Bacteria MSE 493

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2024

Bacteria from homemade kombucha btw


s just keep this here cause its awesome
BLANCA

What's on the "menu" today?

- Main dish: Kimchi and miso
- Dessert: Nata de coco
- Beverages: Kefir and kombucha

Miso

Kimchi

Kefir water

Kombucha

Nata de coco

Probiotics

- Probiotics are live microorganisms
- Claims that they provide health benefits when consumed, e.g. by restoring gut microbiota
- Mixed evidence of efficacy

ELSEVIER

Current Opinion in Food Science

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Probiotic – friend or foe?

Jurica Zucko [1] ✉, Antonio Starcevic [1], Janko Diminic [1], Damir Oros [1], Amir M Mortazavian [2], Predrag Putnik [1] ✉

Highlights

- Probiotics are very popular addition to human nutrition with proven health benefits.
- They represent lucrative segment of food markets.
- Their manufacturing is not sufficiently regulated on worldwide markets.
- The safety is insufficiently tested while their intake might have adverse effects.
- More work is necessary fully to confirm health benefits and safety of probiotics.

Miso

2 stage fermentation:

- **Step 1:** Create starter culture called *kōji* (麹) by growing *Aspergillus oryzae* (fungus) on substrate (rice, soybean); koji produces enzymes that break down protein and starch to smaller and simpler compounds
- **Step 2:** Fermentation with bacteria and yeast of koji + salt + soybean mash, up to 2 years.
- The microbial community is very important to taste, nutrition, and texture of miso – yet, not much is known.

https://doi.org/10.1111/1750-3841.15773

Kimchi

- Salted and fermented vegetables
- Early stage: *Leuconostoc* variety is dominant; lower acid tolerance, produces CO_2, lactic acid and acetic acid
- Middle stage: *Lactobacillus* and other bacteria with higher acid tolerance, continues to produce lactic acid, lowers pH to 4 (prevents growth of pathogenic bacteria)
- Late stage: more *Lactobacillus*, continued fermentation at low T (refrigerated)

- Fermentation: B12, probiotics, unique flavors and textures

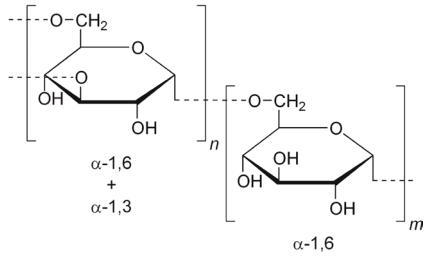
https://en.wikipedia.org/wiki/Kimchi

Kefir water

- a mix of Lactobacillus, Streptococcus, Pediococcus and Leuconostoc bacteria, with yeasts from Saccharomyces, Candida, Kloeckera and possibly others
- Lactobacillus brevis bacteria has been identified as the species responsible for the production of the dextran polysaccharide that forms the "grains"

https://en.wikipedia.org/wiki/Tibicos

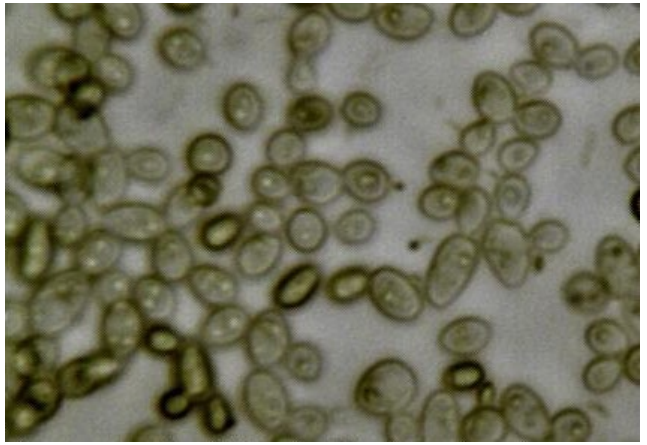
"grains" - a symbiotic community of bacteria and yeasts (SCOBY) living in translucent "grains" held together by polysaccharide



Kombucha

- Also a symbiotic culture of bacteria and yeast (SCOBY), commonly called “Mother”
- Cellulose pellicle (hydrogel) holds the SCOBY together, not the desired product
- The yeast component generally includes *Saccharomyces cerevisiae*, along with other species; the bacterial component almost always includes *Gluconacetobacter xylinus* to oxidize yeast-produced alcohols to acetic acid (and other acids).

