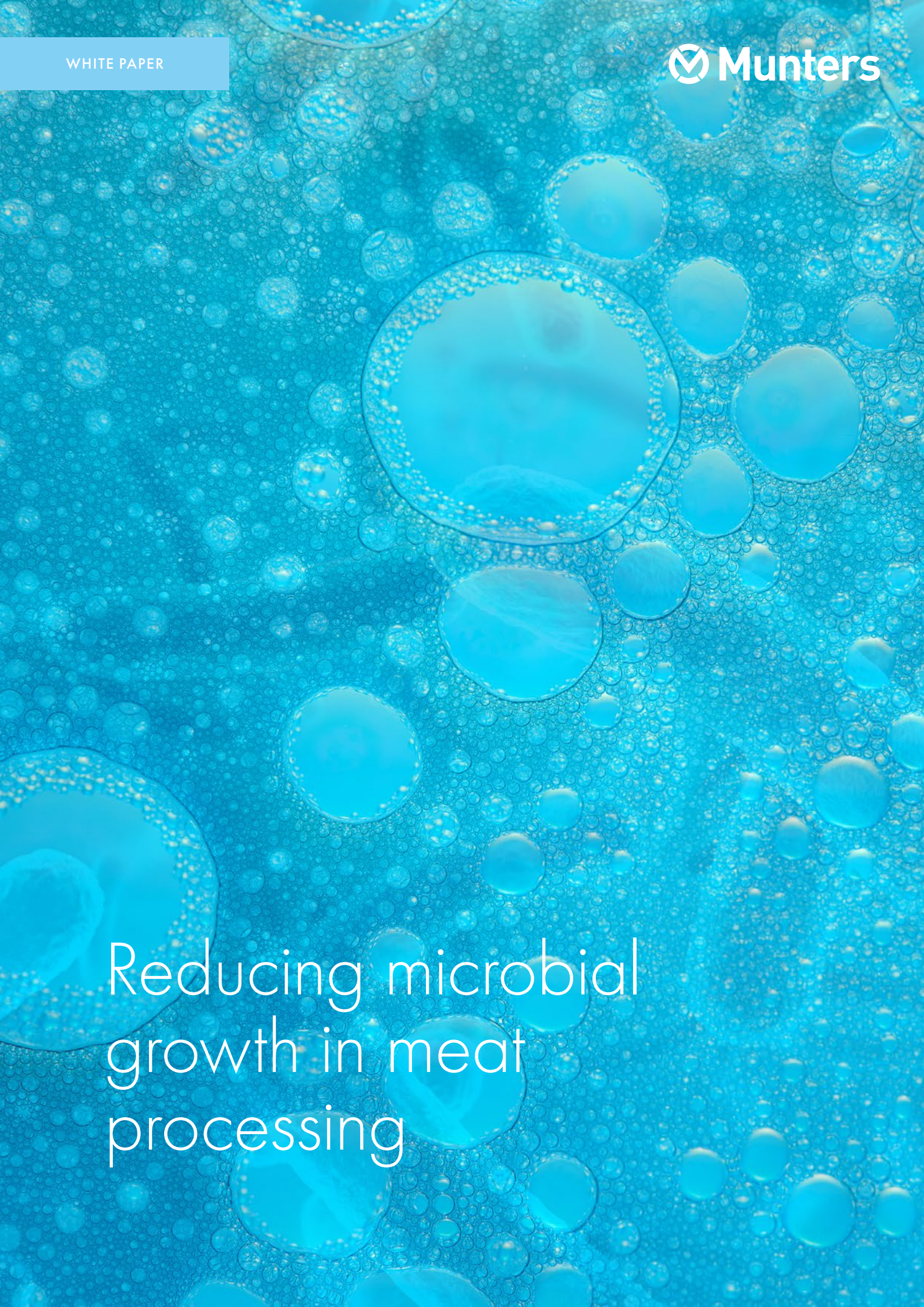
WHITE PAPER

Munters



# Reducing microbial growth in meat processing

# Introduction/Executive summary

Meat processing facilities require large amounts of water for cleaning processes. While nearly all water is drained away, some moisture remains in the air and condenses on surfaces. Equipment malfunctions. Worker safety is compromised, and bacteria can grow. Downtime, shutdowns, and lost revenue are all possible outcomes.

This report summarizes why microorganisms such as bacteria can thrive if strict sanitation, temperature control and optimized dehumidification are not part of your process, and how Munters can help you reduce the potential for microbial growth so you can maintain hygenic conditions, eliminate downtime and boost production.

As the world's biggest supplier of desiccant dehumidifiers and air handling solutions, Munters has extensive experience in controlling climate conditions, and understands the importance of ensuring product safety.

