UNIVERSITY OF EASTERN FINLAND

Food Microbiological Safety: New Technologies & Applications

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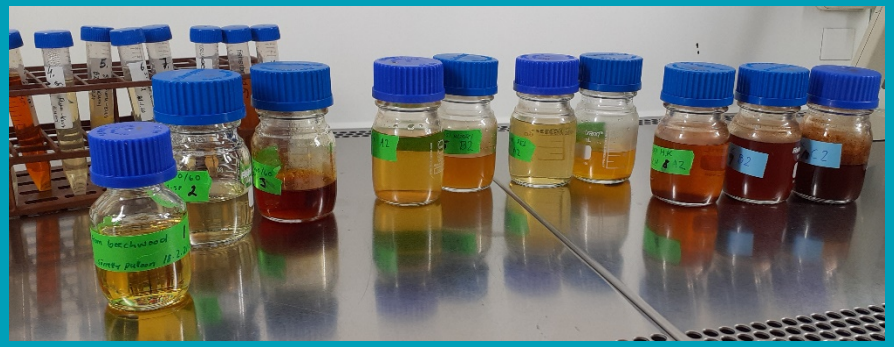
EU Green Week 26.5.2021

New technologies and applications

1. New liquids from wood –antimicrobial activities and safety testing (Bio-Mahti)
2. High-pressure processing (HPP) technology (ELSAPA)
3. Visible light (LED) technology (ELSAPA)

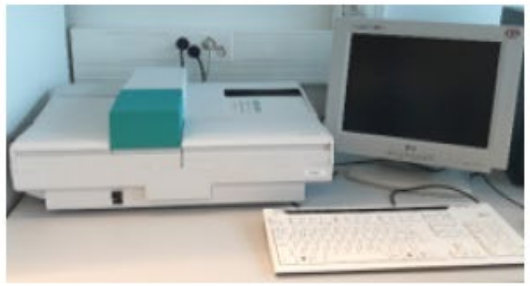


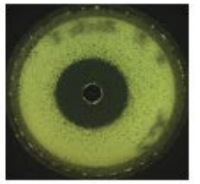
New liquids from wood –antimicrobial activities and safety testing

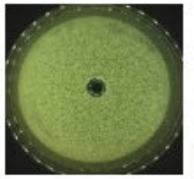
Development of microbiological methods and safety of compounds

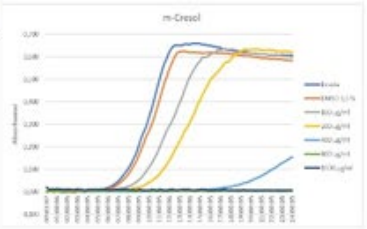
Combination of microbiology, analytics and separation techniques

MICROBIOLOGY:
Testing of antimicrobial effects



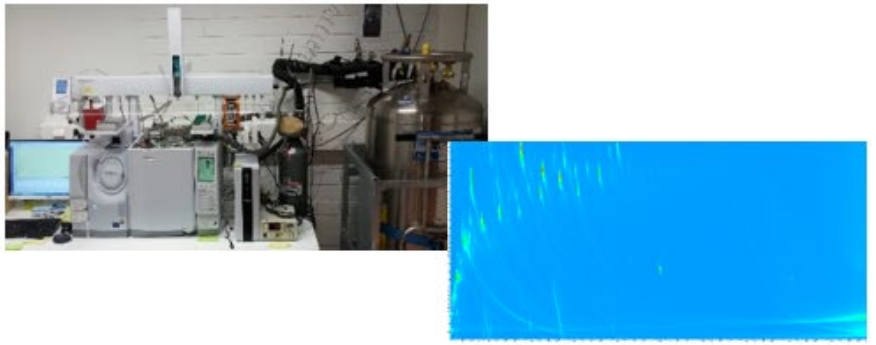






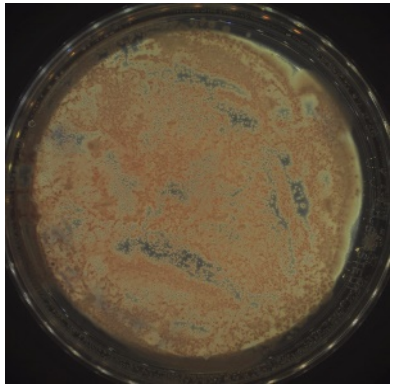
ANALYTICS
Identification of molecules

SEPARATION TECHNIQUES:
purification of molecules



Prevention of spoilage microbes and pathogens

1.



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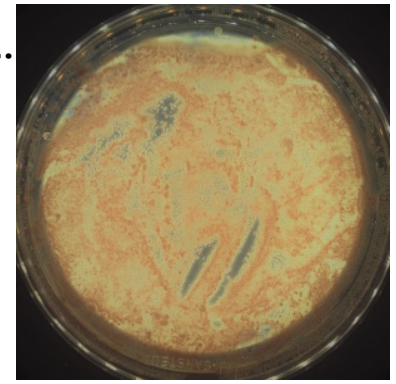

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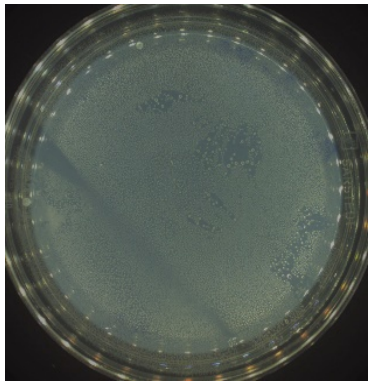

