Food

CASE STUDY

Structural analysis of a novel enzyme used to produce soy isoflavones

A group of enzymes called β-Glucosidases are used in the food industry to hydrolyse glycosidic bonds in complex sugars. Since many food industrial processes involve harsh conditions like high concentrations of solvents and sugars, low pH, and high temperatures, there is a need for these kinds of enzymes to be adapted to function in extreme environmental conditions.

These enzymes can be employed for the cleavage of isoflavone glucosides from soy flour, to produce soy isoflavones, a valuable food supplement.

University of Nottingham
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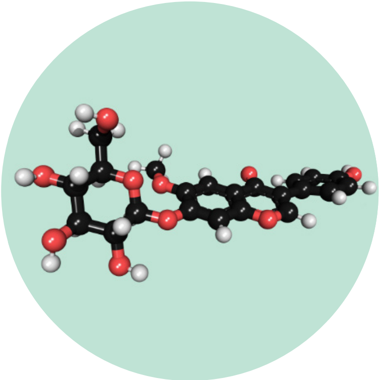
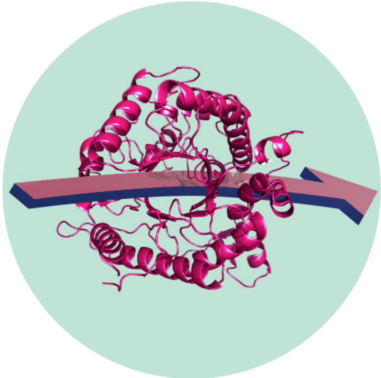
The Challenge



Researchers from the Universities of Nottingham, Bern, and Milano identified a novel β-Glucosidase from the extremophilic organism *Alicyclobacillus herbarius* that can hydrolyse isoflavone glucosides under extreme conditions.

A high-resolution structure was needed to understand how the enzyme works and what makes it tolerate these extreme conditions.

The Solution

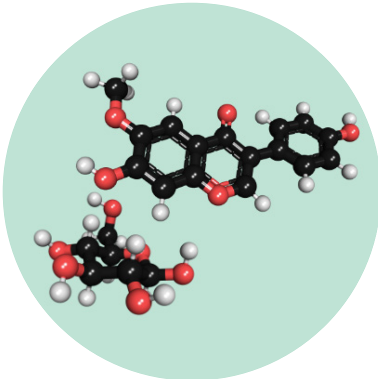


The enzyme was expressed and purified in sufficient quantities that permitted the researchers to set up crystallisation experiments and obtain crystals.

X-ray diffraction data was collected using beamline I04 at Diamond. The high quality and resolution of the data made it possible to determine the atomic resolution structure of the enzyme.

Structural analysis showed that even though this β-Glucosidase shared low sequence similarity with related enzymes, the structural similarity was high, and conserved amino acid residues important for enzyme stability and activity could be identified.

The Benefits



The advanced data collection capabilities of beamline I04 combined with the highly intense X-ray beam generated by the Diamond synchrotron made it possible to model the enzyme of interest at atomic resolution.

An understanding of how these types of enzymes work and why they can retain activity in extreme conditions is important for current and future applications within the food industry.

"Extremophilic organisms are an excellent source of highly resistant biocatalysts particularly suited to the food industry. However, our understanding of their structural features is limited as they often present limited sequence similarity with known, crystallised enzymes. Structure elucidation of more extremophilic enzymes drastically broadens the set of data which can be used to correlate sequence to environmental adaptation." **Prof Francesca Paradisi**, Professor of Biocatalysis, University of Nottingham.

For further information

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