400x



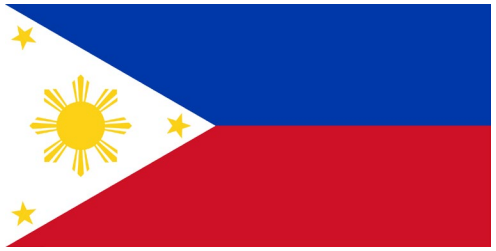
https://en.wikipedia.org/wiki/Kombucha

Nata de coco

- Bacterial cultures fermented with coconut water
- SCOBY/cellulose pellicle
- *Komagataeibacter xylinus* produces cellulose, in this case, the desired product

https://en.wikipedia.org/wiki/Nata_de_coco

Making Nata de Coco



Bacterial cellulose

Iguchi, M., Yamanaka, S. & Budhiono, A. Bacterial cellulose—a masterpiece of nature's arts. Journal of Materials Science 35, 261–270 (2000). https://doi.org/10.1023/A:1004775229149

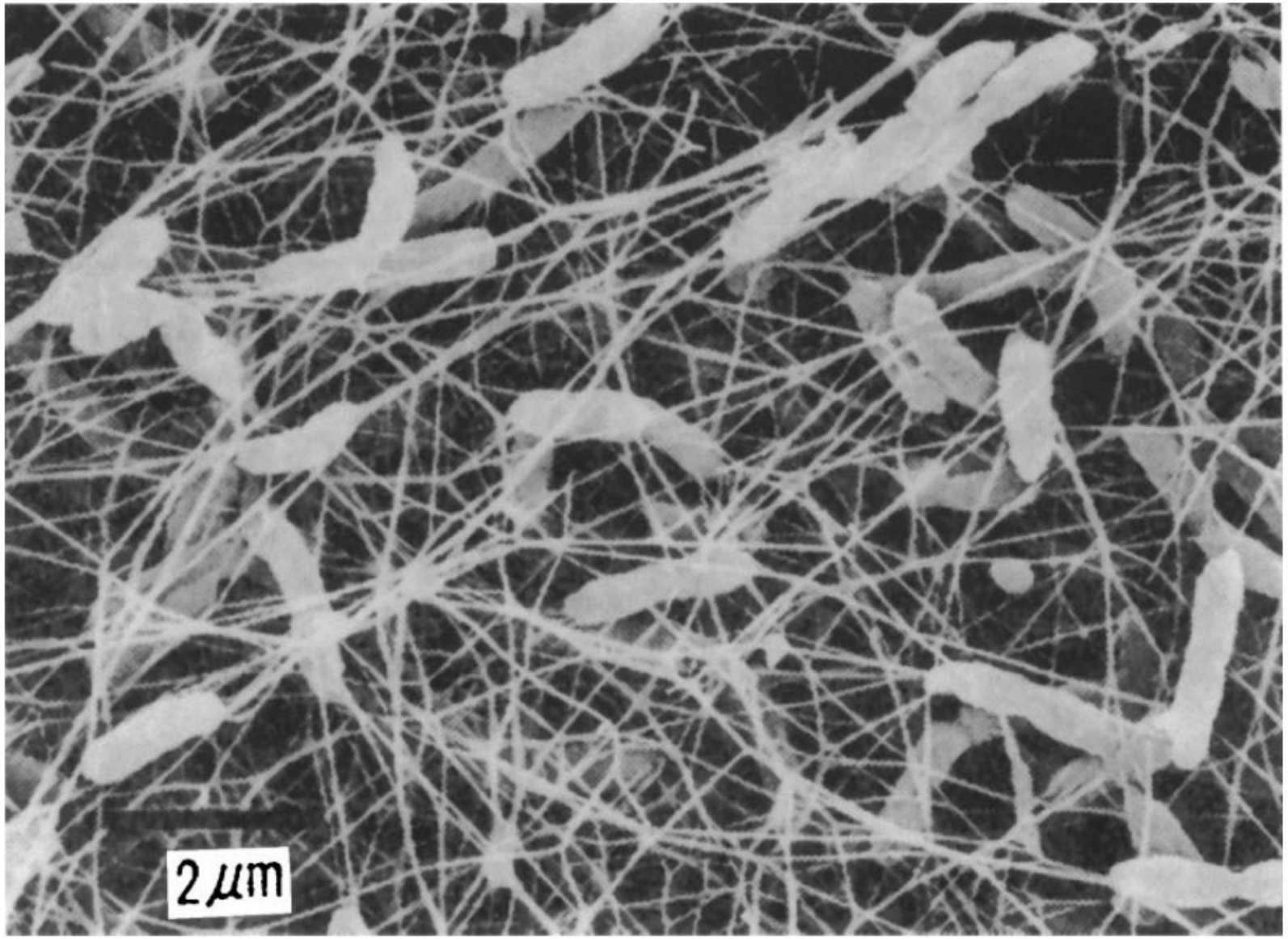
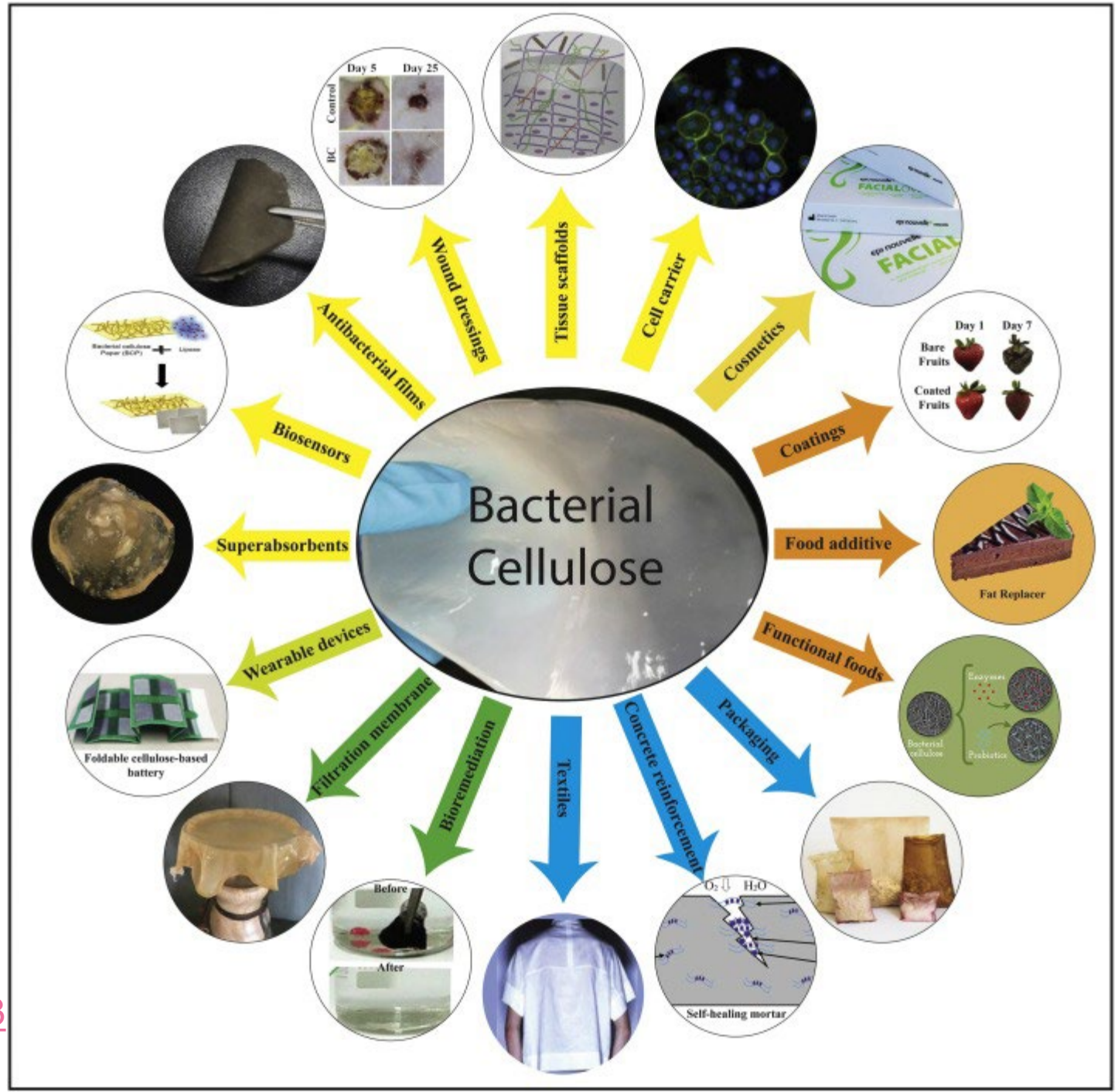


Figure 1 A scanning electron micrograph of freeze-dried surface of bacterial cellulose gel.

