



Food

CASE STUDY

Elemental mapping of wheat grain

Deficiencies in iron and zinc are affecting an increasing number of people worldwide due to the low intake and bioavailability of minerals from traditional diets based with little or no meat, fruit and vegetables.

The problem is particularly serious in Africa, the eastern Mediterranean and south-east Asia where a variety of chronic health problems are related to low mineral intake.



The Challenge

The Health Grain Programme is focused on improving the nutritional value of diets by increasing the mineral content of wheat flour. Minerals are usually found in the outer layer or bran, but the white flour is made from the starchy endosperm and is almost devoid of minerals.

Breeding wheat for mineral-enriched white flour requires finding available varieties or developing new ones that deposit digestible forms of minerals in the white flour.

Understanding of the mineral type and content in the wheat is essential for further investigations of the digestibility of the wheat. It is therefore essential to investigate the distribution and complexation of mineral deposits in different varieties of grain.



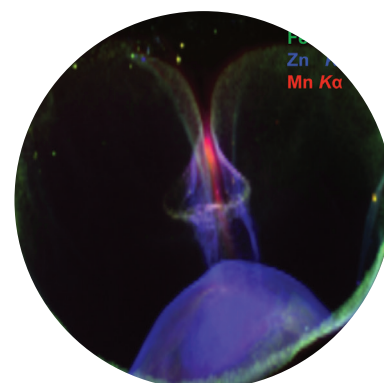
The Solution

Beamline I18 at the Diamond synchrotron provides excellent facilities for high resolution X-ray fluorescence (XRF) and X-ray absorption spectroscopy (XAS) experiments. These complementary techniques provide a combined approach to investigate metal distribution and complexation in a wide variety of sample types. X-ray fluorescence can be used to identify metals and their distribution while the combination with X-ray absorption spectroscopy also provides localised metal complexation information. X-ray measurements were performed using cross sections of wheat grains to identify the metal species present and their relative locations.



The Benefits

This combined approach is providing new insights into the distribution of different mineral components in staple foods and the effects of varying complexation upon the nutritional quality or digestibility of the food we consume. Studies have shown that balanced intake of whole grains and cereal dietary fibre can protect against chronic diseases such as cardiovascular disease and Type 2 diabetes.



“Even today one billion people are still permanently hungry and millions die each year as a consequence of deficiencies of iron and zinc. This is not good enough. Whether this is a problem of politics, production or distribution doesn’t matter: we must explore all avenues to correct this, and it starts with basic scientific investigation”

Prof. Andrew Neal, Senior Research Scientist at Rothamsted Research



For further information

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