KCL BIOHUB webinar
Microbiology for forest industry processes and products
KCL microbiology portfolio
Sep 17th, 2024

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KCL culture-independent microbiology for raw materials, processes and end products

accelerating sustainability

- What level of active microbes are growing?
  - ATP measurement within 10 minutes (ATP = AdenosineTriPhosphate)
- What kind of microbes are growing?
  - Are they harmless or potentially dangerous?
  - qPCR analysis within one day
- Need to wait for cultivation result for several days?
  - ATP in 10 minutes or qPCR within one day to reduce storage time
- How long does your product stay safe?
  - Shelf-life studies

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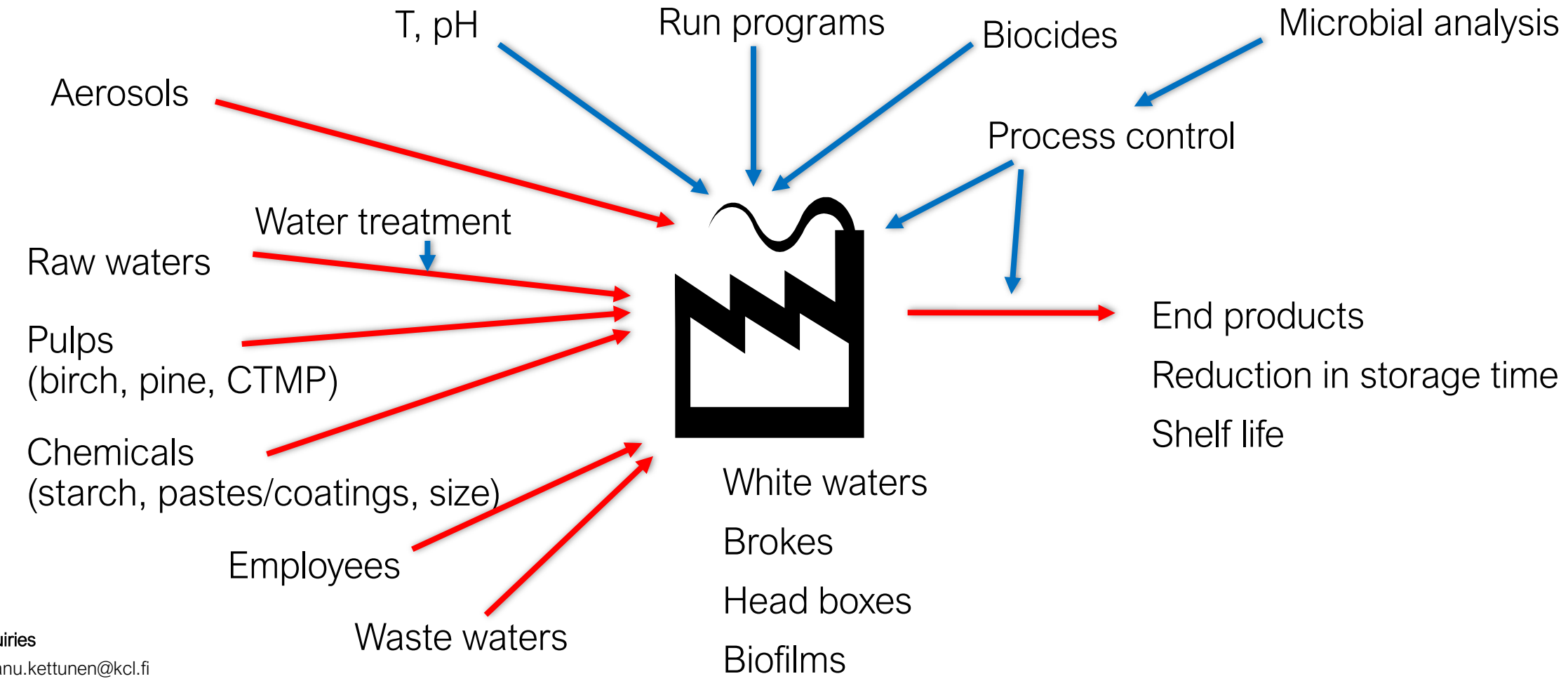
Microbes in the production process: runnability and end product purity



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The coverage of different approaches

