

Predictive Model for Growth of Gas-Producing *Leuconostoc* spp. in Deli Meat

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INTRODUCTION

Growth of gas producing lactic acid bacteria (LAB) can limit the shelf life of deli meats and cause recalls. Models predicting the growth of LAB can be used in the product development phase and assist in generating product formulations that limits growth of LAB to prevent spoilage and thereby ensure a long shelf life and reduced food waste.

AIM

Isolation and identification of the causative microorganisms for blown deli meat and developing a mathematical model to predict the growth in heat-treated products.

DMRIPREDICT

Predictive growth models, are a powerful tool for setting a realistic shelf life and assess the risk of pathogenic growth.

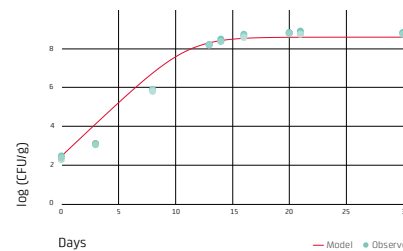
At DMRIPredict.dk several validated shelf life and safety models are publicly available. They are all built on data from challenge tests performed on real meat products. Two of the DMRI models (ConFerm and StaphTox Predictor) are recommended by USDA-FSIS for supporting decisions related to fermented, salt-cured, or dried meat and poultry products (FSIS-GD-2023-0002, May 2023)

IDENTIFYING THE PERPETRATOR

Blown packs of deli meat were obtained from Danish retailers and dominating gas producers were identified using whole genome sequencing (WGS). WGS was performed on an Illumina MiSeq platform using the Nextera XT DNA library preparation kit (Illumina). Bioinformatic analysis was performed with the CGE online bioinformatic tools (<http://www.genomicepidemiology.org/services/>; DTU-FOOD). In all heat-treated deli meat samples (n=12) *Leuconostoc carnosum* or *Leuconostoc mesenteroides* were isolated.



Gas production in vacuum-packed deli meat inoculated with a *Leuconostoc* cocktail.



Example of growth observed in validation experiment and growth predicted by the model.

MODEL DEVELOPMENT

Eleven strains of *Leuconostoc* spp. isolated from blown deli meat packages were inoculated ($-2 \log$ (CFU/g)) on deli meat (baloney) with varying conservation (see table). Growth rates from these experiments (n=36) were used to develop a predictive growth model.

VALIDATION

The model was validated on data from previous projects and new growth experiments on different meat products (baloney and ham) where the spoilage was caused by *Leuconostoc* spp. In some cases, the meat was inoculated with a *Leuconostoc* cocktail and in others, the spoiling organisms were determined with rRNA 16s amplicon sequencing.

Validation of the model (n=59) showed that it was acceptable with a bias factor (Bf) of 0.90 and an accuracy factor (Af) of 1.38. The model will be made publicly available at DMRIPredict in 2023 (www.dmrpredict.dk).

Area of Application

Parameter	Range
Temp.	3-8 °C
pH	5.3-6.5
WPS%	2-6%
Na-nitrite	0-150 ppm
Na-lactate	0-3%
Na-acetate	0-0.5%



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