diamond

Food

CASE STUDY

Plant-based alternatives to meat

The diet in Thailand has traditionally consisted of vegetables, pork, chicken and fish, and many Thais are avid meat lovers. Recently, however, there has been a move towards healthier alternatives to meat, providing a challenge for the food industry to maintain the desired flavour and experience of eating meat, whilst turning to more plant-based sources.

Heme is a substance from haemoglobin/myoglobin (found in animal muscles). It is an important source of iron and gives meat its blood-red look and meaty flavour when cooked. It has therefore attracted a lot of interest from researchers as a viable component in the meat analogue market.

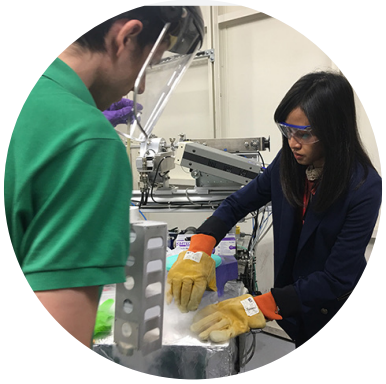
SYNCHROTRON THAILAND CENTRAL LAB

algaeba

Newton Fund

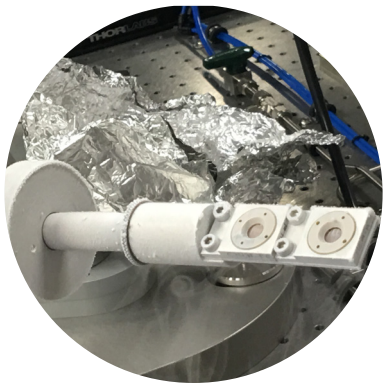
The Challenge

Existing products, using heme, have been prepared from leghemoglobin. This uses a haemoglobin gene from soybeans infected by Rhizobium or Bradyrhizobium bacteria which has been modified and expressed in yeast. Concern over this process has driven the desire for more naturally derived products, and greater research in this area.



The Solution

A collaboration of researchers from the SLRI synchrotron in Thailand and Algaeba are working on a new form of food supplement, using chlorophyll from algae. Chlorophyll has a similar structure to heme but is built around magnesium rather than iron (II) ions, found in haemoglobin; by replacing the magnesium in chlorophyll with the iron, it is possible to create a heme-like supplement that mimics the attributes of meat. This can then be applied to existing food products, such as soya protein meat analogue, to give it a meat flavour.



Initially, the team used UV-Vis/FTIR, to validate the extraction of chlorophyll from spinach leaves. UV-Vis was used to investigate the composition of chlorophyll and FTIR to investigate the primary structure of chlorophyll by functional groups. To fully understand the interactions taking place, they also needed to study the local structure and bonding between the synthesised Fe complexes and nitrogen – this was made possible by performing Fe K-edge XAS measurements under liquid He conditions on the I20-Scanning beamline at Diamond.

The Benefits

Supported through the Newton Fund, via STFC, the group of scientists from SLRI were able to study the local structure of Iron-porphyrin from chlorophyll, at Diamond, on a range of pre-prepared samples.

The aim is to now develop this product further and trial it with different food hosts. If successful, this research has the potential to revolutionise the food industry, providing a better source of nutrition, which is easier to digest and lower in calories/ cholesterol than meat.

"Using the high energy and flux of Diamond's advanced instruments, we were able to acquire detailed insight into the structure and bonding activities of our heme substitute, whilst also achieving high throughput across a wide range of samples. The results will help to address current manufacturing challenges and meet the demands of Thai consumers for a natural plant-based food supplement to replicate the qualities of meat." **Dr Somchai Tancharakorn, Assistant Director for Special Affairs, Synchrotron Light Research Institute (SLRI), Thailand**

For further information

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