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Potential Use of X-Ray nanoCT in Food Science

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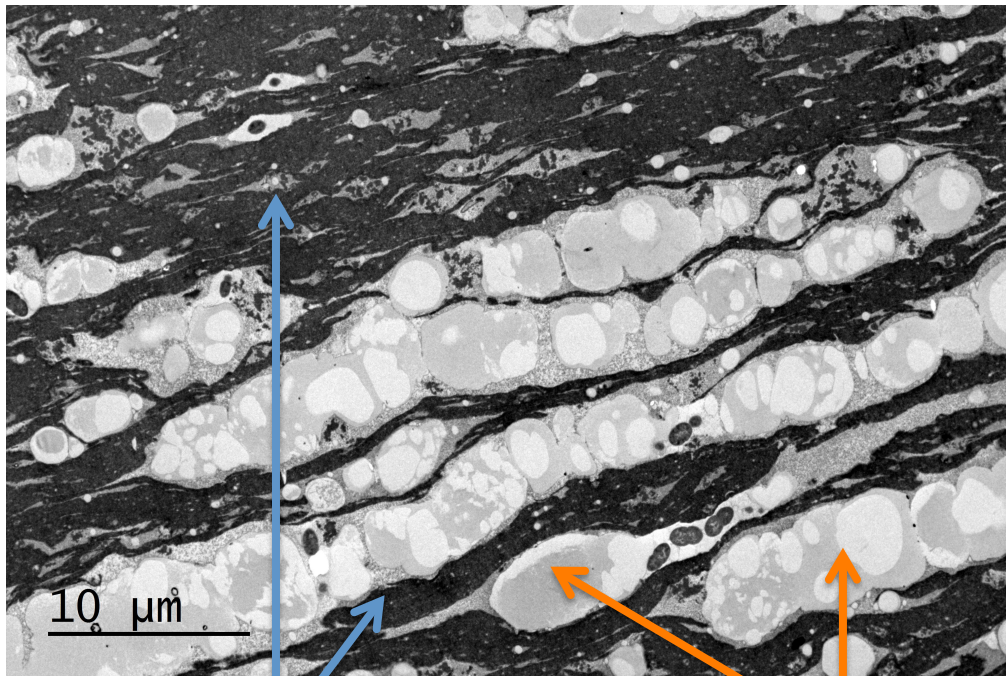
Terrah Tek – A Biostructure Company

Background

- Mozzarella production is a multi-billion-dollar industry.
 - Mozzarella is the best cheese for pizza.
 - Consumer demands drive industrial-scale production and innovative research.
 - Evaluation of cheese microstructure to aid assessment of functional properties.
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- A close-up photograph of a hand holding a slice of pizza. The pizza is covered in melted mozzarella cheese, which is stretching and dripping with sauce. The toppings include pepperoni and possibly mushrooms. The background is a blurred wooden surface.

