Secret of UK chocolate manufacture inspires discovery of new lactose form

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A new form of crystalline lactose has been discovered using part of the technique that gives UK chocolate its unique appeal.

The new form of lactose, an ingredient widely used in industries including food manufacturing and pharmaceuticals, has been written

about in a journal article in Acta Crystallographica Section C: Structural Chemistry.

By cooking pure lactose syrups in a way similar to that used in the production of chocolate crumb (a key component used to give UK chocolate its distinctive taste and texture) the team found that the resultant dried powders were unlike any of the previously reported crystalline forms of lactose. Using a technique called X-ray crystallography, they were able to obtain the full three-dimensional structure of this novel solid form of lactose.

Prof Kenneth Shankland, a Professor of Pharmaceutics at the University of Reading said:

"The result was certainly surprising given that lactose is so widely used in everything from baking to tablet making, and so widely studied as a result.

To find a new crystalline form of a common substance such as lactose is very exciting, as the discovery further populates the 'lactose landscape', potentially aiding industries that rely upon a thorough understanding of lactose and its properties in the solid state."

Using lactose

Lactose (a milk sugar) is added to food and medicines in a number of forms, for a number of reasons.

For example, in food, it is used to enhance the controlled browning of bakery goods such as cakes and breads in bakery. It is a key component of milk chocolate, present because it is a component of the milk that is part of the chocolate recipe. It has a complex relationship with sucrose, the latter contributing much greater sweetness to the chocolate than

lactose.

In the pharmaceutical industry, it is used mainly in the crystalline form known as "α-lactose monohydrate" though some products use anhydrous lactose, which can take multiple crystal forms e.g. "anhydrous β-lactose" and "stable anhydrous α-lactose".

The main application areas are:

- as an inert bulking agent for tablets; for any given tablet, it is quite likely that significant percentage of the weight of the tablet is lactose.
- as a carrier for inhaled drugs i.e. when one inhales a drug (e.g. using an asthma inhaler) the inhaled powder consists often of very small lactose particles that carry the drug down into the lungs

More information: Daniel Nicholls et al. A new crystalline form of αβ-D-lactose prepared by oven drying a concentrated aqueous solution of D-lactose, *Acta Crystallographica Section C Structural Chemistry* (2019). DOI: 10.1107/S2053229619008210

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