Using ComBase Predictor and Pathogen Modeling Program as support tools in outbreak investigation: an example from Denmark - DTU Orbit (06/03/2019)

During a 20-case-outbreak of verocytotoxin-producing Escherichia coli O26:H11 in 2007 in Denmark, two of the cases were also found to be infected with Yersinia enterocolitica. The source was an organic semi-dried fermented sausage and the question was: "Could Y. enterocolitica have survived, or even multiplied, during the production of the suspected sausage?" To elucidate this, the ComBase Predictor (CBP) and the Pathogen Modeling Program (PMP) were used as support tools. From information on the company’s website, it was calculated that the water phase salt changed from 4.6% to 8.0% during production and pH changed from 5.5 to 4.7. No nitrite was used. Predictions of growth/reduction of Y. enterocolitica and E. coli in a matrix covering these pH- and WPS-values were compared at 24°C mimicking fermentation temperature, at 16 and 5°C mimicking drying and storage temperatures, respectively. The results showed that Y. enterocolitica would be able to multiply during the first part of the production. Compared to E. coli, growth of Y. enterocolitica was predicted to be slower in the beginning of the fermentation but faster in the end with CBP and faster during the whole fermentation with PMP. CBP predicted that an increase of one log-unit took approx. 50 h at conditions in the beginning of the drying period and approx. 100 h in the middle. During storage growth of Y. enterocolitica would only be expected in case of production failures, such as insufficient drying or addition of a too low amount of salt to the batter.

A deterministic model was constructed in Microsoft Excel using information on the production of the implicated sausage. This model predicted the level of Y. enterocolitica to increase 2.3, 4.2 and 7.8 log-units during fermentation, drying and storage, respectively. At the point of release of the sausage for sale, 1 Y. enterocolitica could have increased to 10^6 and the sausage could, therefore, not be ruled out as the source of Y. enterocolitica found in two of the outbreak cases.

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