Microstructure of Mozzarella Cheese

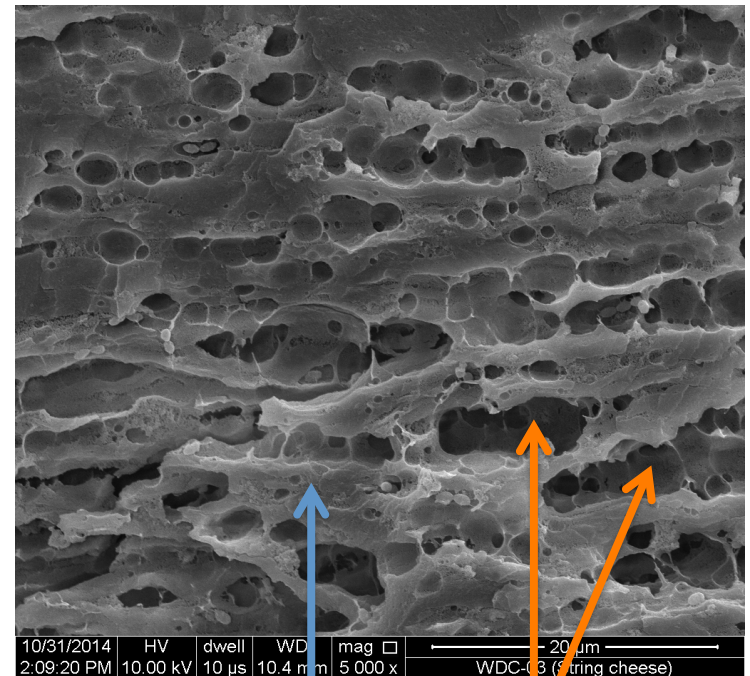
TEM, JEOL 1400 Plus



Protein matrix

Fat

SEM, FEI Quanta 600



Protein matrix

Voids of Fat

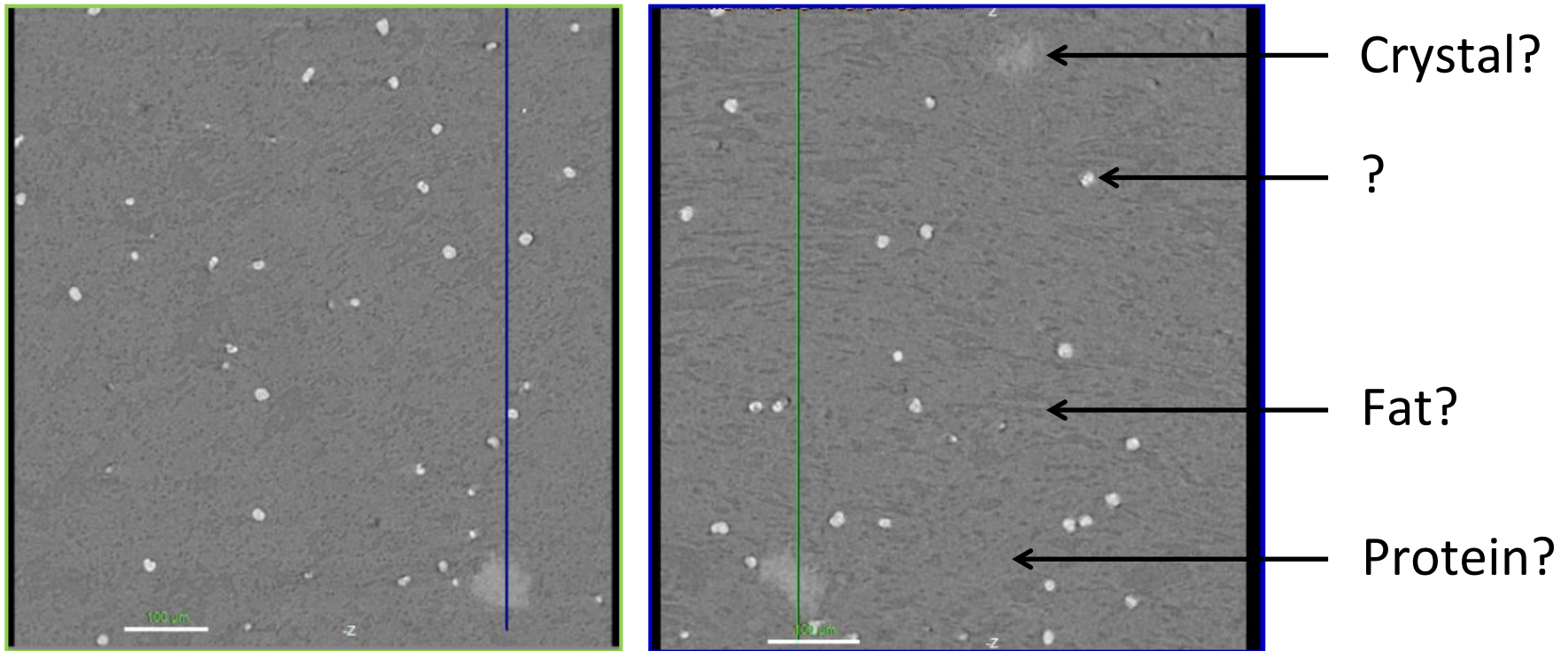
Microstructure of Mozzarella Cheese

- Problem: Chemically fixed samples, 2D
- Desirable: Native analysis methods, 3D
- Approach: X-ray nano computer tomography (ZEISS Xradia 520 Versa)



