



TEKNOLOGISK
INSTITUT



Fremtidens Proceskontrol

Birgit Groth Storgaard
Fødevarerikkerhed, DMRI

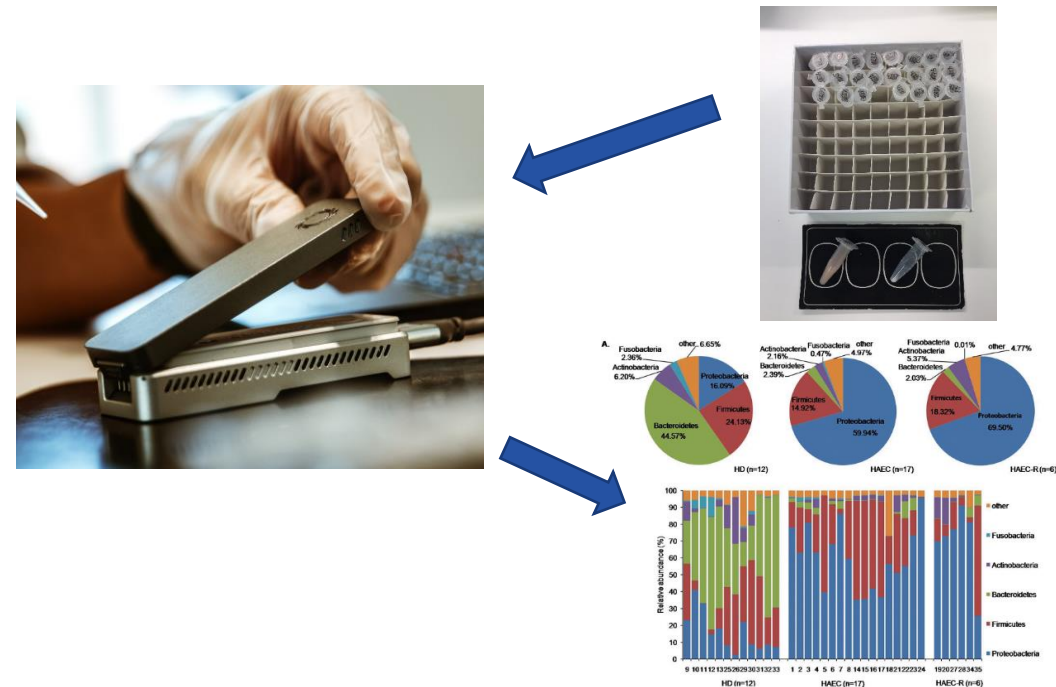


Klassisk fødevareanalyse



- Dyrkningsbaseret
- Selektive/ikke-selektive substrater
- Gas, pH, temperatur
- Dage -> uger

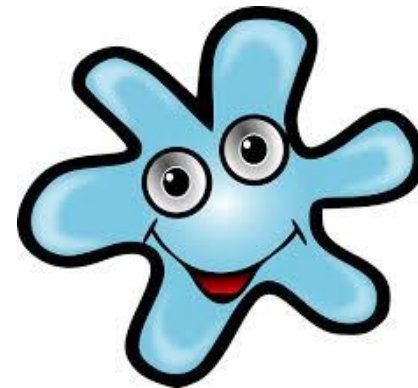
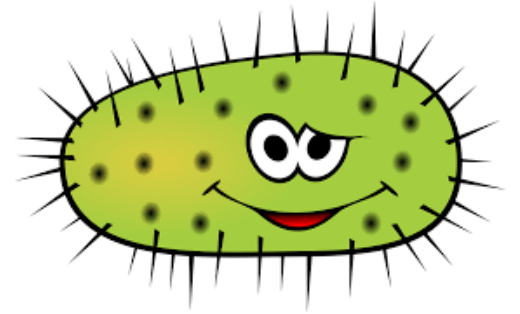
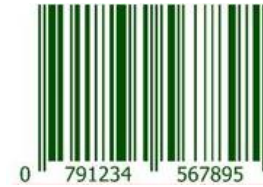
Fødevareanalyse med DNA sekventering



