ATP-Sensitive Potassium Channels: a Potential Target of Chronic Contamination with Cesium 137.

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Radioactive fallout of the Chernobyl accident led to 137cesium (137Cs) dispersion in the environment. This radionuclide has a half-life of 30 years and is therefore still present as a contaminant in the food chain. Thus, populations living in radioactive-polluted regions are chronically exposed and many questions are raised about public health, notably about cardiovascular pathologies. 137Cs is known as an ionic analogue of potassium. Potassium ions are transported via membranous ATP-sensitive potassium (KATP) channels among others. They are made of a combination of two types of subunits: the pore-forming subunits Kir6.x (Kir6.1 or Kir6.2) and regulatory subunits sulfonylurea receptor SUR (SUR1 or SUR2). These subunits are differently expressed according to the tissue and its excitable or non-excitable status. KATP channels are present in many organs and have leading roles in cardiac and muscle functionalities and also in homeostasis, hormone secretion, immunity response or cellular proliferation. Therefore, we carried out in vivo experimental studies in rats with 137Cs chronic exposure to study biological effects on this channel type. Gene expressions of Kir6.1, Kir6.2, SUR1 and SUR2 subunits in heart, skeletal muscle, hypothalamus and kidney were analyzed in adult rats exposed to 137Cs through drinking water for several months (1,3 or 9 months) at a dose of 6500Bq/l (610Bq/kg/day). We noticed gene expression modifications in the heart between the control and the contaminated group, with an increase in Kir6.1 and SUR1 (+194% and +164% respectively, $p<0.05$) for 1 month-contaminated rats and an increase in SUR2 (+132%, $p<0.01$) for 3 month-contaminated rats. At the opposite, there were a decrease in Kir6.2 and SUR1 (-57% and -44% respectively, $p<0.001$) for 9 month-contaminated rats. However these modifications were not bound to any protein expression disturbances in the heart for rats exposed to 137Cs for 3 and 9 months. In conclusion, a heart transcriptional regulation of KATP channels is affected by a chronic contamination at a post-accidental 137Cs dose, which suggests a specific sensitivity of heart as compared to other organs. Moreover, the short-term increase induced at 1 and 3 months was followed by a decrease at 9 months: these time-dependant variations could evoke a tissue regulation during chronic 137Cs contamination. However this chronic exposure doesn't seem to breed any pathological disorders in rats as indicated by complementary histological and ECG data (Gueguen et al., 2008). It would be therefore interesting to expand our analyses to juvenile animals supposed to be more sensitive to radionuclide exposure.

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