Materials science applications of bacterial cellulose

- Biomedicine
- Packaging
- Coatings
- Cosmetics
- Superabsorbents
- Sensors
- Tissue engineering



https://doi.org/10.1016/j.mser.2021.100623

Bacterial cellulose flashbacks

854
doi:10.1017/S1431927621003354

Microsc. Microanal. 27 (Suppl 1), 2021

Visualization of nanostructural dislocations in microcrystalline cellulose fibrils through super-resolution fluorescence microscopy

Mouhanad Babi[1], Anthony Palermo[2], Tiffany Abitbol[3], Ayodele Fatona[4], Victoria Jarvis[5], Akanksha Nayak[4], Emily Cranston[6] and Jose Moran-Mirabal[1]

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- Trying to understand how nature puts together cellulose microfibrils

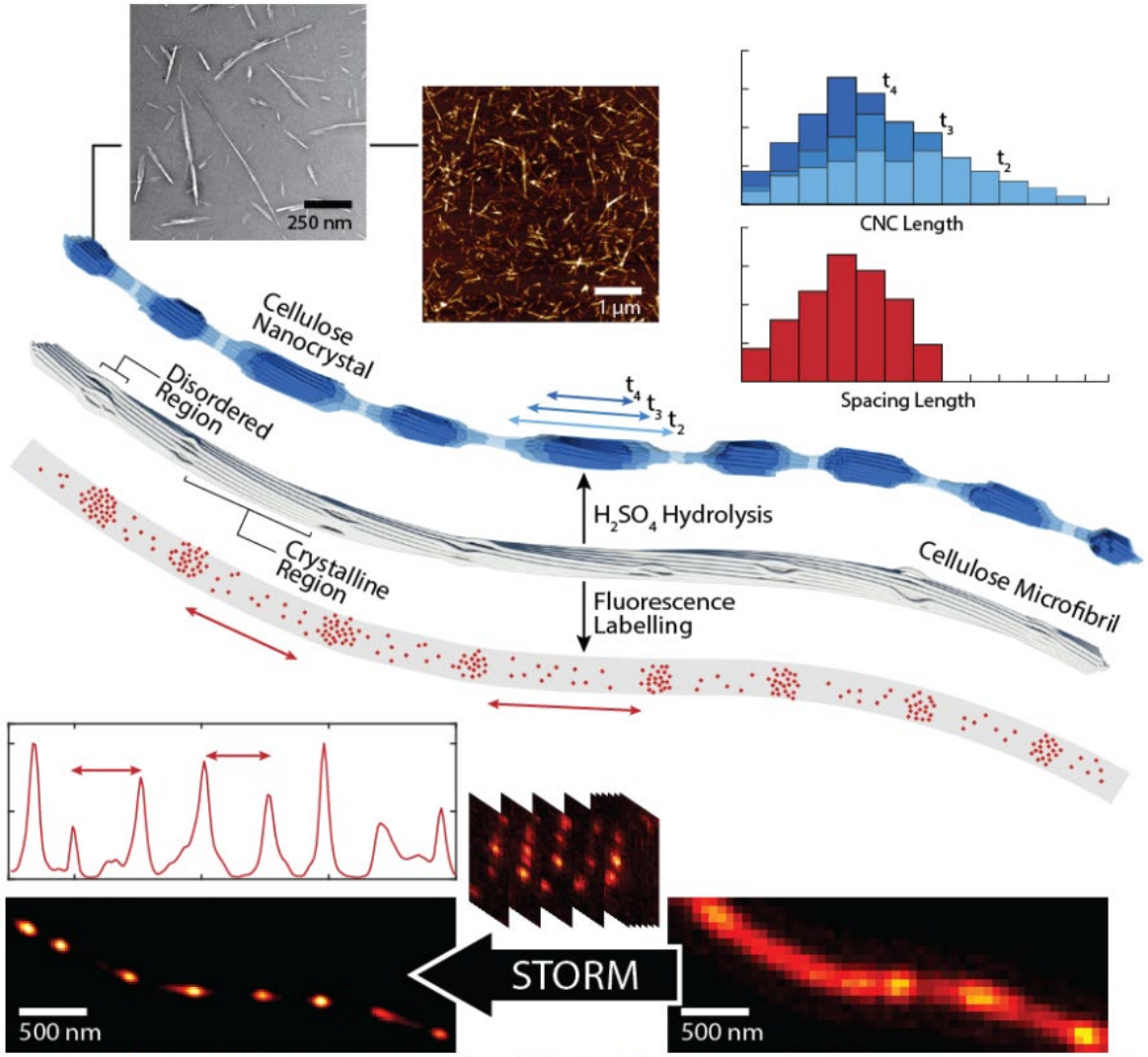

Figure 2. Figure 2. Visualizing dislocations in bacterial cellulose microfibrils using super-resolution fluorescence microscopy. The fringed-micellar structural model of the cellulose microfibril (grey) postulates the presence of