- Ikke dyrkningsbaseret
- Identificerer alle bakterier (inkl. Ikke-dyrkbare)
- Bakterie sammensætning
- Timer -> dage

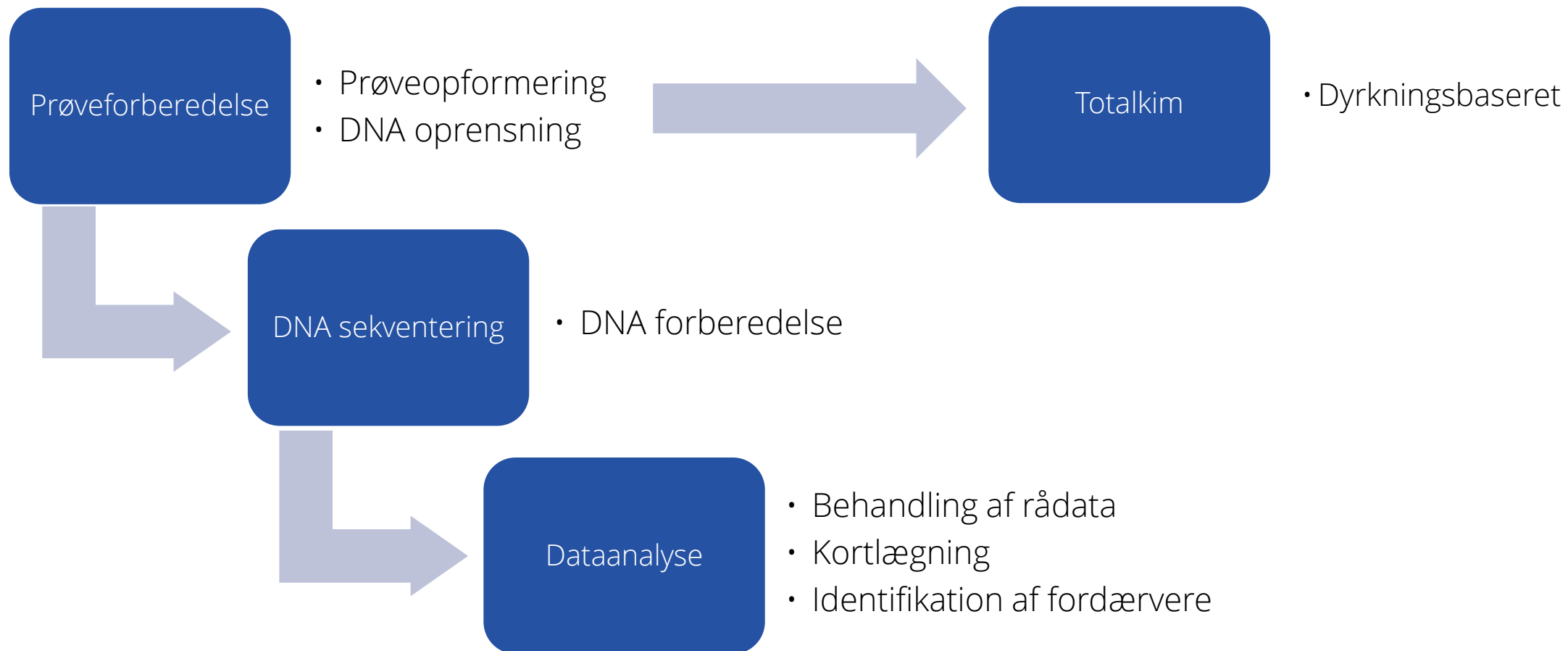


16S rRNA gen sekventering – bakteriens stregkode





Hvordan?