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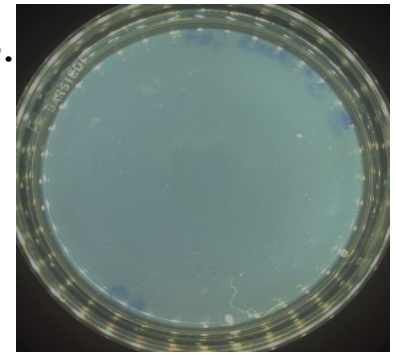
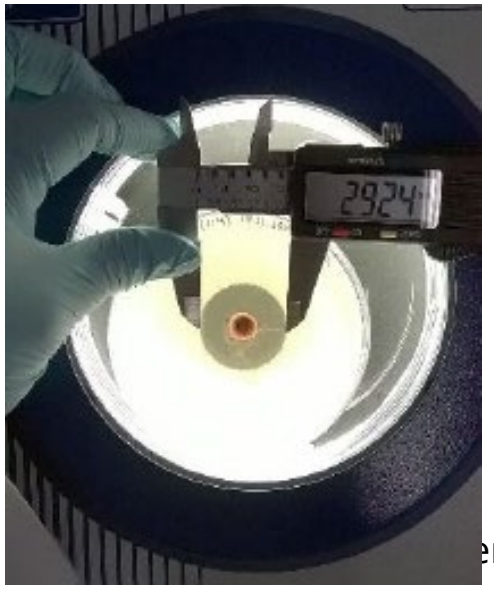
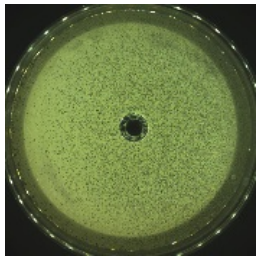
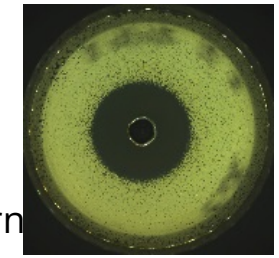
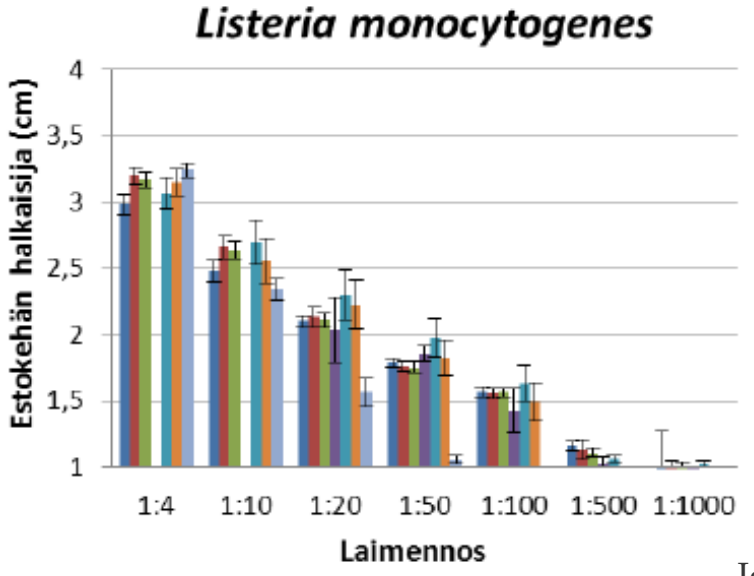




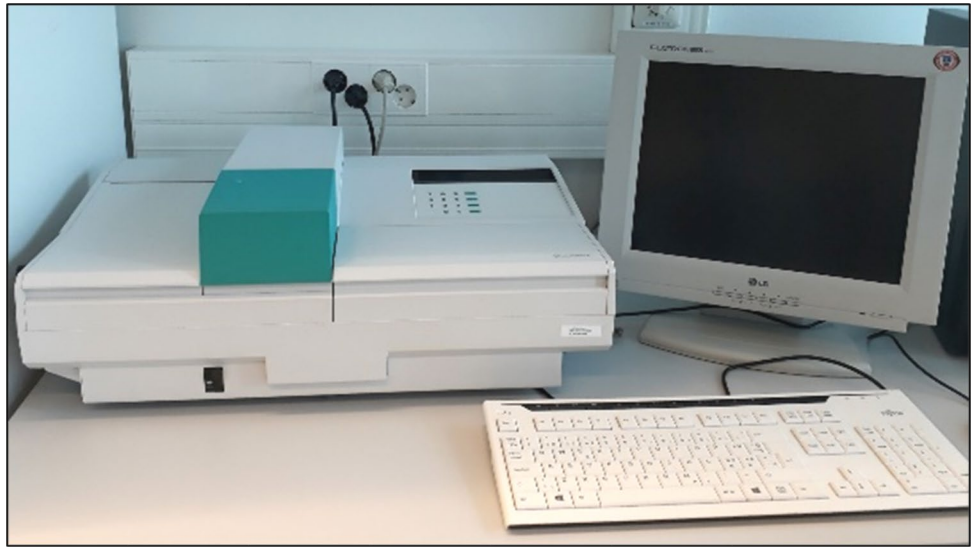


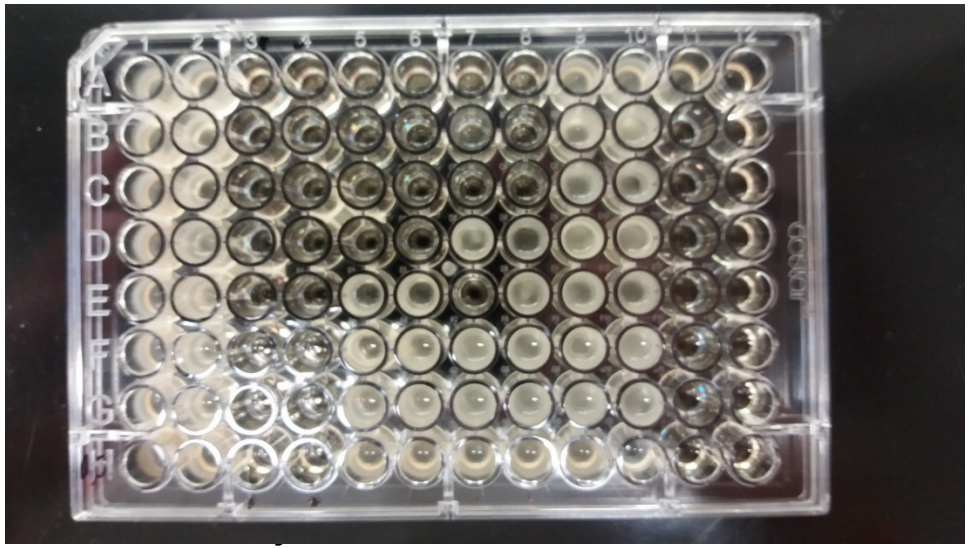


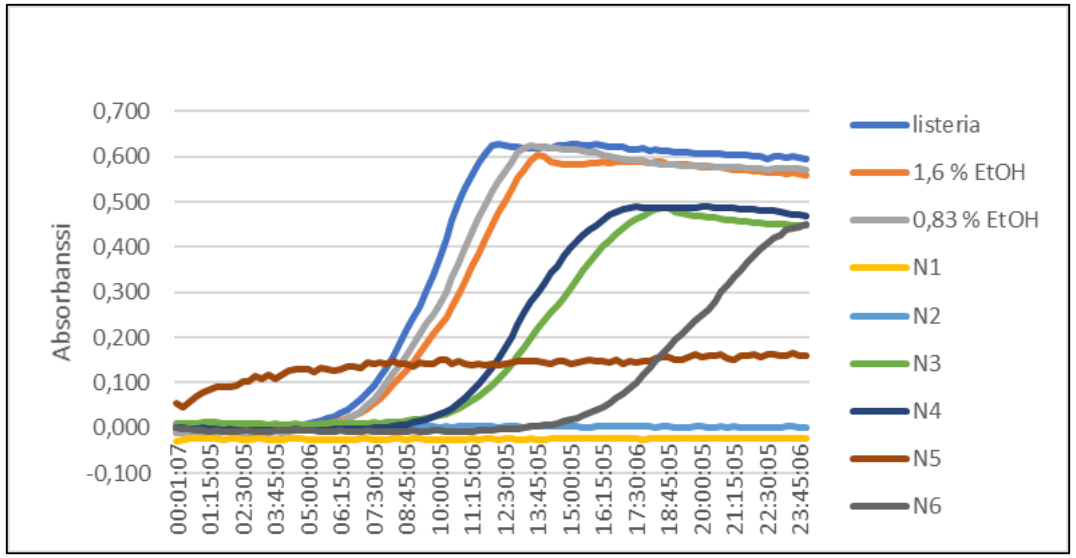


1. ***Fusarium proliferatum***
2. **M-cresol 200 µg/ml**
3. **M-cresol 200 µg/ml + sample**
4. **M-cresol 800 µg/ml**

