

# International Conference on the Management of Naturally Occurring Radioactive Materials (NORM) in Industry

## VIRTUAL EVENT

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## Dose estimates to the public due to $^{210}\text{Po}$ ingestion through consumption products from Lolodorf high background radiation area, Cameroon

$^{210}\text{Po}$  activity concentrations have been measured in Lolodorf high background radiation area in consumption products including cocoa beans which are hand-processed into cocoa powder for breakfast purposes in one hand and in cocoa leaves which are consumed as vegetables by the local population in the other hand.  $^{210}\text{Po}$  is an alpha emitting radionuclide with no radioactive progeny and produces only very-low-intensity gamma rays at very low abundance; thus, the dose largely arises from internal exposure. The main reasons for its radiological importance are its relatively high activity concentrations in certain foods and its relatively high ingestion dose coefficient. As  $^{210}\text{Po}$  is part of the  $^{238}\text{U}$  decay series, it is naturally occurring and is found in varying amounts worldwide. Ngombas and Melondo which are two localities of Lolodorf subdivision of the south region of Cameroon were considered as study areas. Samples have been collected by 10 points over an area of approximately 1 hectare for both localities. Cocoa beans and leaves sample were collected, washed, frozen and lyophilized for a week in a lyophilizer at  $-40^{\circ}\text{C}$ . After lyophilization, the dried samples were ground into powder and homogenized. The analysis has been carried out by CANBERRA alpha spectrometry using ion-implanted silicon detectors. The acquisition of the spectrum in the computer was made using MAESTRO software.  $^{210}\text{Po}$  Activity concentrations in cocoa beans varied from  $2.31 \pm 0.23$  to  $8.09 \pm 0.56$  Bq.kg $^{-1}$ , while these values varied from  $21.7 \pm 0.87$  to  $66.67 \pm 1.58$  Bq.kg $^{-1}$  in cocoa leaves. The corresponding mean values are  $4.96 \pm 1.86$  and  $42.54 \pm 16$  Bq.kg $^{-1}$  on a dry weight basis respectively. The obtained values confirm the fact that  $^{210}\text{Po}$  activity concentrations in cocoa leaves are high compared to the cocoa beans due to the deposition of  $^{222}\text{Rn}$  daughters in the atmosphere.

Consumption of food is usually the most important route by which natural radionuclides can enter the human body and assessment of their levels in different foods is therefore important to estimate the intake of these radionuclides by man. Based on the collaboration of several families regularly consuming cocoa powder in their breakfast as well as cocoa leaves as vegetables, a consumption rate of 1kg/week of cocoa powder and 1kg/two weeks of vegetables for a family of about 5 persons has been assumed.

The ingestion doses were estimated using the activity concentration of  $^{210}\text{Po}$  determined in cocoa beans and leaves and the appropriate dose conversion factor recommended by ICRP. The mean radiological doses to human due to the consumption of cocoa beans were founded to be 0.227, 0.134, 0.083 and 0.062 mSv/year for children 2 to 7 year old, 7 to 12 year old, 12 to 17 year old and for adult respectively. These mean radiological doses to human due to the consumption of cocoa leaves as vegetables were founded to be 0.750, 0.575, 0.355 and 0.265 mSv/year for the same group ages respectively. Ingestion of cocoa leaves as vegetables and cocoa powder by the most exposed group ages (children) might not exceed the recommended dose limit for members of the public, which is 1 mSv/year.

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