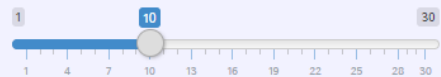




Heatmap (Classic)

Data is presented in %-relative abundance

Number of top genera



Choose taxonomy level (Default: Genus)

Genus

Choose taxonomy level (Default: Family)

Family

Add groups and nametags

Enable CFU barplot

Select cfu variable

cfu

Numeric?

Search for single genus

Enable additional options

HELP!

Heatmap?

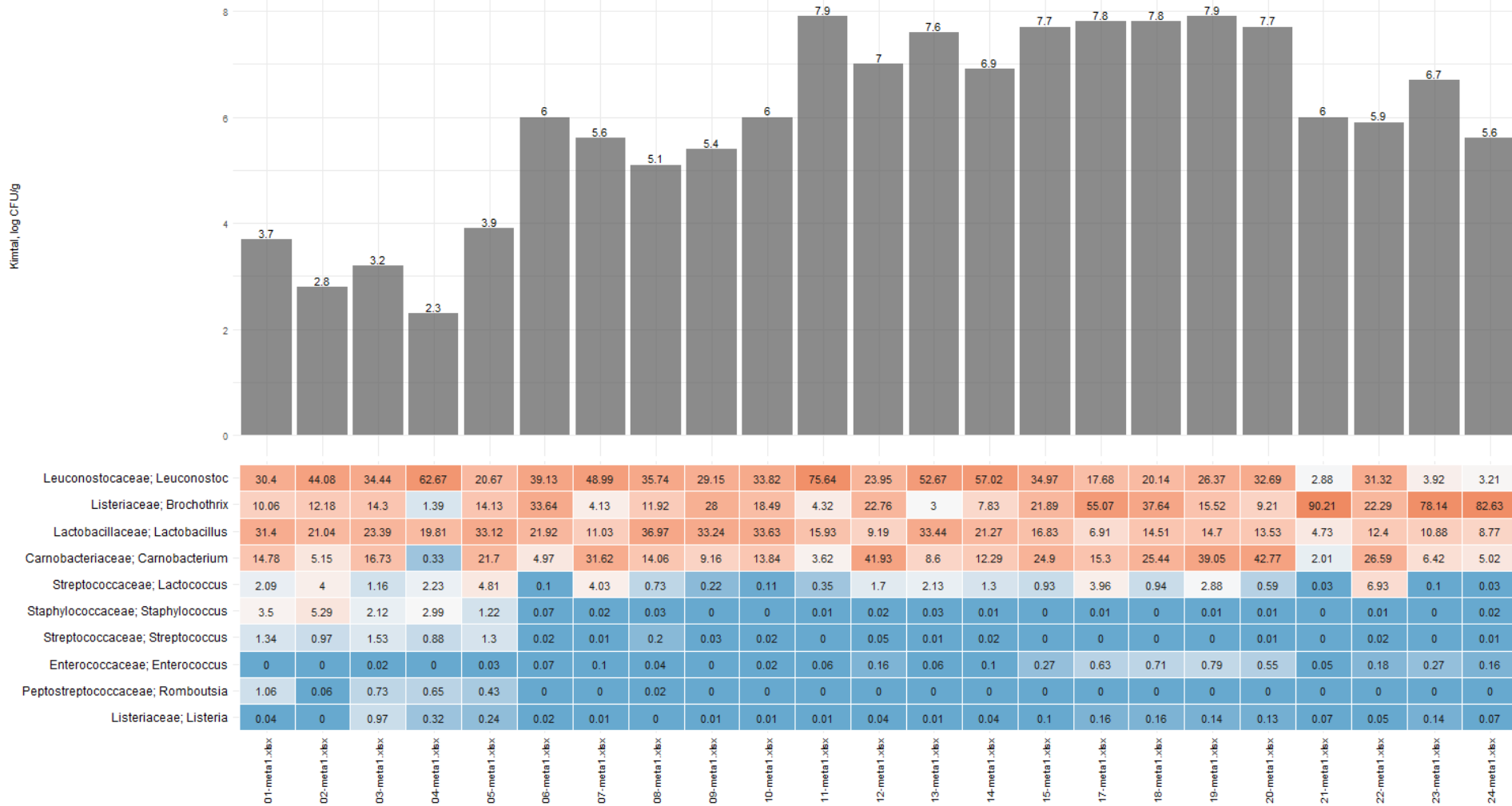
Example

Export

Download plot as shown

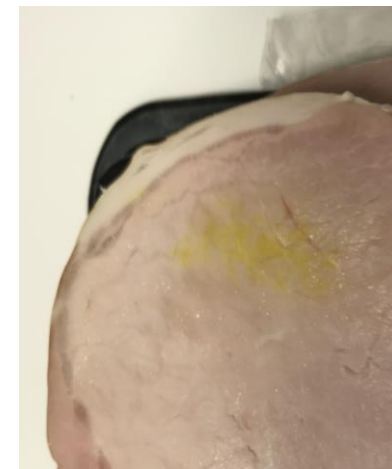
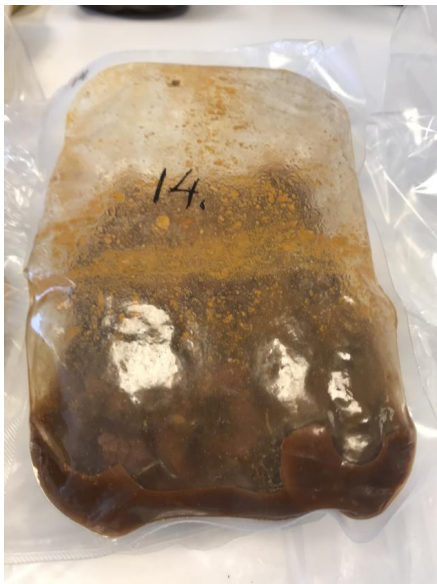
Download .png