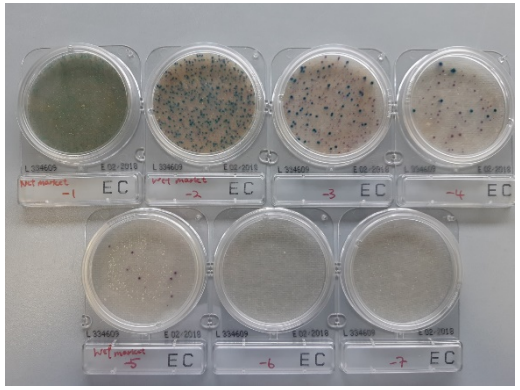
Prevention of pathogens: testing with Bioscreen turbidometric analyser







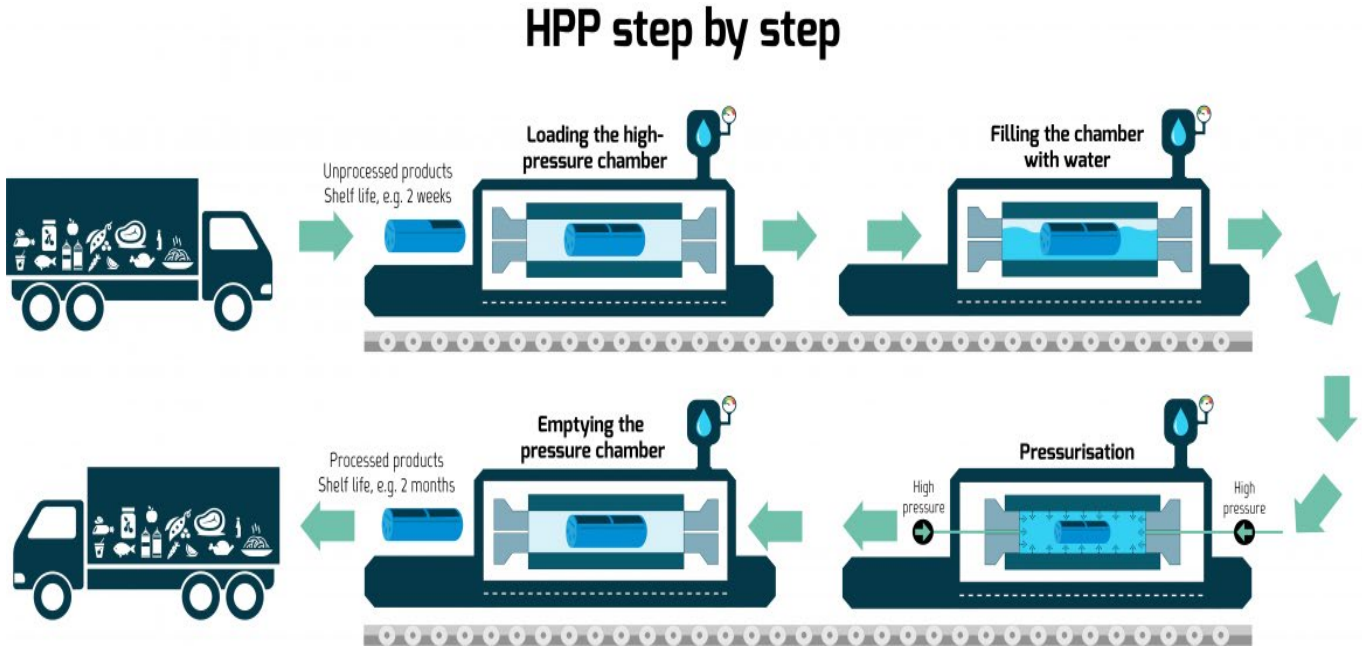
- Bacteriostatid
- Bacteriocidic (plating afterwords)



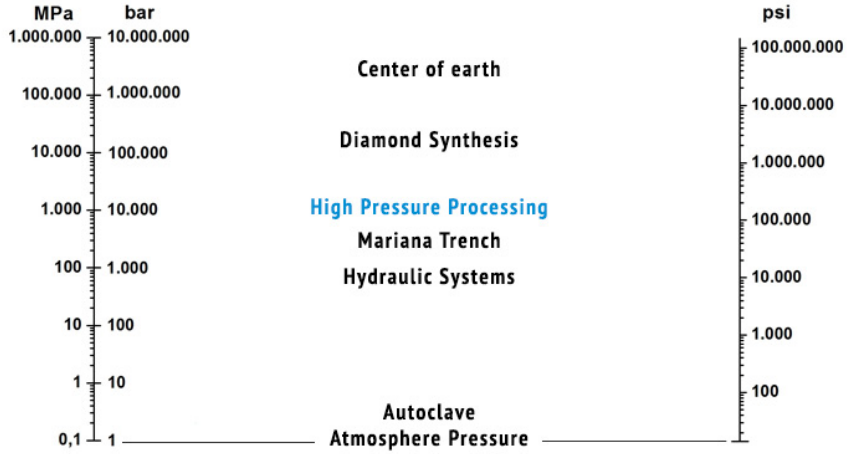
Riekkinen… Korhonen: Antimicrobial activity of slow pyrolysis liquids obrained from pine wood biomass against three food pathogens. Submitted.

