The future of food production
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Food waste can be reduced by knowing the spoilage microflora of a product

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INTRODUCTION

A limiting factor for shelf life of fresh and processed food is growth of microorganisms and production of unwanted by-products that may affect both taste, smell and product appearance, and result in waste of food. In general, spoilage of food is caused by many different bacteria, molds and yeasts, but most often spoilage of different products is caused by only a few specific microorganisms.

Detailed knowledge of which bacteria, molds or yeasts that are normally **associated with spoilage** of a specific product is important as it enables

1. better **identification of potential contamination sources** in the production environment,

2. better **application of specific predictive models** to identify the best combination of hurdles to avoid microbial growth and to set the correct shelf life of the product, which in turn can reduce food waste.

AIM

The aim of this study was to map the bacterial spoilage microflora of different processed meat and veggie products that were spoiled in terms of odour or appearance. The bacterial spoilage microflora was mapped via the DNAPROKON workflow that uses DNA-sequencing to identify the dominating bacteria in a sample within a working day.

Figure 1: Identification of spoilage bacteria performed "at line" within a working day using the DNAPROKON workflow.

RESULTS

The following bacteria were identified in spoiled meat and veggie products, respectively:
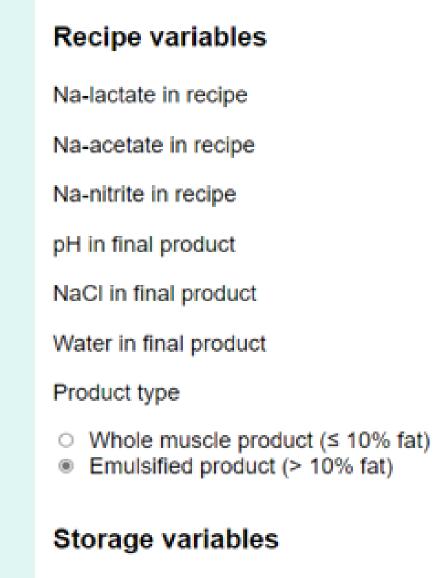
Meat products

Leuconostoc:
 carnosum,
 mesenteroides,
 gelidum
Lactobacillus:
 brevis,
 paraalimentarius,
 curvatus,
 sakei,
Carnobacterium
Pseudomonas libanensis
Brochotrix thermospachta
Clostridium:
 estherteticum
 bowmanii

Veggie products

Leuconostoc:
 mesenteroides,
 gelidum
Lactococcus
Lactobacillus:
 sakei,
 parabuchnerii
Carnobacterium
Pseudomonas fragi
Bacillus
Pantoaea agglomerans

Figure 2: Dominating bacteria in meat and veggie products identified by the DNAPROKON workflow.

Recipe variables

Na-lactate in recipe	3.0	%
Na-acetate in recipe	0.50	%
Na-nitrite in recipe	60	ppm
pH in final product	6.3	
NaCl in final product	2.0	%
Water in final product	66	%

Product type
○ Whole muscle product (≤ 10% fat)
● Emulsified product (> 10% fat)

Storage variables

Added CO_2	30	%
Temperature	5	°C
Leuconotoc count at time zero (cfu/g)	100	

Growth curve

Max growth rate for Leuconostoc 0.0087 hour⁻¹

Calculated values for current growth curve

Leuconostoc count		days	log cfu/g
Days until y log cfu/g		log cfu/g	days

Calculate

Risk for blown packages
Low risk for blown packages
No risk for blown packages

Figure 3: *Leuconostoc* sp. was identified as a common spoilage bacterium in various processed meat and veggie products. This knowledge suggests that using the predictive shelf-life model for Leuconostoc (available at www. DMRIPredict.dk from January 2024) may help preventing food waste by providing a reliable prediction of a product's shelf life and identifying the optimal hurdle combinations to avoid microbial growth and spoilage.

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