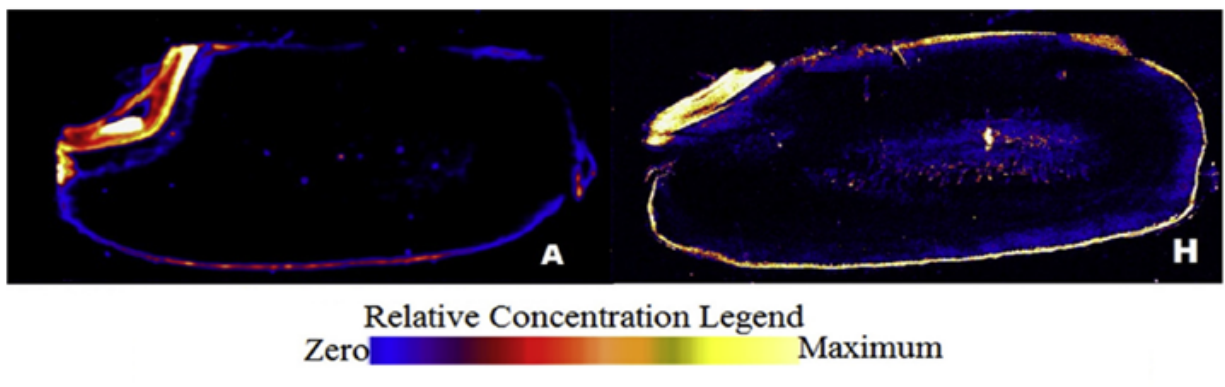


Managing global malnutrition: Researchers map micronutrients in white rice

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The concentration and distribution of zinc in one cross-sectioned grain of rice with no treatment (left) and another following soaking in water at 90C followed by steaming (right). The Australian Synchrotron's X-ray Fluorescence Microscopy beamline clearly showed researchers how zinc migrates to the center of the grain during this optimal parboiling approach, making the milled white rice more nutritious. Credit: Australian Synchrotron

Efforts to address chronic malnutrition in billions of people have taken a step forward with Australian researchers defining processing conditions that boost the nutritional value of white rice—the staple food of more than a third of the world's population.

While it is known parboiling grains before milling helps retain essential micronutrients, researchers from Charles Sturt University (CSU) and the

NSW Department of Primary Industries (DPI) have used the Australian Synchrotron to compare parboiling techniques, showing in the *LWT—Food Science and Technology* journal that longer parboiling processes at higher temperatures cause more micronutrients to migrate from the outer bran layer into the starchy core of the grain.

Dr Peter Torley, Senior Lecturer Food Science and Technology at RMIT University and formerly of CSU, says the Australian Synchrotron's X-ray Fluorescence Microscopy beamline has enabled researchers to accurately track the diffusion of nutrients at sub-micron resolution levels without damaging the [rice](#) grain's internal structure.

'Using the powerful and tightly-focused synchrotron beam meant we didn't have to grind the rice to prepare our samples, which is necessary when using standard laboratory equipment, enabling more accurate interpretation as we could plot essential micronutrients to their precise locations within the grain, before and after parboiling.

'Of the approaches in our experiments, soaking in water at 90°C followed by steaming proved to be the most effective for retaining nutrients.'

White rice—prepared by drying and milling rice kernels, a process that strips the outer bran containing most of the nutrients, including iron, manganese, potassium and zinc - provides up to 80 per cent of the total caloric intake for people in some regions of the world, such as South-East Asia.

Over two billion people, or 30 per cent of the world's population, suffer from iron deficiency with symptoms ranging from poor mental development in children to depressed immune function and anaemia.

NSW DPI researcher Mr Prakash Oli, lead author of the recently

published paper and CSU PhD candidate, says the findings will have significant implications for [rice production](#) as researchers work to address micronutrient deficiency around the world.

'Improving rice processing is one of two approaches we're working on to combat widespread malnutrition; the second involves fine-tuning rice species to express more iron and other important nutritional minerals in the grain core during growth and during soaking, which can also reduce the glycaemic index (GI) of white rice.

'Optimising rice processing is also important for farmers and industry as grain breakage during milling can cause crop value to plummet to as little as one per cent, something parboiling can help to avoid.'

Dr Laura Pallas, Rice Chemist at the NSW DPI, says changing global rice processing and eating habits is an enormous task, as there are deeply entrenched expectations across various cultures around consistency and flavour, and different approaches to parboiling ranging from those in small home farms to large industrial plants.

'Rice is the closest thing we have to a global dish and it is gluten-free and a good source of complex carbohydrates.

'If we can combine the higher micronutrient content of brown and coloured rice varieties with the light and fluffy texture of [white rice](#), we could reach the holy grail: a rice version of "wonder white" bread that people, everywhere, really want to eat.'

More information: Prakash Oli et al, Synchrotron X-ray Fluorescence Microscopy study of the diffusion of iron, manganese, potassium and zinc in parboiled rice kernels, *LWT - Food Science and Technology* (2016). [DOI: 10.1016/j.lwt.2016.03.034](https://doi.org/10.1016/j.lwt.2016.03.034)

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