High-pressure processing (HPP) technology

Principle of High Pressure Processing (HPP)



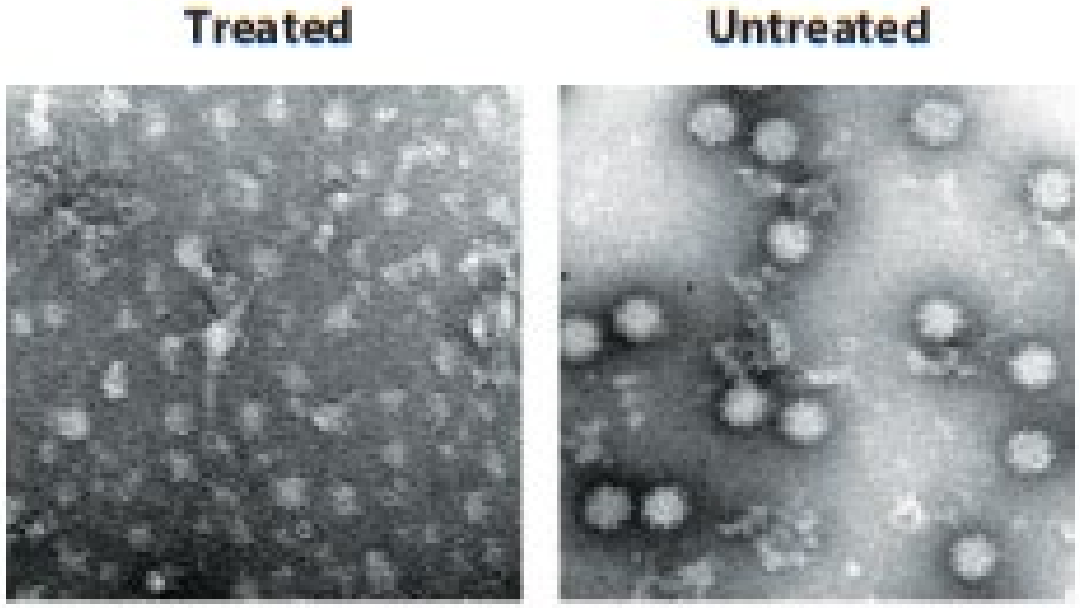
Picture: Toripiha.fi



www.hiberbaric.com/en/

Prevention of norovirus with HPP

- HPP is the most promising nonthermal treatment for noroviruses
- HPP, as well as ionizing radiation and UVC light can reduce noroviruses in foods
- Treatments used to eliminate viruses can impair food product quality
- Optimal virus elimination strategies should be validated independently for each food product



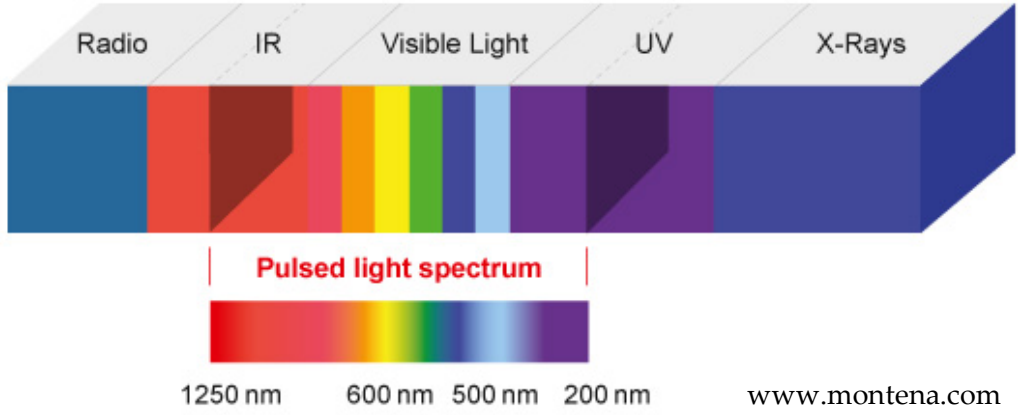
Ahmed, Maunula & Korhonen: Reduction of Norovirus in foods by nonthermal treatments: a review, *J Food Prot* 83:12:2020

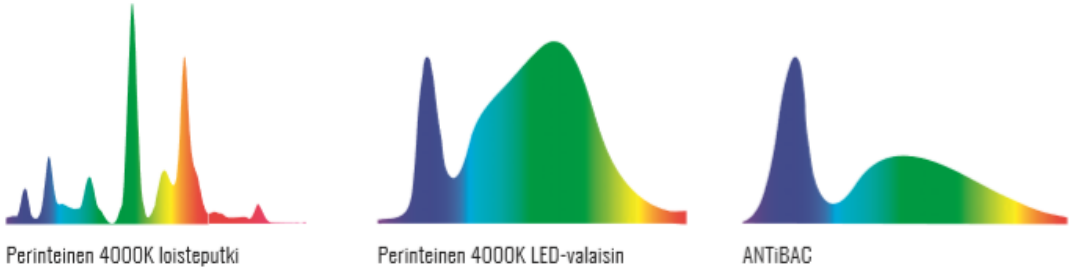
Visible light (LED) technology

Light treatment

- Blue light (405 nm)
- UV-light (254–260 nm)
- Light pulses (200–1100 nm)

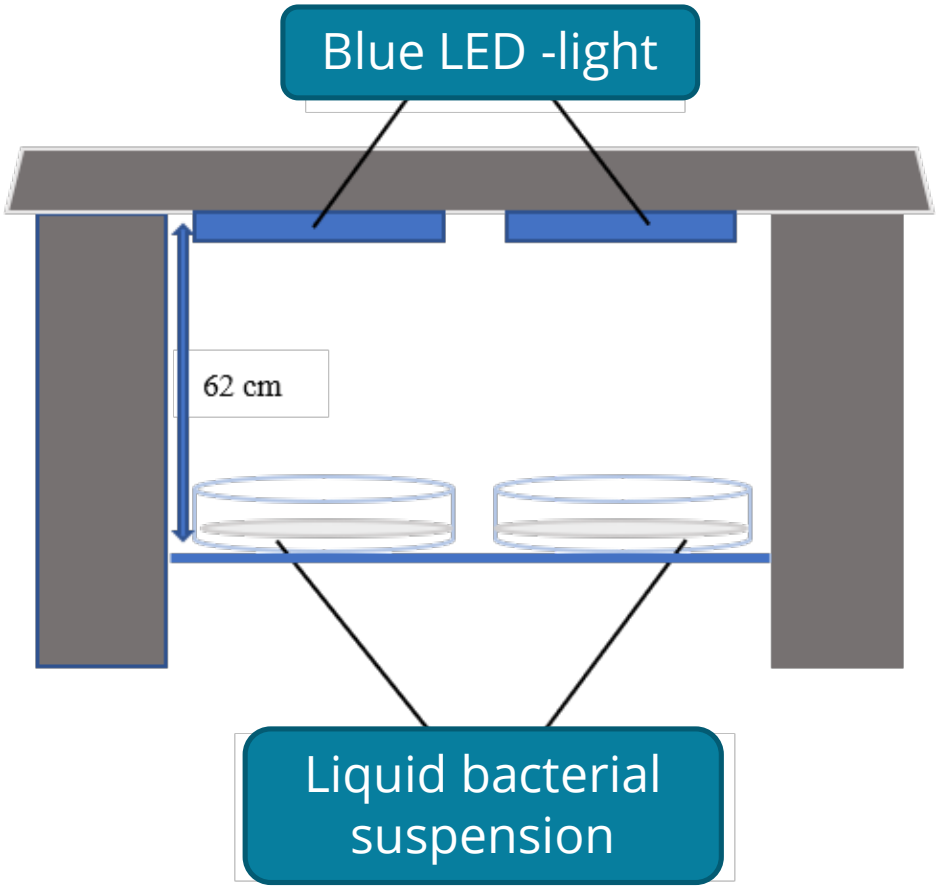
- Inactivation of microorganisms is base on oxidizing molecules and DNA/RNA damages