# What are microorganisms

Organisms that can only be seen through a microscope, microorganisms can be found everywhere. They occur in the atmosphere, in water, on plants and in the soil. They occur where they find food, moisture, and a temperature suitable for their growth. Fungi, molds, yeasts, and bacteria are all examples of microorganisms.

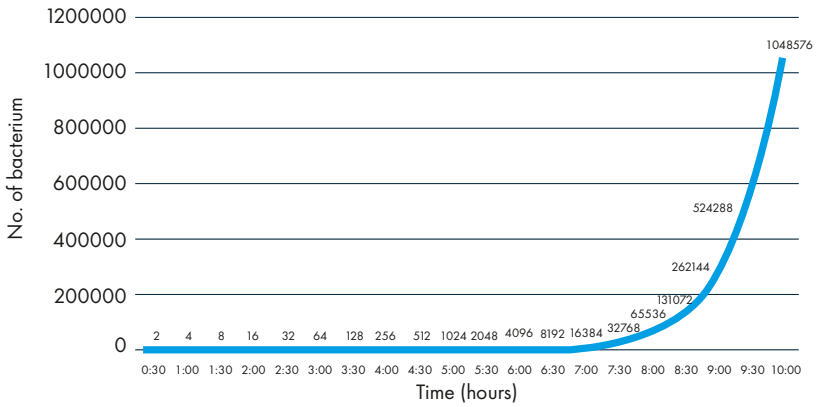
Bacteria, also called germs, are microscopic organisms not visible with the naked eye.

Bacteria are single-celled, or simple, organisms. Though small, bacteria are powerful and complex, and they can survive in extreme conditions.

Bacteria require certain nutrients to grow. Organic compounds such as proteins, fats and carbohydrates are their main sources of food. Bacteria need access to water to grow. They multiply by binary fission and in favorable conditions they multiply at intervals of 20-30 minutes.

Mold is a type of fungus that grows on damp or decaying organic matter or on living organisms. In contrast, yeast is a type of fungus that grows as a single cell.

**Growth of curve of bacteria**



# How moisture levels affect microorganism growth

The growth and metabolism of microorganisms requires water in an available form, which is measured as water activity. The water activity of food is the ratio between the vapor pressure of the food itself, when in a completely undisturbed balance with the surrounding air, and the vapor pressure of distilled water under identical conditions.

A water activity of 0.80 means the vapor pressure is 80% of that of pure water. The water activity increases with temperature. The moisture condition of a product can be measured as the equilibrium relative humidity (ERH), which is expressed as a decimal.

Many foods have a water activity above 0.95 and that will provide sufficient moisture to support the growth of bacteria, yeasts, and mold. Many microorganisms, including pathogenic bacteria, grow most rapidly in the range 0.99-0.98, and because fresh meat typically has a water activity of 0.99, this makes meat the food source with the highest risk for microbial growth.

### Water activity in food

| Food | $a_w$ | Food | $a_w$ |
|---|---|---|---|
| Fresh meat and fish | 0.99 | Salami | 0.82 |
| Liverwurst | 0.96 | Soy sauce | 0.80 |
| Cheese spread | 0.95 | Jams and jellies | 0.80 |
| Bread | 0.95 | Peanut butter | 0.70 |
| Red bean paste | 0.93 | Dried fruit | 0.60 |
| Caviar | 0.92 | Cookies | 0.30 |
| Aged cheddar | 0.85 | Milk Powder | 0.20 |
| Fudge sauce | 0.80 | Instant coffee | 0.20 |

*Meat is the food source with the highest risk for microbial growth*

# Moisture in manufacturing environments

Food processing facilities´ cleaning processes require large amounts of water. While nearly all is removed, some remains and evaporates. This water vapor condenses on cold surfaces and can cause problems in the production process, for example:

- Drips from a cold storage ceiling onto packaged or unpackaged meat.
- Droplets from a refrigeration unit land on exposed product.
- Moisture from a loading dock ceiling drips onto boxes of product, weakening the packaging.

Ambient or treated air above 50% Relative Humidity (RH) allows some level of microbial growth to take place. Condensation on cold surfaces increases this growth and bacteria begins to develop once the 90% threshold is met.

Mold grows anywhere there is moisture and an available food source, and this is often in hard-to-reach places such as:

- Cold water piping behind equipment, cabinets, or partitions,
- Air handling ductwork with either 70% + RH or water droplets that are formed by excessive cooling.
- Under plant and storage equipment.
- In dirt, dust and waste that may accumulate out of sight.
- In ceiling tiles.
- