

# Determination of Sr-90 and Pb-210 in freshwater fish in Austria

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A method for the determination of  $^{90}\text{Sr}$  and  $^{210}\text{Pb}$  in freshwater fish was developed. The determinations were conducted within a project on behalf of the Federal Ministry of Health. The aim of this project was to get an overview of natural radionuclides and artificial radionuclides in wild caught freshwater fish in different lakes in Austria.

For sampling the Neusiedler See in Burgenland, two lakes in Styria the Grundlsee and the Toplitz See and the Zeller See in Salzburg were chosen. Chub (*leuciscus cephalus*), pike (*esox lucius*), perch (*perca fluviatilis*), carp (*cyprinus carpio*), catfish (*silurus glanis*), pike-perch (*sander lucioperca*) and burbot (*lota lota*) were analysed.

The fish sample was ashed and dissolved. After ammonium oxalate precipitation and destruction of the oxalate  $^{90}\text{Sr}$  and  $^{210}\text{Pb}$  were separated with strontium specific extraction columns (Eichrom Industries, Inc. / Triskem International).  $^{90}\text{Sr}$  and  $^{210}\text{Pb}$  were measured with Hisafe 3 and Quantulus 1220<sup>TM</sup>. For the determination of the chemical recovery first the initial strontium and lead concentration in the sample was measured and then a  $\text{Sr}(\text{NO}_3)_2$  and  $\text{Pb}(\text{NO}_3)_2$  carrier solution was added. The strontium and lead concentrations were measured with ICP-MS.

First different elution solutions were tested to elute the  $^{210}\text{Pb}$  from the column. Then the whole procedure was tested with the IAEA-414 fish reference material. The sample amount for the determination of the wild caught fish varied between 190 g and 2 kg. 5.5 g Sr-spec<sup>®</sup> resin were used for column preparation.

## Testing different elution solutions for Pb-210

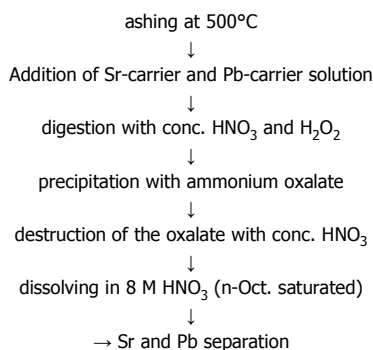


chemical recovery of the column for Pb [%]	
6 M HCl	4
Water	12
0.1 M Ammonium oxalate	75

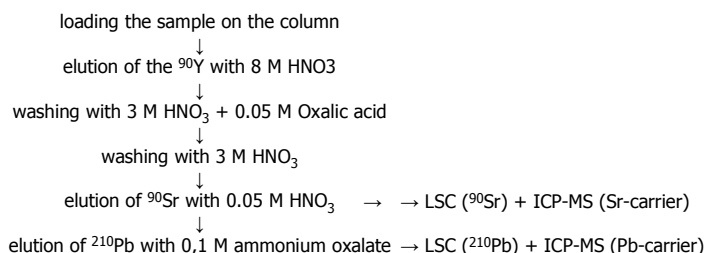
## Determination of $^{210}\text{Pb}$ in IAEA-414 fish

25 g of reference material were ashed and analysed for  $^{210}\text{Pb}$ .  
 The chemical recovery for Sr and for Pb was 83,3% and 79,6% respectively.  
 Laboratory value  $^{210}\text{Pb}$  [Bq/kg]  $2.08 \pm 0.32$   
 Reference sheet information value [Bq/kg] 2.1 (1.8 – 2.5 (95% confidence interval))

## Sample Preparation:



## Sr and Pb separation with Sr-spec:



## Results:

For elution of  $^{210}\text{Pb}$  the most adequate solution tested was the 0.1 M ammonium oxalate solution. The separation method is a fast and suitable method for determining  $^{90}\text{Sr}$  and  $^{210}\text{Pb}$  in the same sample aliquot with just one column (Sr-spec<sup>®</sup>) separation. The Figures below show the results of our measurements. The median chemical recovery for  $^{90}\text{Sr}$  and  $^{210}\text{Pb}$  was 76% and 70% respectively. The sample with the highest  $^{210}\text{Pb}$  and  $^{90}\text{Sr}$  activity concentration was perch from Grundlsee. This was a sample from combined small fish which still contained all the fishbone. From the other samples most of the fishbone were taken out. The lower limit of detection for  $^{90}\text{Sr}$  and  $^{210}\text{Pb}$  varied with the amount of sample used and the chemical recovery. For 1 kg fresh weight and the median chemical recovery for  $^{90}\text{Sr}$  and  $^{210}\text{Pb}$  was 6.9 mBq/kg<sub>fresh weight</sub> and 7.4 mBq/kg<sub>fresh weight</sub> respectively.