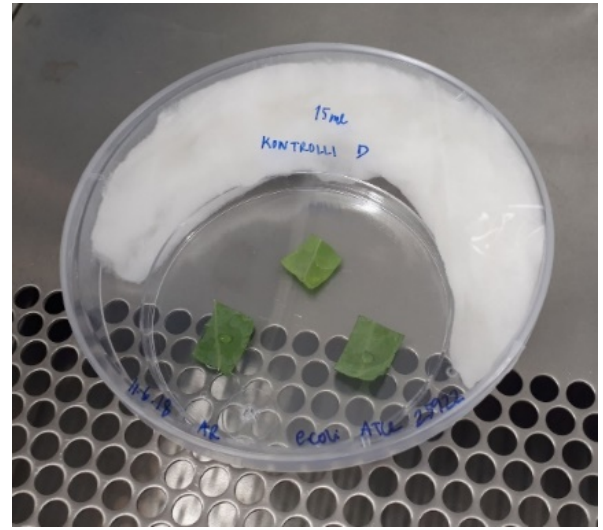


Picture:: http://ledtailor.fi/wordpress/wp-content/uploads/antibac-esite-2019.pdf

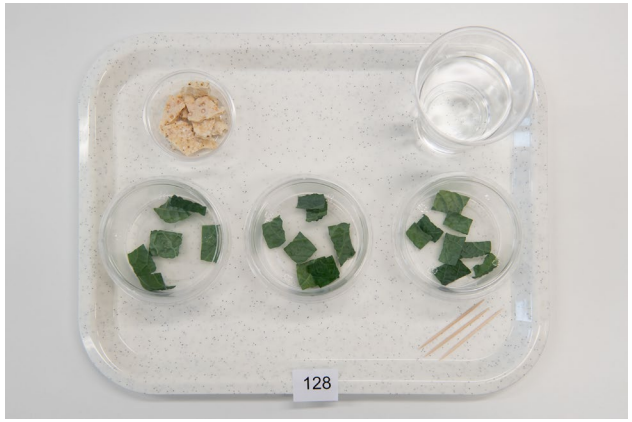
Visible light illumination against pathogens