Preliminary Results

Unfixed & Unstained String Cheese Sample

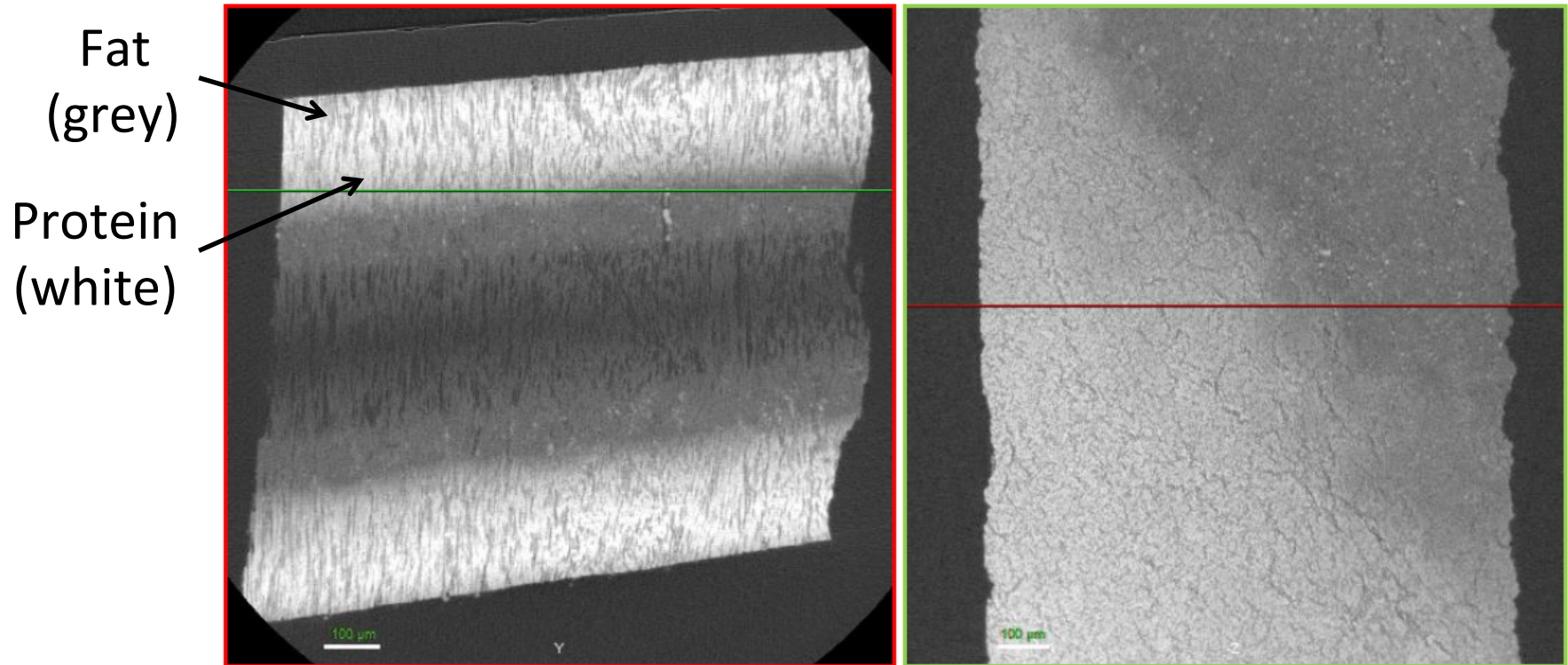


2D virtual slices in two different orthogonal planes.

The image on the right is the virtual cross-section of the blue line on the left. The left image is the virtual cross-section of the green line on the right.

Preliminary Results

Fixed & Stained String Cheese Sample as a Reference



2D virtual slices in two different orthogonal planes.

The image on the right is the virtual cross-section of the green line on the left. The left image is the virtual cross-section of the red line on the right.

Conclusions

- More studies needed to clearly identify the components of string cheese (protein, fat, crystals) in micrographs obtained with the X-ray nanoCT.
- IF components can be unequivocally identified, use for large-scale, 3D reconstruction of cheese envisioned.
- Thermal instability of cheese might be a problem.