

## Troubleshooting guide for fermented meats

### ***Slow acidification***

- Frozen culture allowed to thaw and subsequently held too long before dispensing into meat. Microorganisms exhaust nutrients in packet/can, reducing the pH resulting in a lower culture activity.
- Environmental temperatures/humidities during fermentation inconsistent with recommended culture optimums.
- Secondary growth in meat of contaminant microorganisms producing components that buffer pH drop.
- Prolonged storage of the meat mixture at cold temperatures resulting in extended lag phase at the beginning of the fermentation cycle.
- Cheese in product may contain phosphate that buffers pH drop; it also has a tendency to absorb moisture from surrounding meat.
- Sausage entering the smokehouse/climate chamber colder than normal, for example by using very cold meat, which may prolong the lag phase of the starter culture.
- Spice formulation adjustment that either decreases acid stimulation or inhibits the culture.
- Excessive salt or cure addition that inhibit starter culture.
- Culture contact directly with curing components may inactivate the starter culture.
- High fat formulation that reduces the moisture content.
- Large diameter product giving slower heat transfer.
- Rapid moisture loss in product.
- Insufficient carbohydrate source [dextrose] added to sausage mixture.

### ***Fast acidification***

- Temperature/humidity is higher than normal.
- Spice formulation adjustment that favors the culture.
- Excessive water addition.
- Product delayed prior to entering the smokehouse/climate chamber resulting in higher initial temperature.
- Leaner product giving more moisture and lower salt-in-water.
- Change of meat (from beef to pork) in recipe.
- Smaller diameter product processed at high humidity.
- Initial meat pH lower than normal.
- Wrong combination of carbohydrate.
- Too slow drying that allows longer acidification.

### ***Inconsistent acidification***

- Inadequate distribution, resulting in “hot” and “cold” spots in meat mixture.
- Inadequate distribution of culture, salt, cure, spices, dextrose.
- Diverse initial product temperature.
- Stored product and directly processed product in same climate chamber; culture activated in stored product resulting in a faster fermentation.
- Products with different spice formulations, meat components, casing diameters, pH or water/fat content.
- Uneven temperature/humidity in the climate or fermentation chamber.
- Uneven humidity in dry room causing different drying rates.
- Too low acidification temperature.

### ***No acidification***

- Culture not added.
- Culture inactivated by direct contact with salt, cure components, or heavily chlorinated dilution water.
- Non-compliance with recommended handling temperatures after thawing of frozen culture.
- Insufficient carbohydrate added to sausage mixture.
- Excessive salt content.
- Antibacterial agents added to meat mixture (preservatives, chemical boiler treatments via steam, antibiotics in meat).
- Culture exposed to high temperature during transportation or storage.

### ***Too low final pH***

- Failure to monitor acidification.
- Excessive carbohydrate source.
- Insufficient heat processing to retard fermentation (cooking procedure).
- See also “Fast fermentation”.

### ***Insufficient moisture loss***

- Excessive humidity.
- Excessive air speed and/or too low humidity “sealing” surface pores giving case hardening/dry rim. No moisture migration from product.
- Excessive smoke initially that coagulates surface proteins retarding moisture migration. Slow drying, too high pH.
- No acidification.
- Smearing (during grinding) preventing water loss.
- Casing greasy due to fat melting commenced. Water outlet potential through casing greatly reduced.

### ***Too much moisture loss***

- Excessive drying, too fast air velocity, too low humidity.
- Too fast acidification.
- Applying a too fast acidifier (wrong culture).

### ***Souring of product, post-processing***

- Insufficient heat treatment to destroy microorganisms (cooking process) .
- Residual carbohydrates in excess that permits secondary fermentation.
- Excessive moisture and residual carbohydrates in non-cooked product.
- Insufficient drying.
- Temperature abuse post-packaging.

## **Off-flavor**

- Microbial contaminants either growing during fermentation or post-packaging.
- Use of spoiled raw materials (meat).
- Poor sanitation post-processing.
- Chemical contaminant.

## **Discoloration/green or gray coloration.**

- No addition of staphylococci.
- Oxidation of meat pigments via microbial contaminants, metal contaminants.
- Exposure to sunlight.
- High pH.
- Excessive peroxide-forming bacteria.
- Too low amounts of nitrate/nitrite added.
- Too fast acidification.
- Spoiled raw materials.
- Chemical acidifier added.
- Too low fermentation temperature.
- Too much sorbate in the casing.
- Growth of yeast on the surface.
- Trace metals (unclean salts).
- Grey/brown rim due to high smoking temperature.
- Smearing preventing water loss giving spoiled (grey) center.
- Excessive air speed and/or too low humidity, "sealing" surface pores giving case hardening/dry rim. No moisture migration from product giving grey center in sausage.

## **"Mushy" product**

- Over-working at mixer, chopper or grinder.
- Excessive fat extension.
- Insufficient salt level or no salt added.
- Spoiled raw materials.
- Proteolytic microbial contaminant.

## **Slimy, gassy-product**

- Yeast or heterofermentative lactic acid bacteria contamination in package post-processing.
- Excessive moisture content.
- Inadequate smoke concentration at product.

## **Greasing (fat melting)**

- Excessive heating rate (cooking process).
- Excessive fermentation temperature.
- Unstable meat mix, low-binding meats.
- Overworking raw meat mixture.

This information is based on experiments made by Chr. Hansen GmbH using the *Bactoferm*<sup>TM</sup> starter culture. We hope that this information has succeeded in answering many of the troubleshooting questions that might arise.