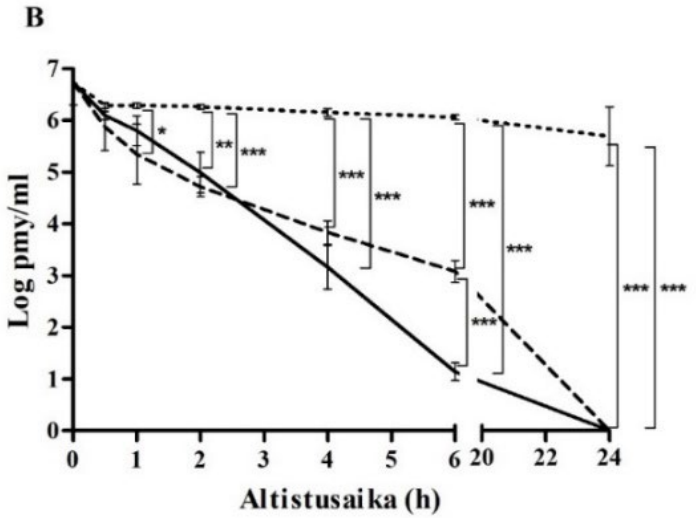
Picture: Katriina Ojala



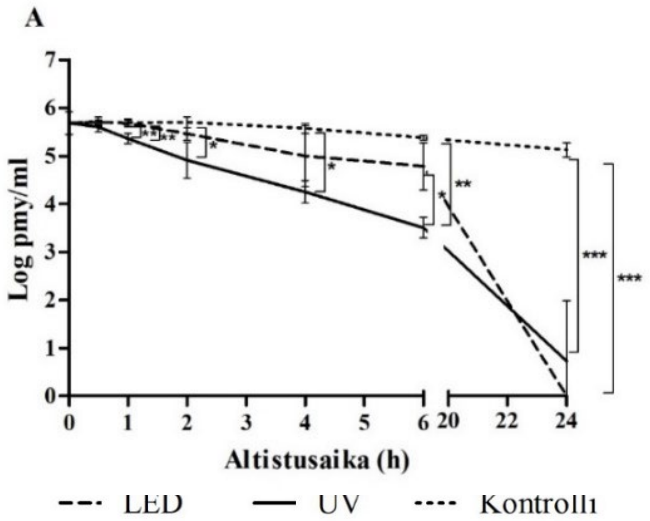
Kuva: Anniina Riihijärvi



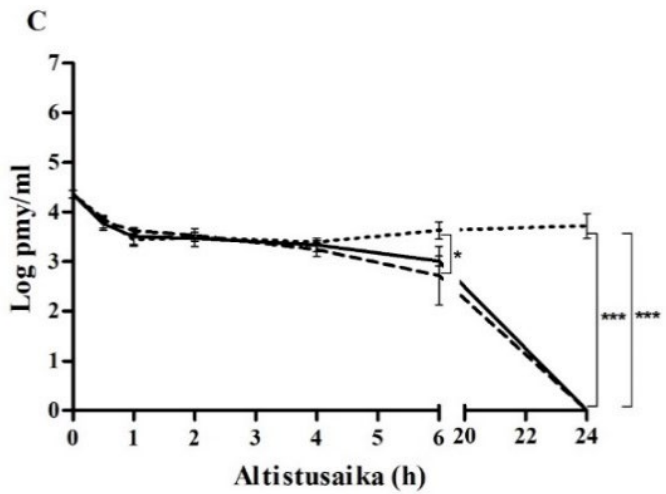
Listeria monocytogenes



Salmonella enterica



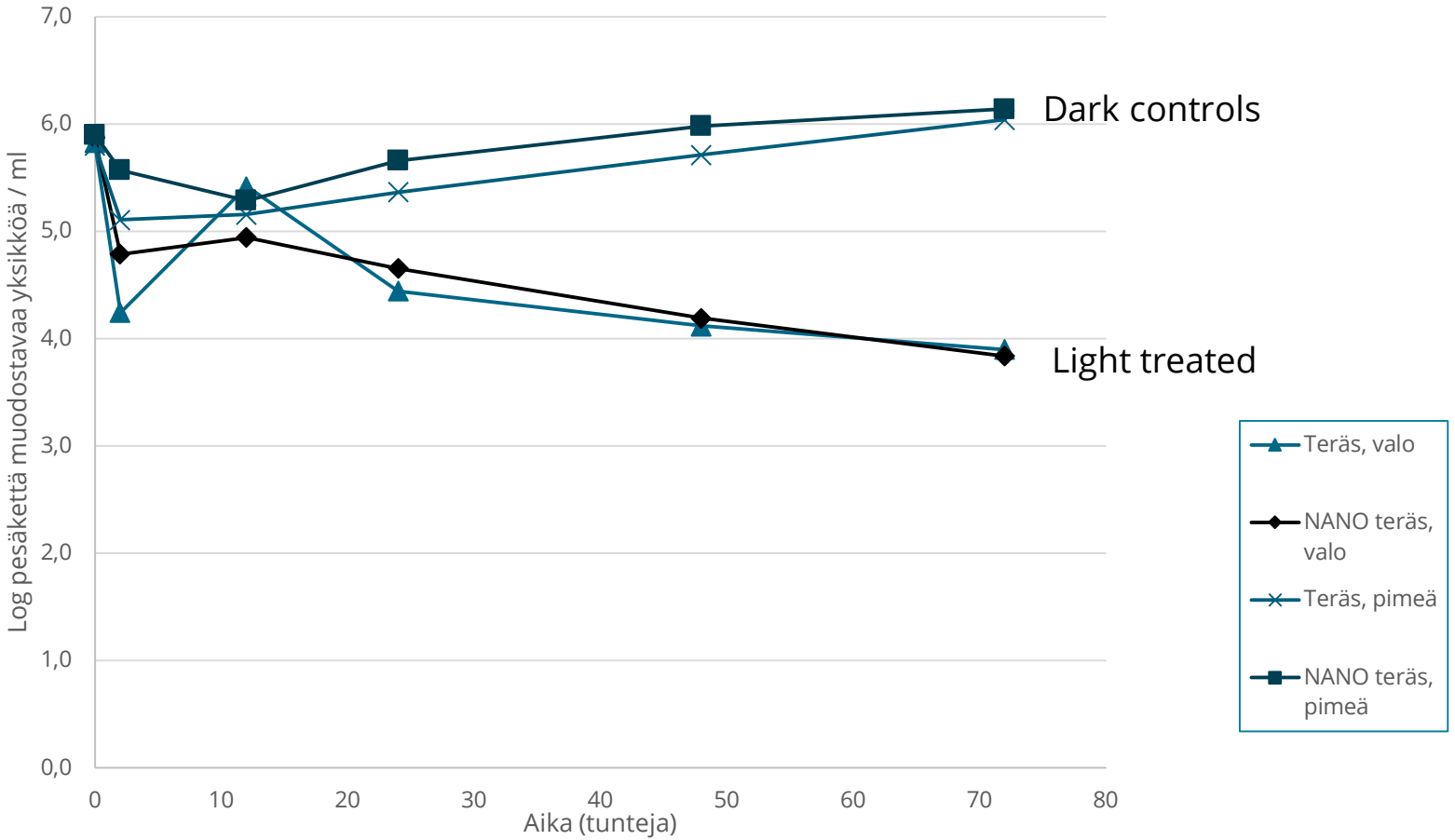
Candida albicans



UV and visible blue light are able to prevent the growth of different food/human pathogens when grown on liquid suspensions
Katriina Ojala, 2020

Biofilm of *Listeria monocytogenes* in steel surfaces

(Puranen et al, unpublished)



