

# Hygienic cooling

RECONTAMINATION OF BAKED GOODS STARTS TWO MINUTES AFTER LEAVING THE BAKING OVEN DUE TO AIR-BORNE MICROORGANISMS



Photo: www.foodbaker.co.uk

**+** For almost three years now, Dipl. Ing. Frank Zehle and bakery technologist Rainer Hoppenstedt of the IVG Institute for Cereal Processing (IGV), Bergholz-Rehbrücke/Nuthetal, Germany, have been investigating the recontamination criteria for baked goods during cooling. During the baker technology meeting 2005 in Detmold, Germany, both scientists presented interesting results. After the baking process, almost all baked goods have a core temperature of 98 °C. This means the items are almost sterile or pasteurized when leaving the oven. However, according to the findings, recontamination starts two minutes and at the latest five minutes after the baked goods have left the oven. The products are contaminated either through direct contact with humans or materials (contact contamination) or by air-borne contaminants. This contamination may be triggered by convection, sedimentation or electrostatic or van der Waals forces.

## Microbial contamination

As soon as the products leave the oven, the cooling process starts. After about 30 seconds, the “below 100 °C zone” migrates into the inside of the baked product. An underpressure develops in the baked goods because water vapor precipitates in the pores. Small baked items pick up environmental

gas in the range of up to 89% of their volume. In the first ten minutes of the cooling phase, a bread roll takes up 3/4 of the gas quantity from the environment. In general, the density of the baked products is a decisive factor here. If the products have large pores (density <0.40g/ml), the scientists presume that environmental air in the range of 75-95 % of the baked goods’ volume is absorbed. If the products cool down in the normal environment, they also pick up air-borne microorganisms and spores. Microorganisms can adhere in particular to thin, gas-permeable places, and it is here that the mould growth starts. To prevent or at least impede the growth of moulds, the scientists have designed a test plant in which the baked products can cool down in a modified atmosphere.

## The results of the test series:

- +** Cooling down the baked goods under protective gas or in sterile air prolongs the microbial shelf life of packed goods by at least 100%.
- +** Packed baked goods cooled down in a protective atmosphere show a microbial stability which in almost all cases is better than the shelf life determined by sensory properties.
- +** The more CO<sub>2</sub> is contained in the protective gas (mixture with N<sub>2</sub>), the better the microbial stability.
- +** If protective gases are used for baked goods with prolonged shelf life, the use of gas-tight packaging materials are recommended. The differences are relatively small.
- +** If sterile air is used, in most cases PE-films are sufficient as packaging materials. +++

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#### Core products / services:

- Waste concepts and consultancy (economically – ecologically)
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Improvement of microbial stability of selected products compared to traditionally packed baked goods