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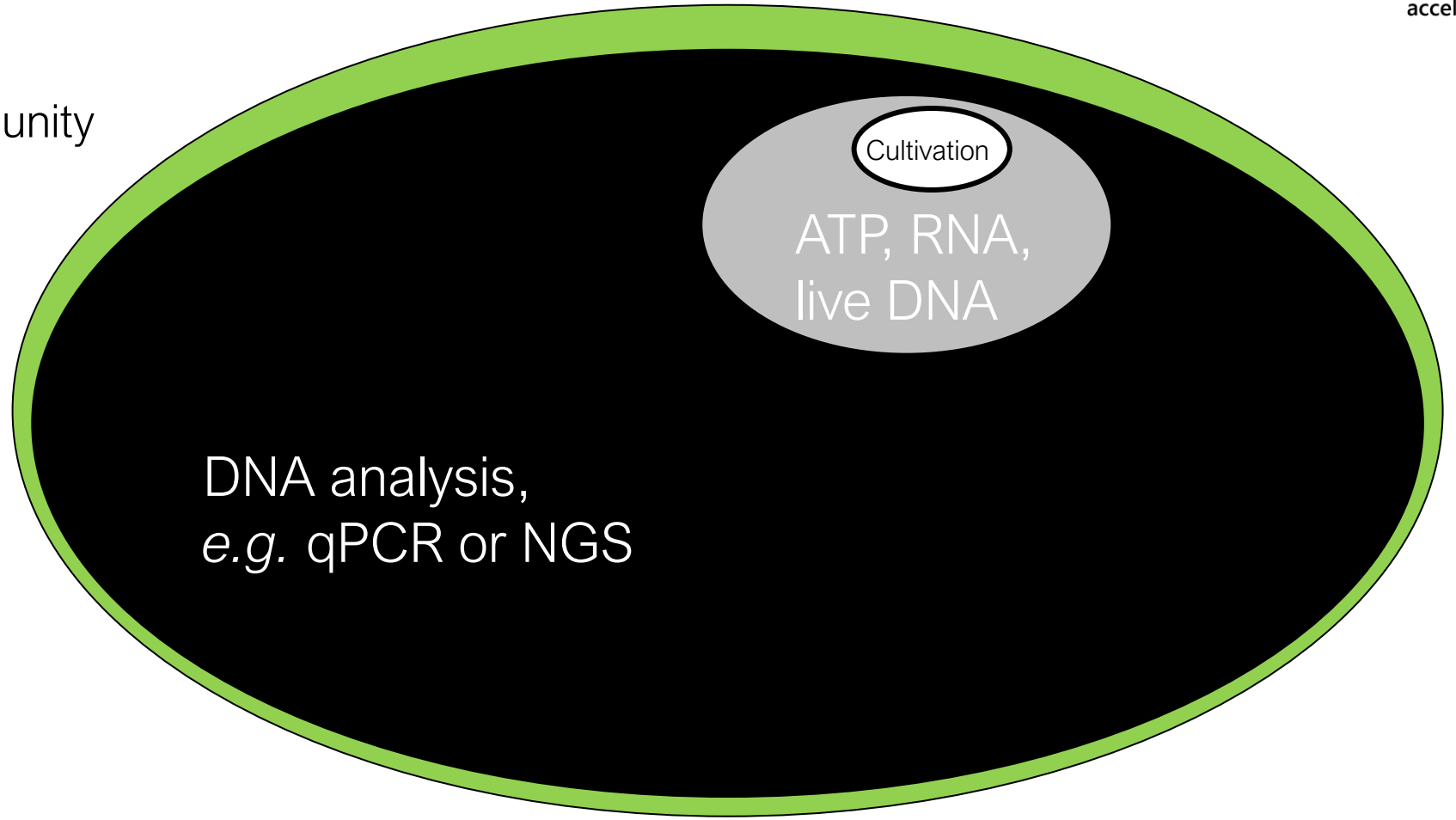
Microbial community



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All cells ≥ living cells ≥ culturable cells

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ATP ⟷ qPCR ⟷ NGS

- AdenosineTriPhosphate = basic energy metabolism compound in cells
- For routine control of overall risk level and *detection of hotspots*
- *E.g.* to evaluate
  - Microbial risk of raw materials
  - Daily variations
  - Hygiene of end products

- Quantitative Polymerase Chain Reaction = DNA tool
- For routine control *when known* what microbe(s) to follow
- *E.g.* to follow
  - Legionella in the process
  - Spore forming bacteria in end products

- Next Generation Sequencing = DNA tool
- For pioneer work *when not known* what microbe(s) to follow
- *E.g.* to identify
  - Most relevant contaminants and contamination routes
  - Effect of aerosols for hygiene in the storage