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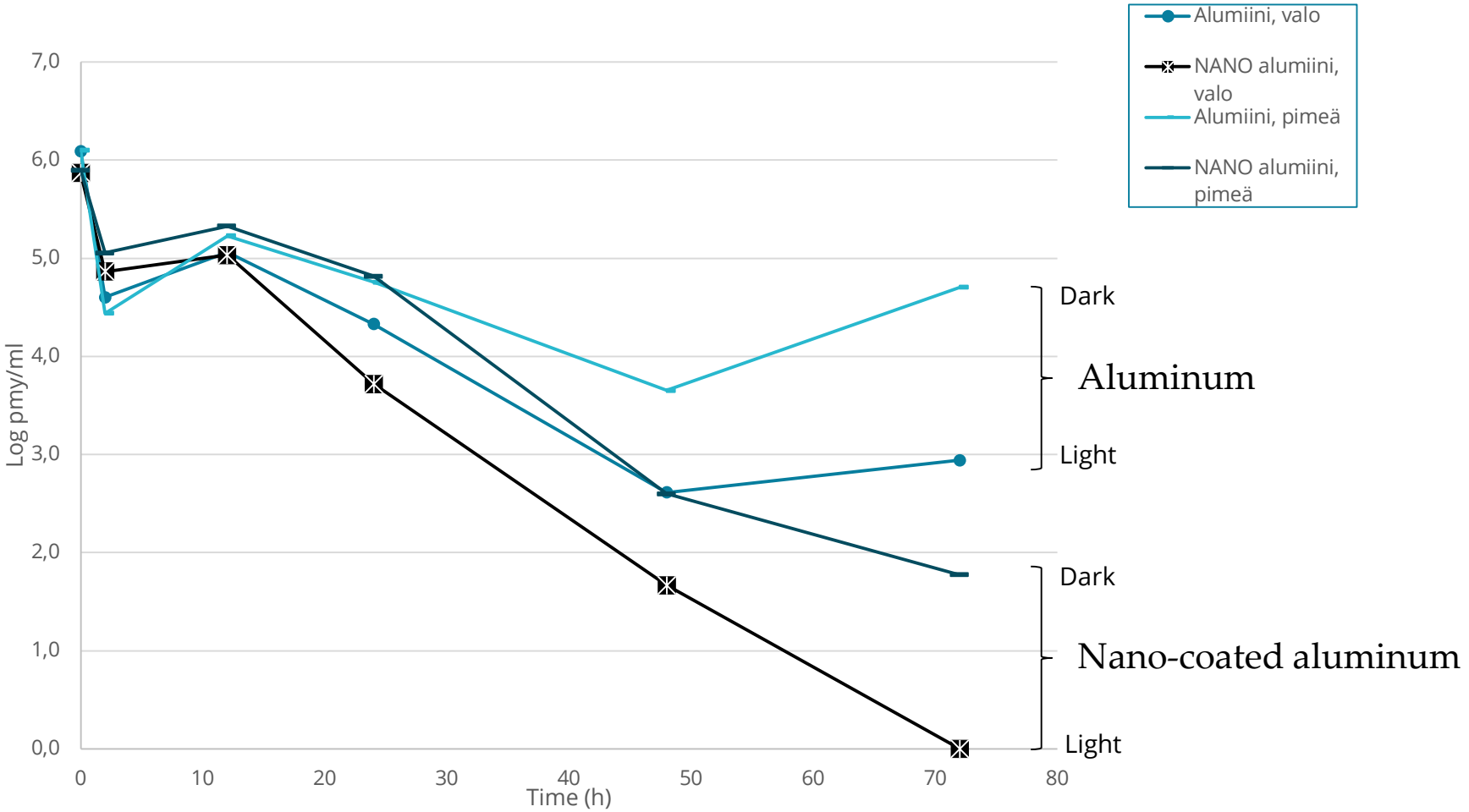
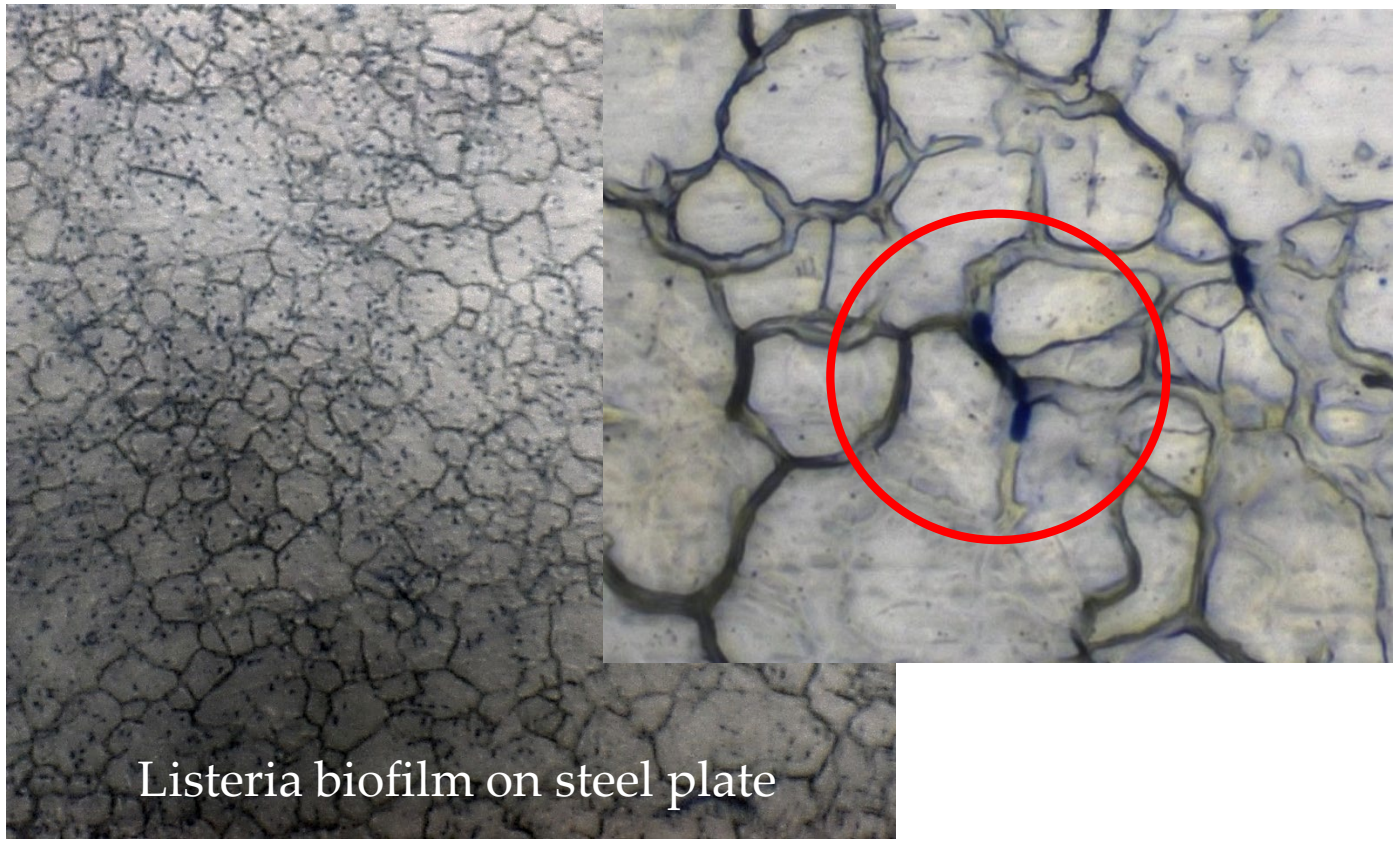
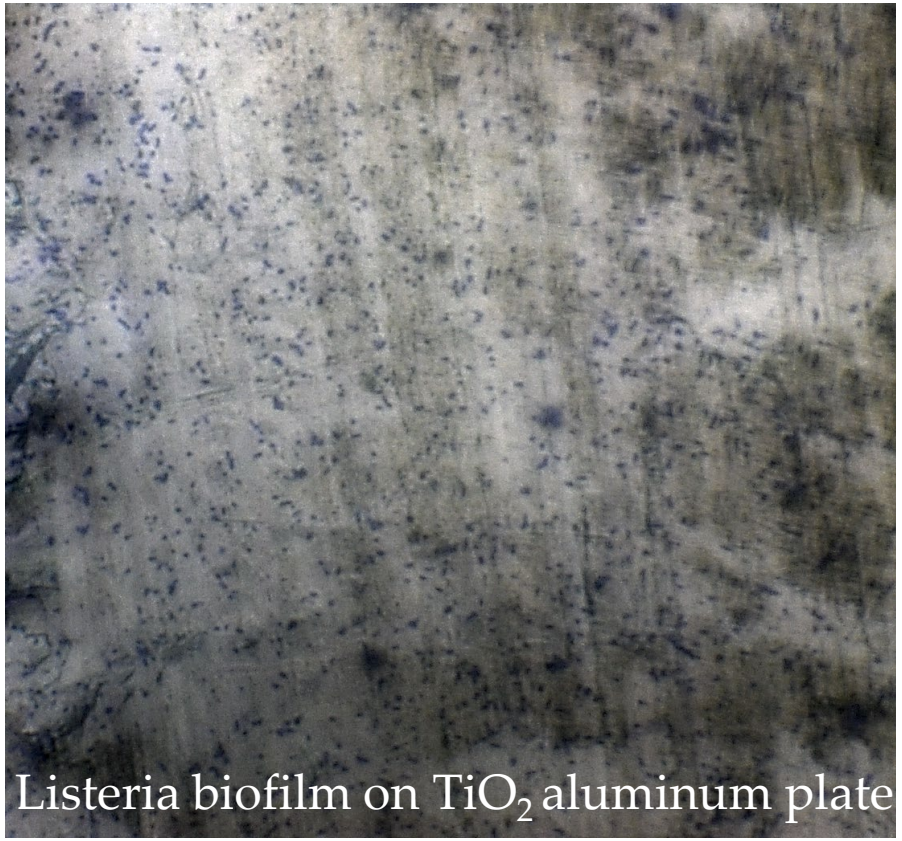