Export options





Identifikation af fordærvelses-organismer

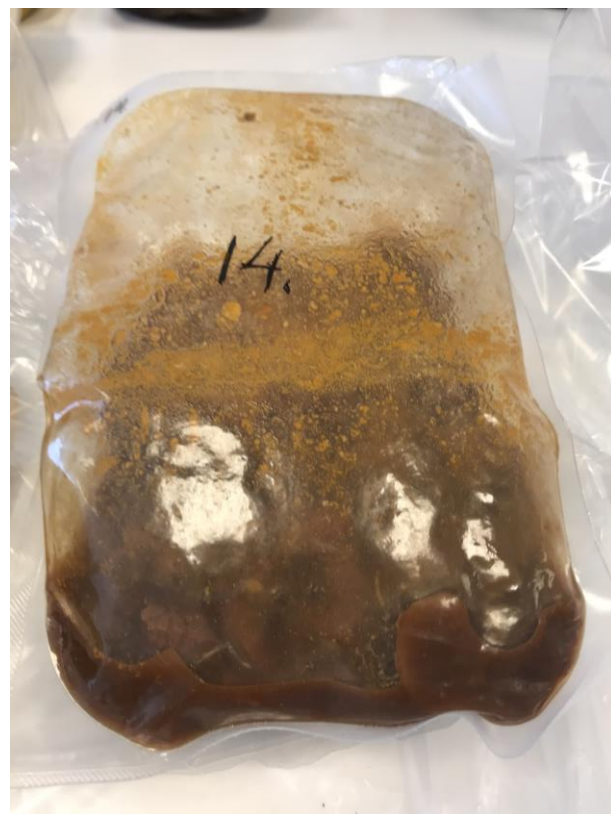




Vakuumpakket kødsauce



Normal

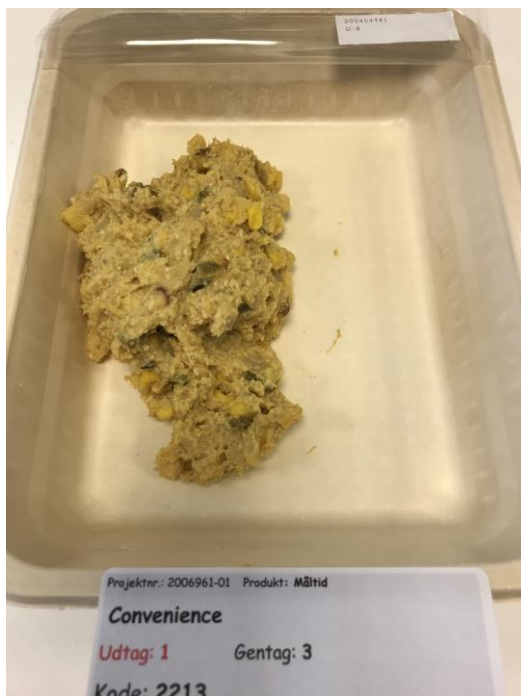


Pustet

Clostridium	89.9	96.3	0
Bacillus	0	0.6	0
Leuconostoc	4	0.7	40.3
Lactobacillus	2.1	0	24.8
Pseudomonas	0.1	0.2	0.3
Carnobacterium	1.3	0	19.1
Weissella	0.1	0	11.7
Lactococcus	2.2	1.8	0
Arthrobacter	0	0	0
Burkholderia	0	0	0
	Pustet, Boeuf Bourguignon	Pustet, Indian curry	Pustet, Spareribs