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For coating samples, Luminultra QuenchGone21S most suitable

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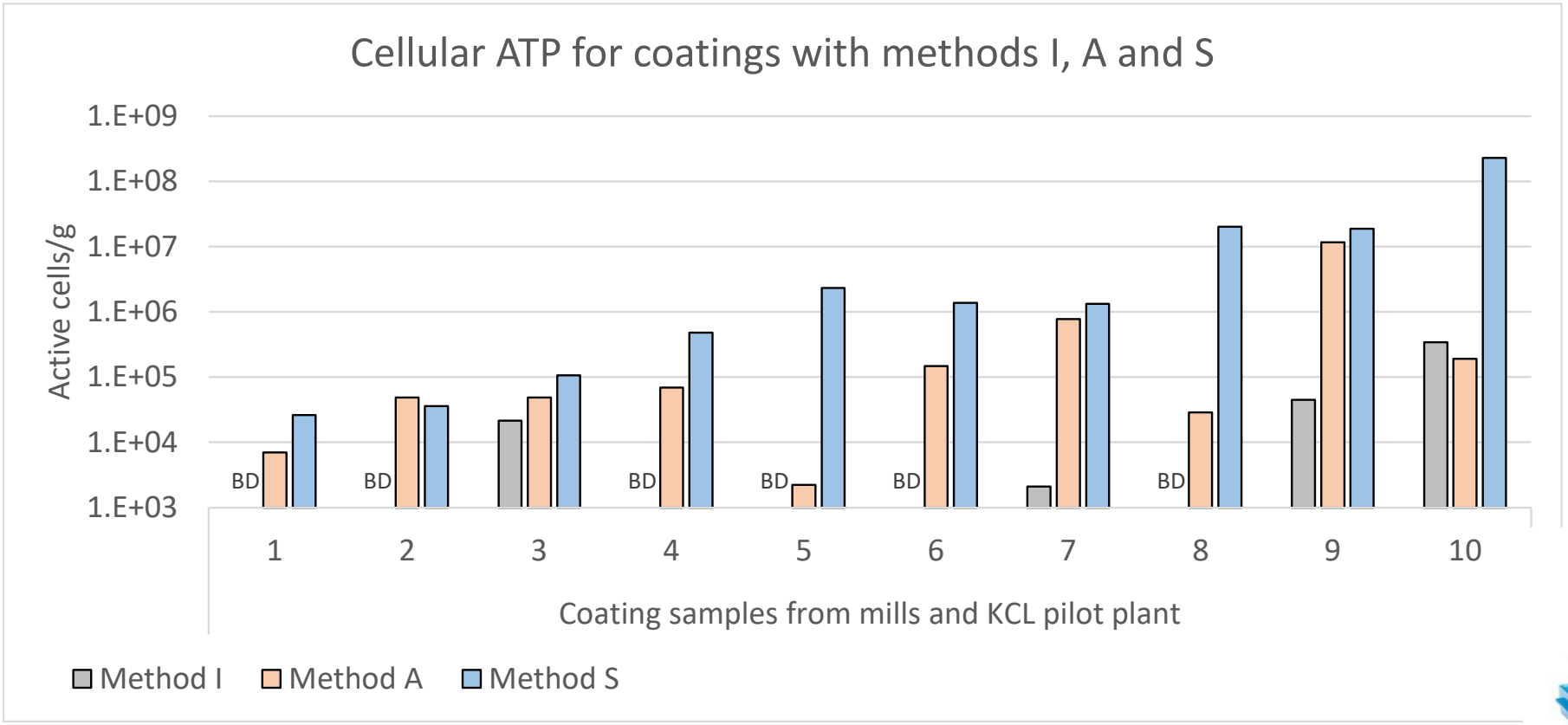

