) and ex vivo experiments in Ussing chambers to compare uranium passage from luminal to serosal side through intestinal epithelium and Peyer’s patches. In vitro studies are also necessary to determine the nature of the cells as well as the transporters implicated in the gastrointestinal passage of uranium. Autoradiography experiments were performed to determine if uranium absorption was only restricted to villi which contained absorptive cells or if uranium absorption was also due to crypt cells. In addition, the transporter implicated in the uranium passage is dependent of the physico-chemical form of uranium present at the different gastrointestinal sites. When complexed to phosphate, uranium is transported by the sodium/phosphate transporter (Na/Pi type II). One hypothesis is that the ionized form (UO22+) may be transported by the divalent metal transporter (DMT1) present in the duodenum implicated in the ferrous iron transport. It appears thus interesting to study the transport of uranium by the different apical, cytosolic and basolateral iron transporters. These whole experiments are performed in rat, and the first results are at present time in analyze phase and will be presented during the congress.