IDENTIFYING TRACE ELEMENTS IN RICE

Rice is one of the most widely consumed foods worldwide. Today 30% of all rice produced comes from China. Recently it has been found that groundwater and soil in China contain high concentration levels of the highly toxic element arsenic, a metal naturally present in the Earth's crust due to volcanic activity and erosion of mineral deposits, but also due to pollution from burning coal and oil and the use of pesticides which contain arsenic.

It is therefore very important to understand whether this arsenic can be incorporated and accumulated in rice grains since these toxins can have a profound effect on the health and well being of people who consume them.

To measure the 2D distribution of arsenic and other trace elements in rice grains grown in China and Hungary the grains were measured by confocal micro x-ray fluorescence at DESY, Hamburg. This technique uses synchrotron radiation to excite electronic transitions within atoms in a sample, which results in emission of characteristic x-rays from each element present. By detecting and counting these fluoresced x-rays, the distribution of all elements can be identified in a sample, even trace elements which have concentrations as low as a few billionths of a percent.

Reducing trace elements in the grain

The measurements revealed that significant levels of arsenic were detectable up to a depth of 80 µm into the rice grains, and while Chinese rice contains more nickel, titanium and rubidium, Hungarian rice

contains more potassium, calcium, manganese and iron as well as significant of levels of strontium. An important finding was that boiling of the rice grains results in the reduction of almost all trace elements, including the average arsenic concentration which was reduced by a factor of 6 – 8.

These measurements and the findings assist authorities in measuring and regulating the levels of toxins ingested by humans and also help to understand the effects our pollution has on our food supply.

Source: Geert Silversmit et al. "Confocal μ-XRF investigation of trace element distribution in Hungarian and Chinese rice" DESY Annual Report (2007) 1283-1284

Figure NUMBER ONE

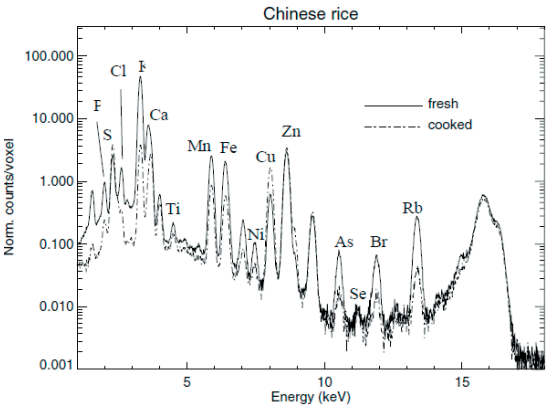

Figure 1 XRF spectra showing all elements present in grains of Chinese rice – before and after cooking

Figure NUMBER TWO

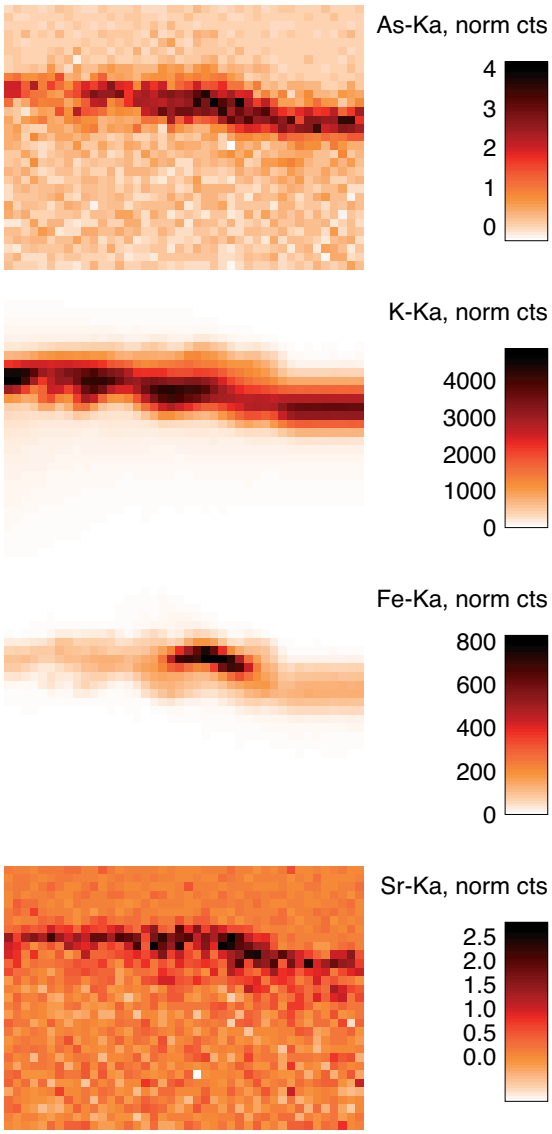

Figure 2 Distribution of potassium (K), iron (Fe), arsenic (As) and strontium (Sr) in fresh rice, detected by x-ray fluorescence, confirming the presence of toxic arsenic.

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