Prevention of Listeria in food processing environments



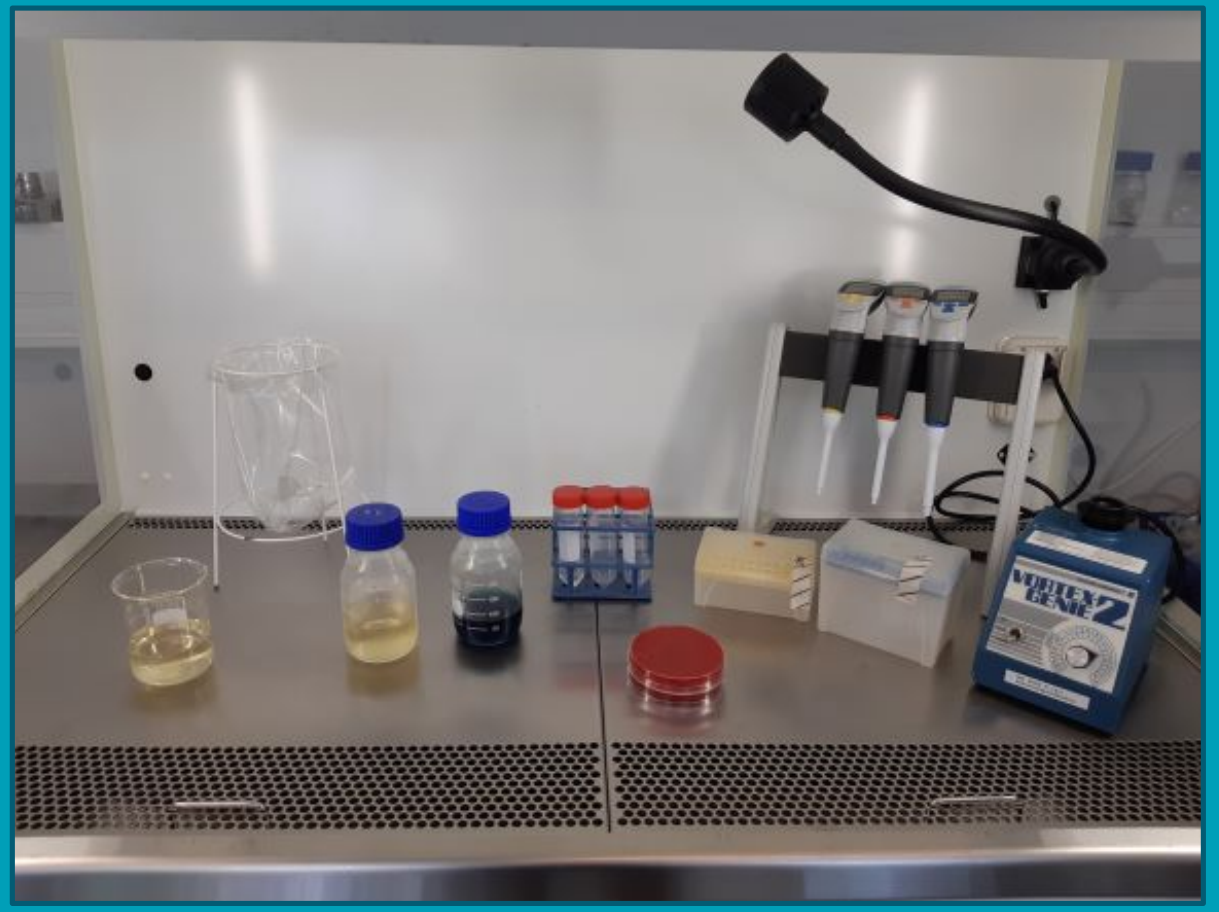
Listeria biofilm on steel plate



Listeria biofilm on TiO_2 aluminum plate

Pictures: Daria Nefedova, Kati Riekkinen and Sanna Puranen

Conclusions



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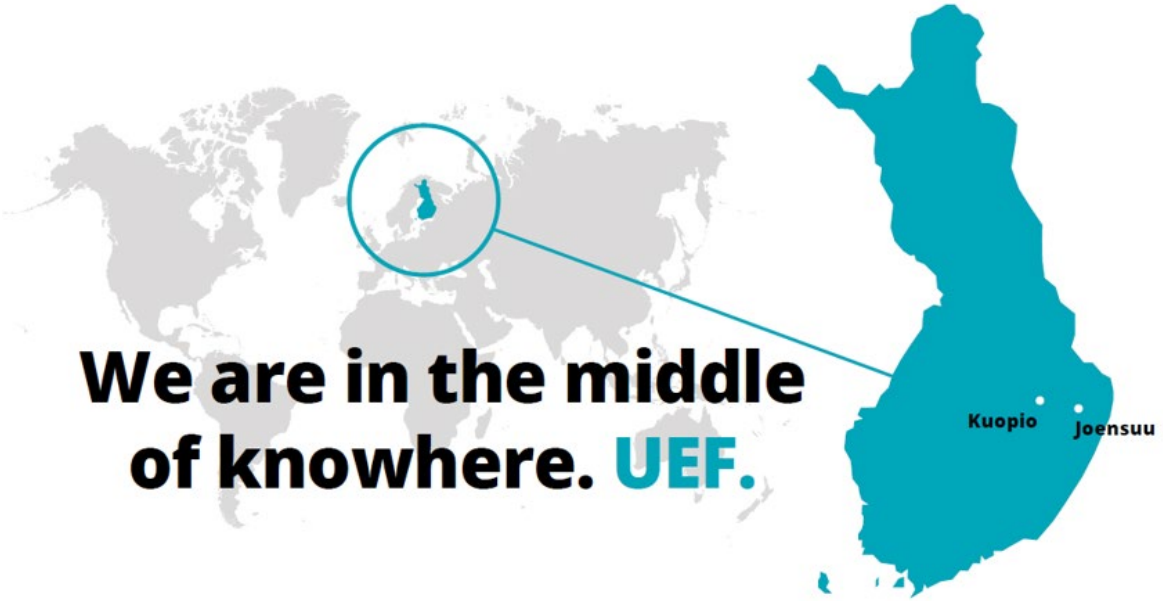

AGRI-FOOD CLUSTER NORTH SAVO - POHJOIS-SAVO
FOOD VALLEY POHJOIS-SAVO
KUOPIO HEALTH

Countryside | Primary production | **Food** | Nutrition | Health

Leverage from the EU 2014–2020

European Union
European Regional Development Fund

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