Holdbarhed c



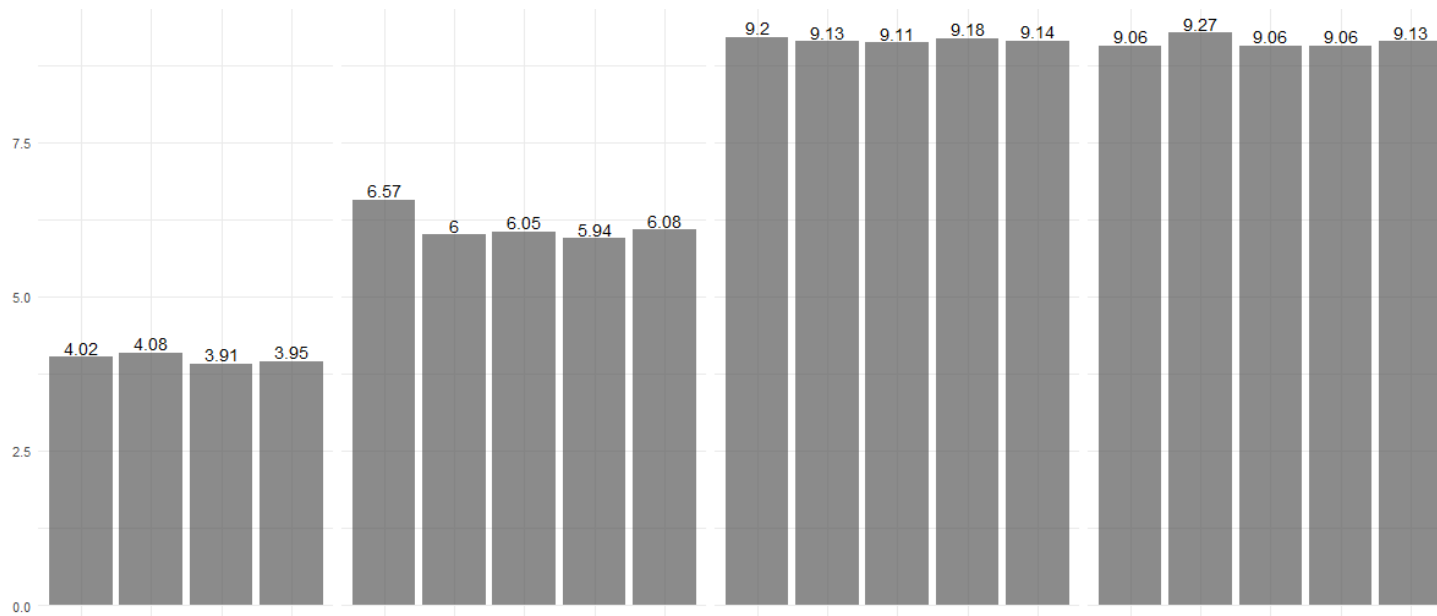
Dag 0

Dag 5

Dag 10

Dag 12

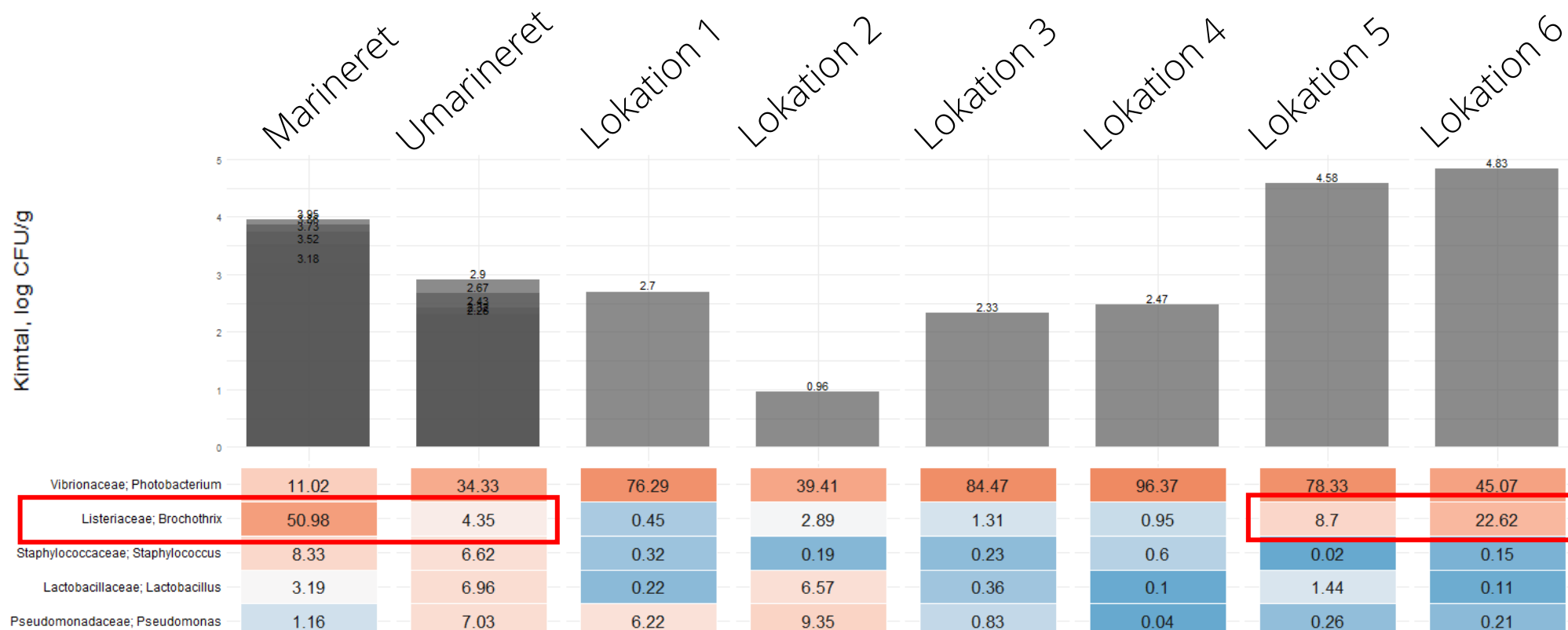
Kimtal, log CFU/g



Leuconostocaceae; Leuconostoc	10.91	2.17	2.63	0	76.21	69.12	72.11	69.39	70.68	99.85	99.96	99.91	99.79	99.62	99.88	99.84	99.82	99.93	99.9
Moraxellaceae; Acinetobacter	30.91	21.74	39.47	53.76	5.39	5.98	4.75	3.27	6.19	0	0	0	0.02	0	0	0	0	0	0
Burkholderiaceae; Burkholderia	16.36	41.3	15.79	6.45	2.6	5.38	5.64	5.71	6.51	0	0	0	0.02	0.08	0	0	0	0	0
Sneathiaceae; Sneathiella	3.64	2.17	13.16	4.3	3.9	2.79	3.56	5.31	2.28	0	0	0	0	0	0	0	0	0	0
Hyphomicrobiaceae; Filomicrobium	5.45	2.17	0	4.3	0.37	1.39	1.78	2.45	0	0	0	0	0	0	0	0	0	0	0
Rhodobiaceae; Methyloceanibacter	1.82	2.17	2.63	2.15	1.49	1.2	1.78	1.22	0.98	0	0	0	0	0	0	0	0	0	0
Corynebacteriaceae; Corynebacterium	1.82	0	5.26	4.3	0.74	1	0.89	0.41	0.65	0	0	0	0	0	0	0	0	0	0
Bacillales_Incertae_Sedis_XII; Exiguobacterium	3.64	0	2.63	0	0.37	1.2	0.59	0.82	0.98	0	0	0	0	0	0	0	0	0	0
Desulfobacteraceae; Desulfobacter	0	8.7	0	1.08	0.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeromonadaceae; Aeromonas	0	2.17	0	1.08	1.12	0	1.19	1.63	0.65	0.03	0	0	0.03	0.08	0	0	0.09	0	0