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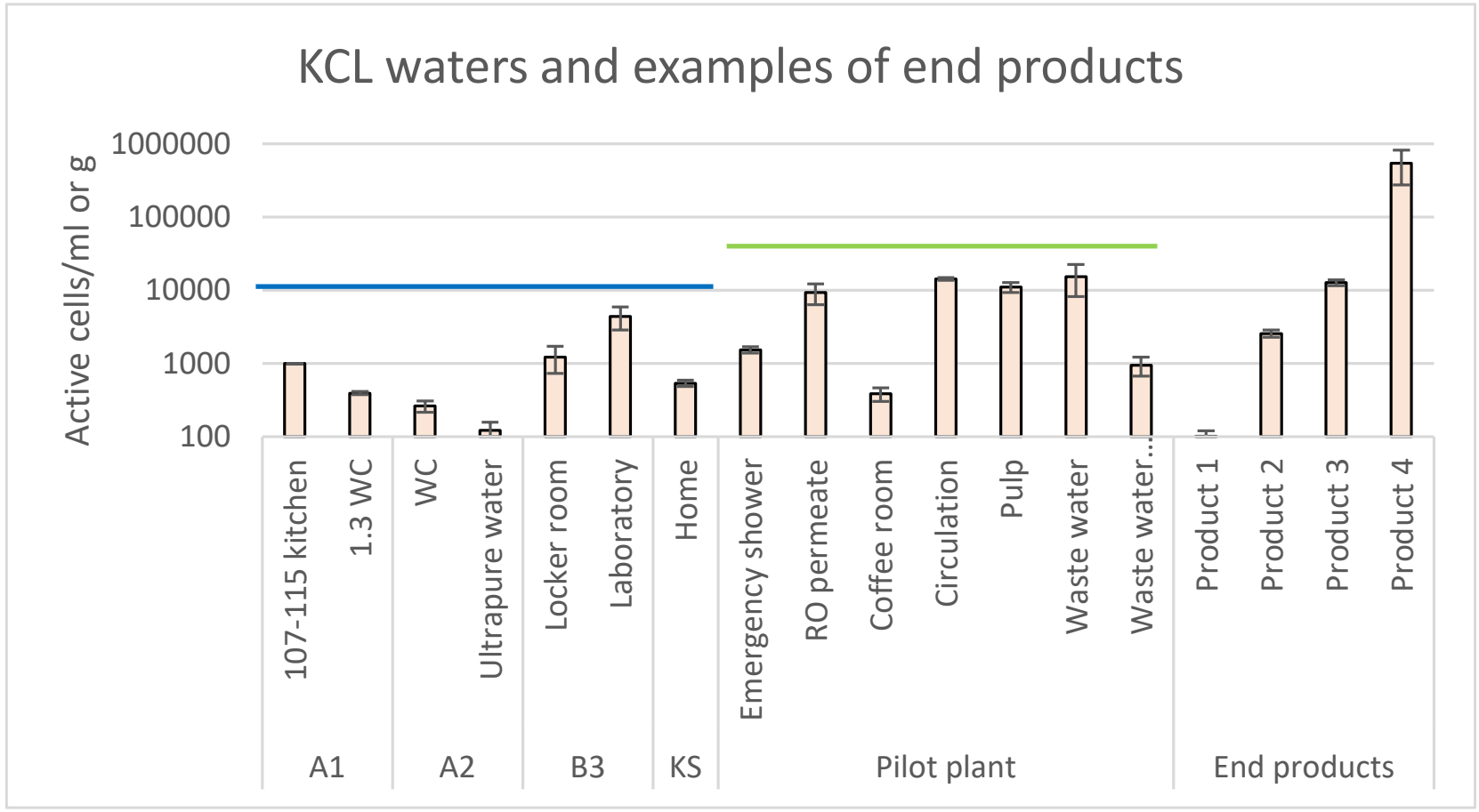
Level of active microbes varies



- The microbiological quality of potable waters in KCL old building is relatively low, still fullfill the requirements for potable waters
- In contrast, KCL pilot plant waters show higher microbiological quality than prevails in average mills
- End product microbiological levels shows huge variation

