

**Type key words: bacon, sodium reduction, structure, product safety, taste.**

## I. INTRODUCTION

Sodium reduction is an issue for all processed foods. The meat industry has also a responsibility to focus on lowering the sodium content of meat and meat products. If the amount of sodium in meat products is substantially lowered, a list of possible problems concerning product structure, shelf life, yield and taste can occur. For lowering the amount of sodium in bacon substantially by substituting it with potassium, the yield, structure, shelf-life and taste was affected. A multidisciplinary approach was implemented to help industry with lowering the sodium content of bacon with 40% and maintain the structure, yield, shelf life and taste.

## II. OBJECTIVES

How can industry lower the sodium content of bacon without affecting structure, yield, shelf life and taste?

## III. METHODOLOGY

A survey of the industrial produced common- and low salt bacon on structure, shelf life and taste was carried out to gather the crucial information to set up a model. The model was set up to predict the shelf life of the current bacon and assess substituted ingredients to reach the same shelf life. Next step was to construct a brine recipe with respect to sustain a good bacon structure. On a pilot scale different brines with possible compositions were composed and tasted. The most promising brines are used in practical circumstances in industry to produce bacons. Results were tested with an expert panel.

## IV. RESULTS AND DISCUSSION

The choice of replaceable additives was made on contribution on the  $a_w$  lowering of those additives,

as shown in table 1. This table was the basic assumption to compose several brines which would give the same calculated  $a_w$  value after injection of the bacon. The combination of  $a_w$  value with storage temperature will give the desired shelf life. The different compositions were also technological judged on their ability to their sustainability on structure and yield. This technological assessment was carried out in close cooperation with the industry. All the compositions were tested with an expert panel on taste; the brine with normal amount of sodium was taken as reference as well as the brine used for a low sodium bacon.

Brines with an off taste were rejected for further experiments.

Several selected brines (see table 2) were tested in practice on small industrial by multi needle injecting pork loins and subsequently tumbling, vacuum packed and stored at +2°C during two days for equalize the sodium in the bacon. All products were frozen, conditioned at -8°C and sliced to the desired thickness to uniform bacon pieces. The bacon slices were sensorial tested by an expert panel on color, outside look, consistency, taste and smell. For results see table 3. All the samples were microbiological tested and checked on  $a_w$  value.

## V. CONCLUSIONS

Despite on the fact all experiments were carried out once, it was proven to be possible to replace 40 % of the sodium in bacon without affecting the yield, the structure of the bacon, the taste and the microbiological risk.

## TABLES AND FIGURES

Table 1: Overview of possible additives to replace NaCl while maintaining  $a_w$

Additive	Formula	Amount needed (in %) to replace 1% NaCl to maintain $a_w$
Sodium chloride	NaCl	1.0
Potassium chloride	KCl	1.3
Calcium chloride	CaCl <sub>2</sub>	1.3
Ammonium chloride	NH <sub>4</sub> Cl	0.9
Magnesium chloride	MgCl <sub>2</sub>	1.1
Potassium sulfate	K <sub>2</sub> SO <sub>4</sub>	2.0
Magnesium sulfate	MgSO <sub>4</sub>	2.0
Potassium lactate	C <sub>3</sub> H <sub>5</sub> O <sub>3</sub> K	2.2
Potassium acetate	CH <sub>3</sub> COOK	1.7
Glucose	C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>	6.2

Table 2: Exchanged composition of salt in brines

Brine composition				$a_w$ -waarde
5% NaCl	Reference brine			0,969
3% NaCl	2,6% KCl			0,970
3% NaCl	1,3% KCl	2,2% K lactaat		0,972
3% NaCl	0,65% KCl	2,2% K lactaat	1,6% glucose	0,973
3% NaCl	Reference low salt brine			0.983

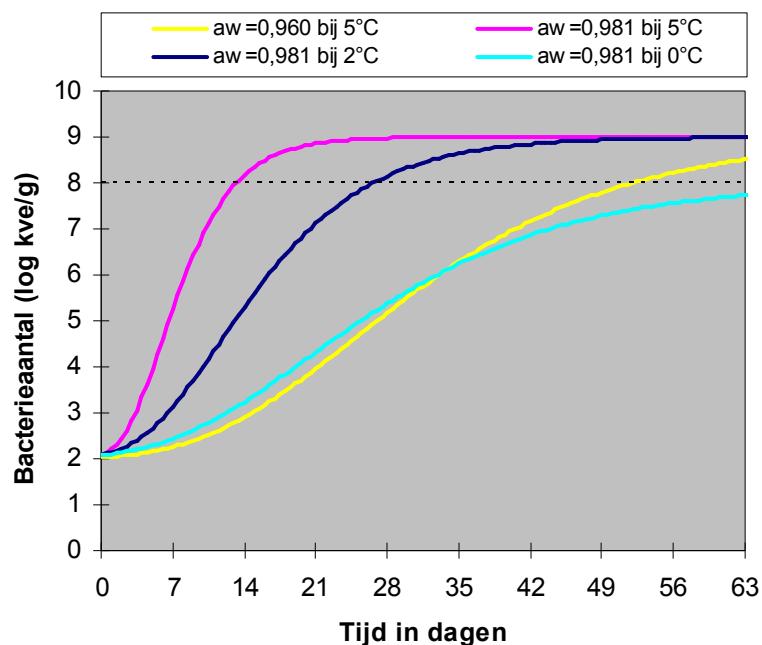


Figure 1: Predictive shelf life of a low salt bacon ( $a_w=0,981$ ) stored at 0, 2 and 5°C against a standard bacon ( $a_w=0,960$ ) stored at 5°C.

Table 3: Scores of sensorial test of 5 different bacons recipes by an expert panel.

Recipe	Reference Low salt	3% NaCl + 2,6% KCl	3% NaCl + 1,3 % KCl +2,2% K-lactate	3% NaCl + 1,3 % KCl +2,2% K-lactate + 1,6% glucose	Reference high salt
Color	7.1	7.3	8.4	7.3	6.9
Outside look	6.5	n.d.	7	7.5	7.0
Consistency /bite	6.8	7.5	7.5	7.5	7.3
Smell and taste.	6.9	7.4	7.1	7.0	7.5

Not enough data to determine the figure.