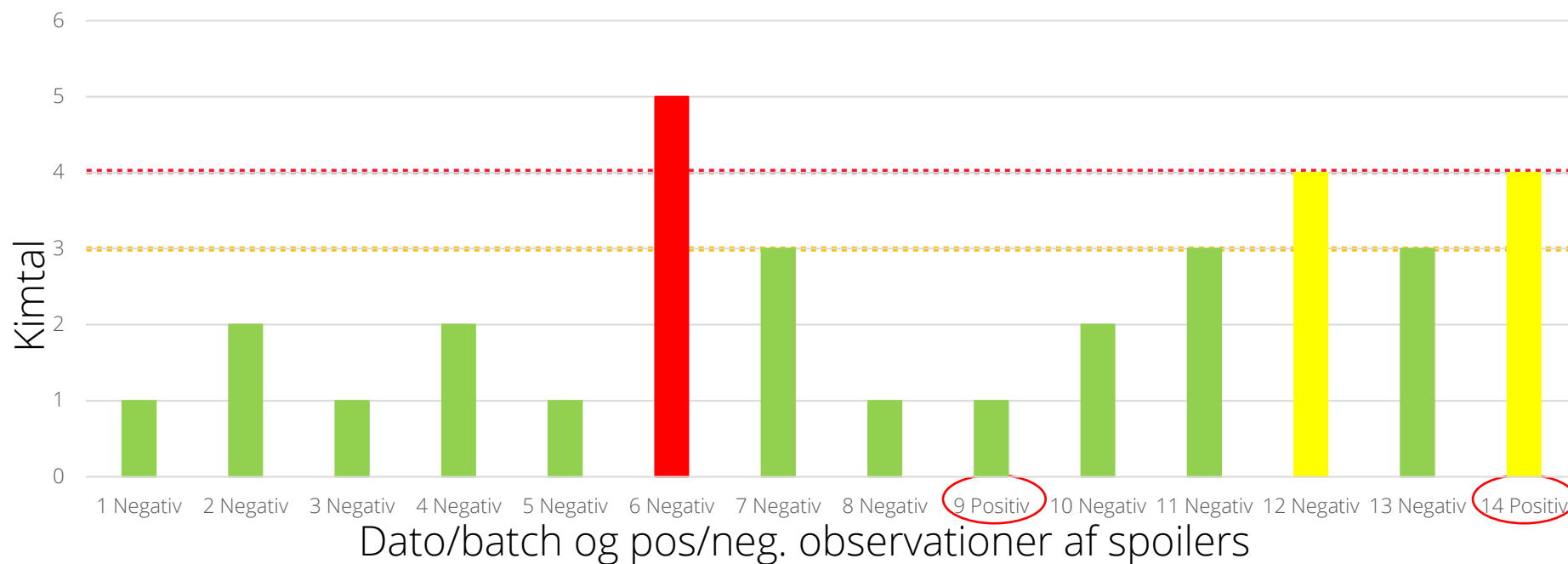


Identifikation af bakterietransmission i produktionsmiljø





Sliding window overvågning





Case: At-line DNA sekventering hos virksomheder

- Kan DNA sekventering udføres at-line på virksomhed?
- Håndholdt sekventering til identifikation på en arbejdsdag?
- Hvad får virksomheden ud af det?





Case: At-line DNA sekventering

Prøvetype	Kimtal (log cfu/g)
Miljøprøve	5,5
Produktprøve	6,8

Er at-line sekventering indenfor en arbejdsdag muligt?

→ identifikation af mikroorganismer efter 10-12 timer

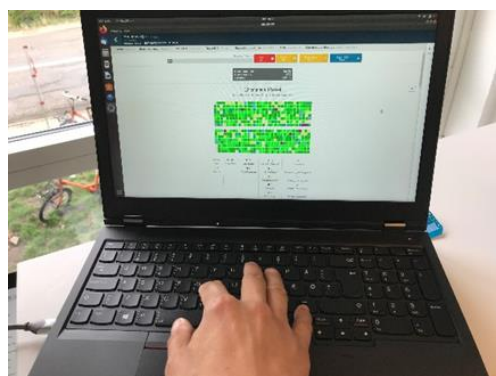
→ Hygiejne-status og - overvågning
Produktionsstop og straks-rengøring

→ Proceskontrol
Status på naturligt fermenteret produkt

Top 1	Escherichia/Shigella Enterobacteriaceae 17.69%	Lactobacillus Lactobacillaceae 62.52%
Top 2	Leuconostoc Leuconostocaceae 7.95%	Leuconostoc Leuconostocaceae 11.91%
Top 3	Aerococcus Aerococcaceae 6.63%	Leuconostoc Leuconostocaceae 5.4%
Top 4	Streptococcus Streptococcaceae 6.26%	Leuconostoc Leuconostocaceae 1.81%
Top 5	Pantoea Enterobacteriaceae 6.22%	Ewingella Enterobacteriaceae 1.67%
Top 6	Weissella Leuconostocaceae 5.93%	Citrobacter Enterobacteriaceae 1.36%
Top 7	Exiguobacterium Bacillales_Incertae_Sedis_XII 4.7%	Serratia Enterobacteriaceae 1.21%
Top 8	Massilia Oxalobacteraceae 4.35%	Lelliottia Enterobacteriaceae 1.17%
Top 9	Paenibacillus Paenibacillaceae_1 3.29%	Citrobacter Enterobacteriaceae 0.96%
Top 10	Pantoea Enterobacteriaceae 3.11%	Lactobacillus Lactobacillaceae 0.83%

Miljøprøve

Produktprøve





Håndholdt? – Der er et stykke vej endnu...





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Tak for opmærksomheden

Fremtidens Proceskontrol

Birgit Groth Storgaard
Fødevarerikkerhed, DMRI

bgs@teknologisk.dk

Støttet af Uddannelses- og Forskningsstyrelsen (UFS) samt
Grønt Udviklings og Demonstrationsprogram (GUDP)