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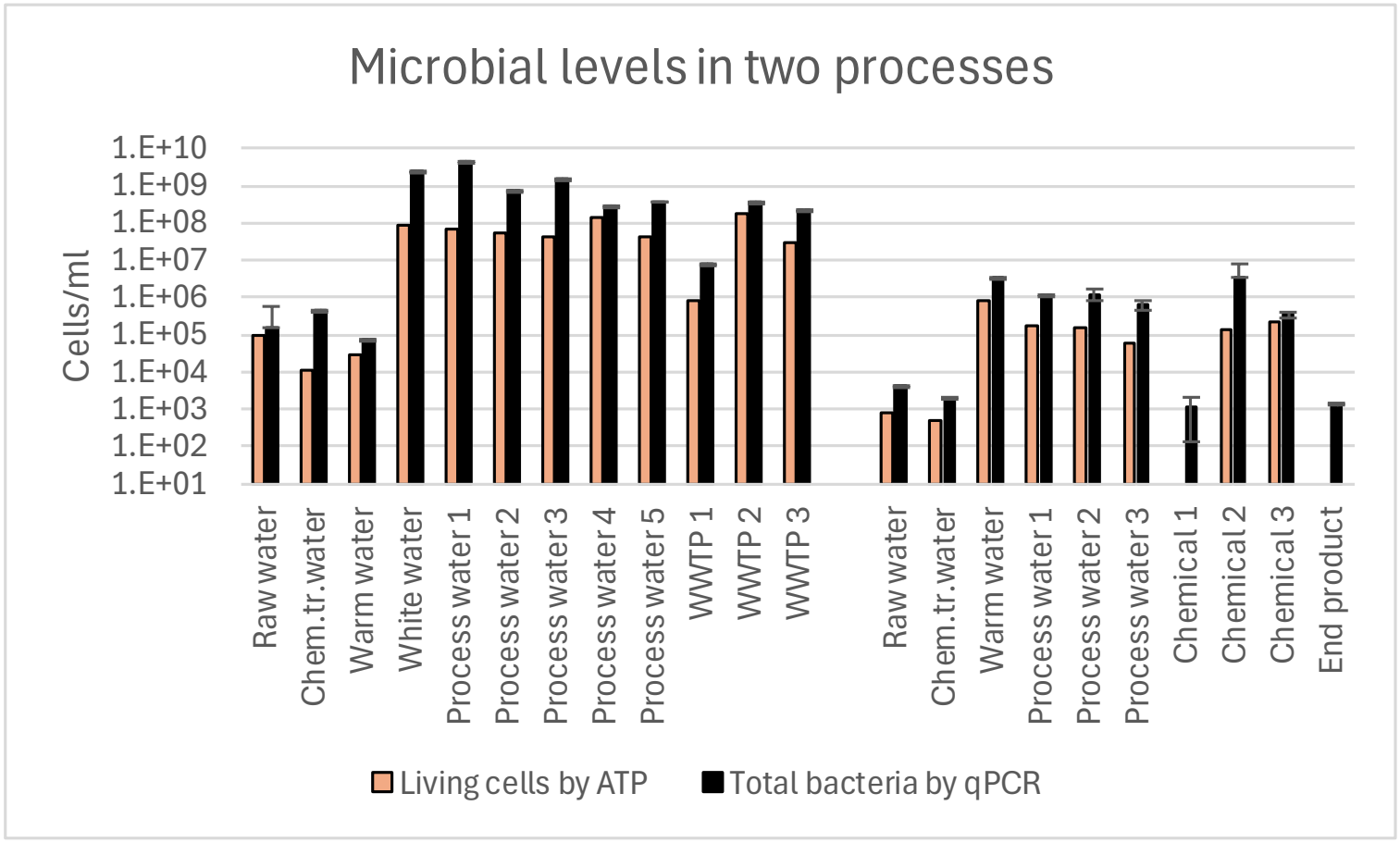
Living cells typically represent ~10-20% of total cells in a stable situation



- Raw water quality is reflected to microbial levels throughout the process and further to end products
- Living cells range from 0 to 100 % of total cells, on average represent ~10-20% of total cells in a stable situation
- Contribution of fungi on one hand and spore forming bacteria/spores on the other hand

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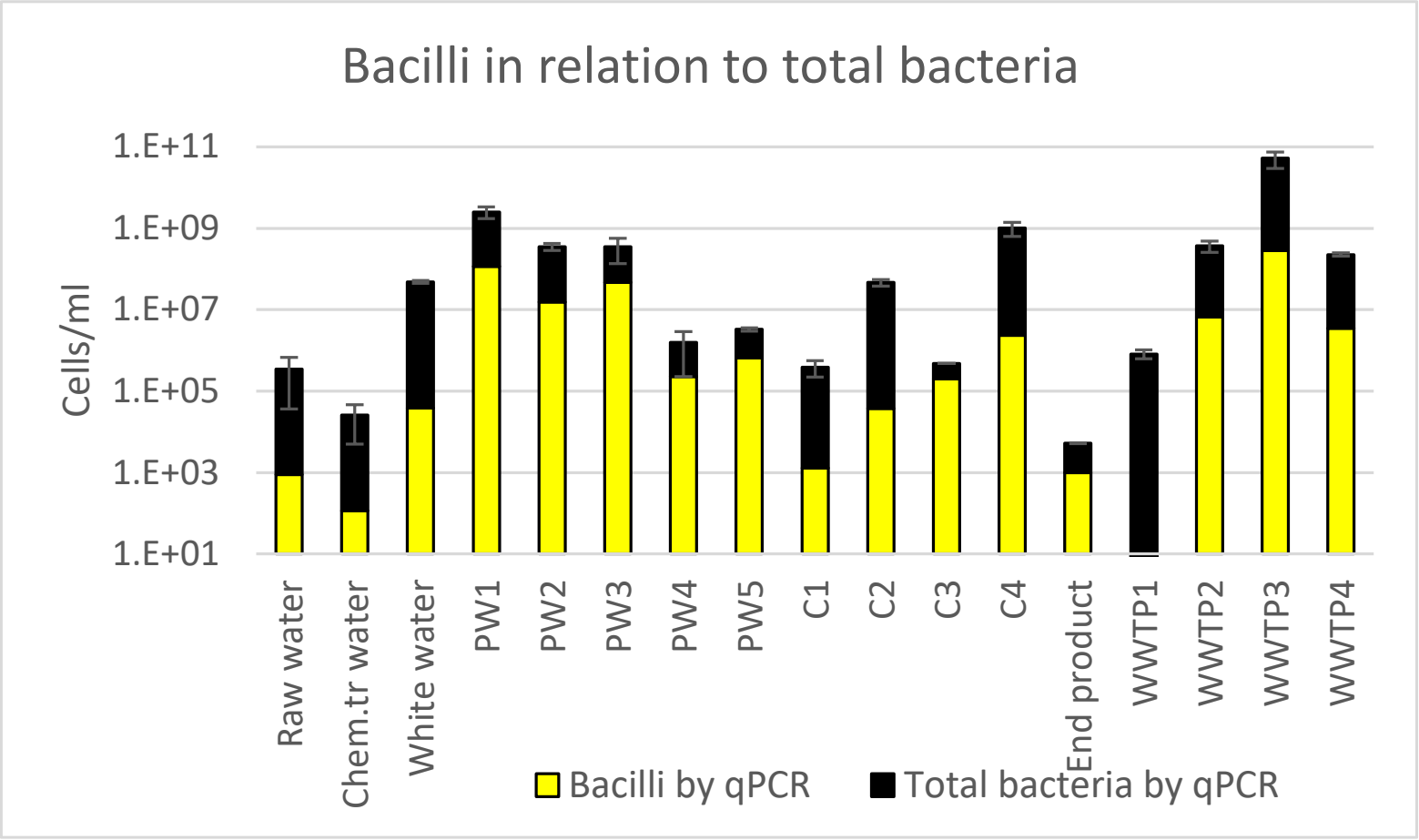
Spore forming bacteria in the process and end products



- Process conditions contribute to sporulation
- Levels and proportions of spore forming bacteria
- Reflection to end products

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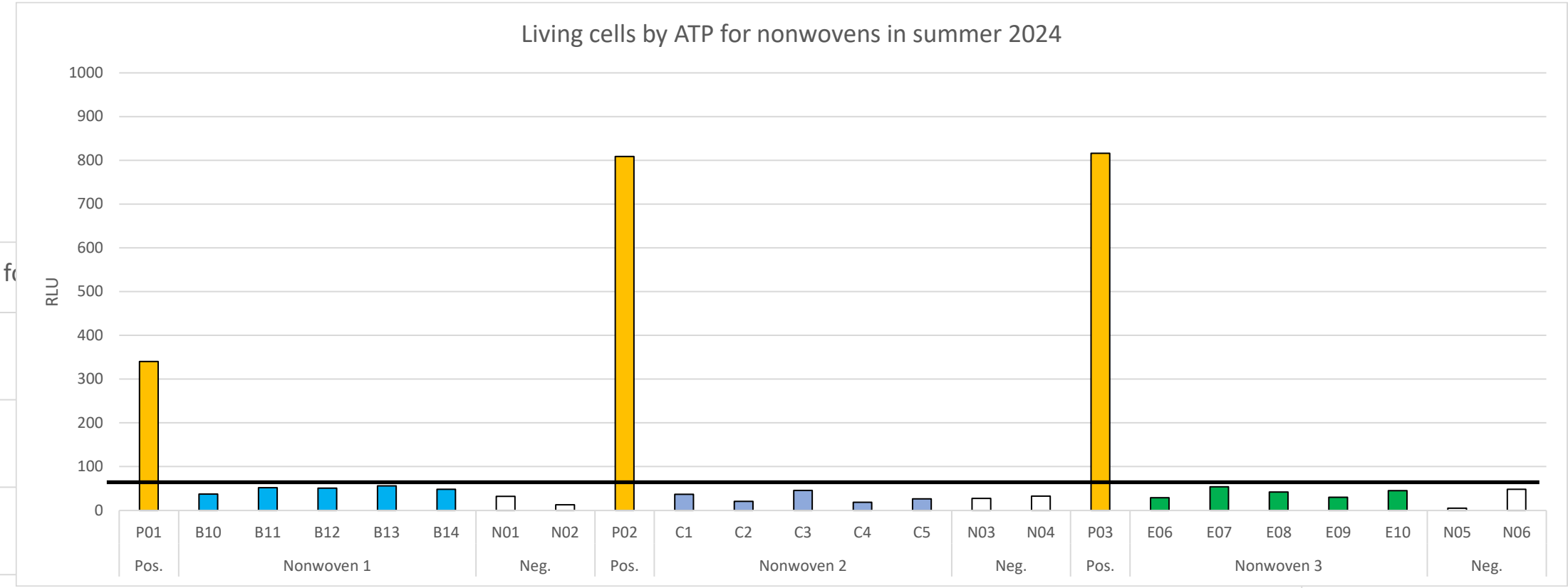
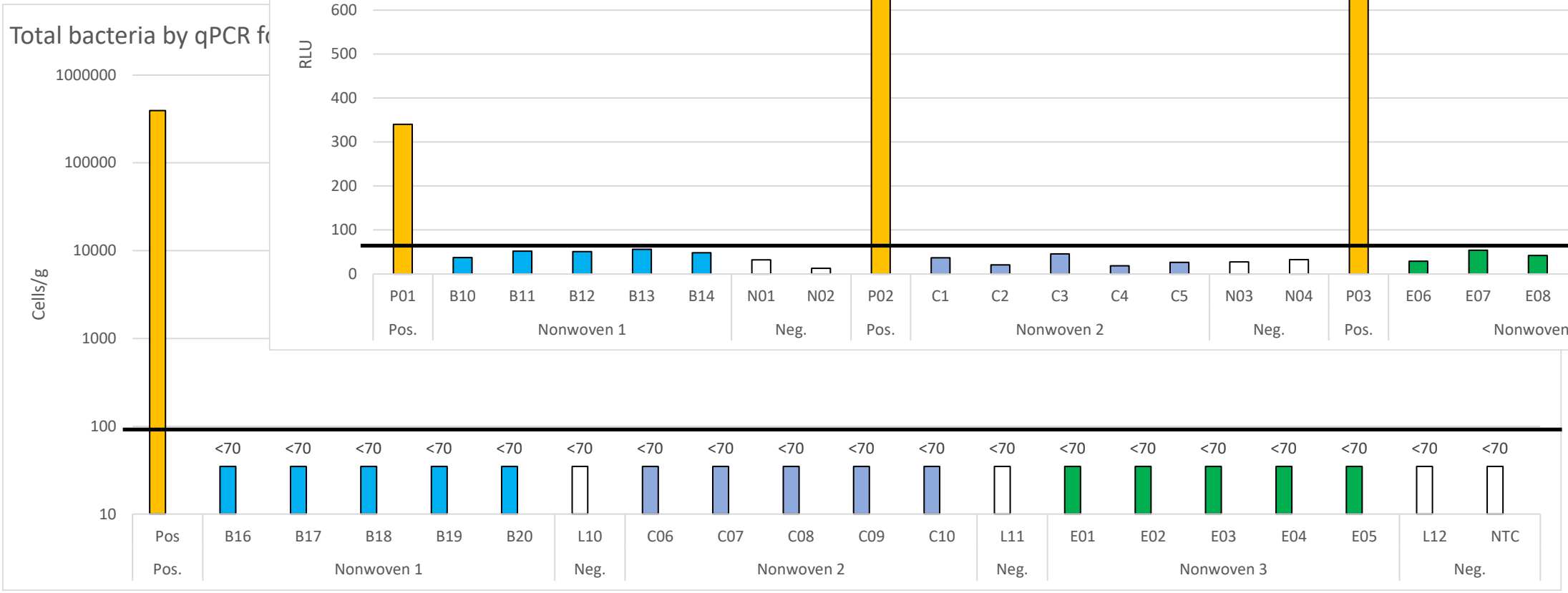
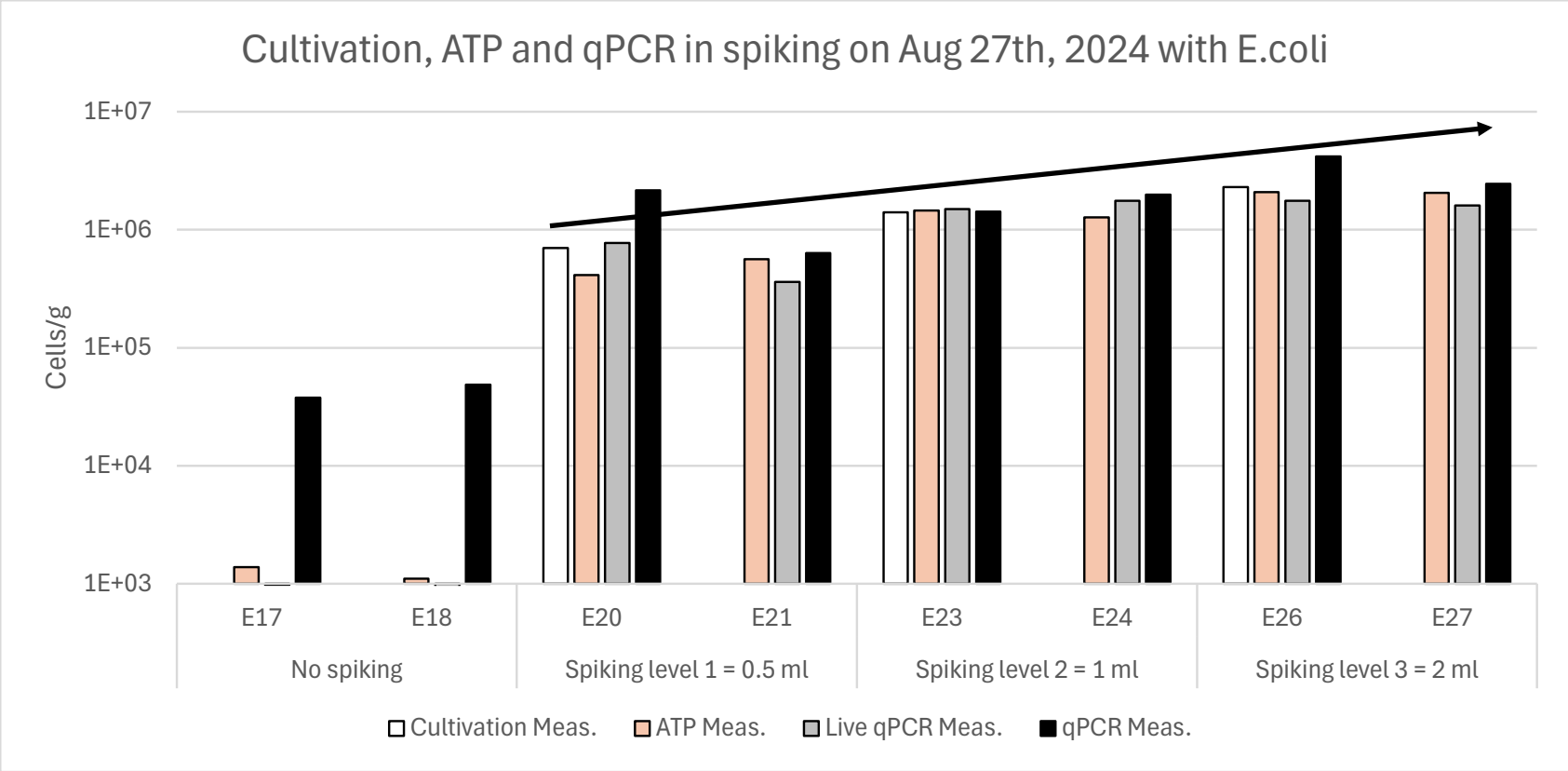
Suominen nonwovens show such a high purity…





… that correspondance between different measurement methods can only be obtained by using amended bacteria in spiking trials:

Cultivation, ATP and Live-qPCR linearly hand in hand



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Take home message

- KCL expertise to measure
  microbial activity and levels of relevant microbes
  in pulp, paper and board processes and end products
  serves clients effectively
  especially when closing water cycles and
  increasing the use of recycled materials

- Future aim is to reach accredited microbial analysis
  for most important microbes/assays

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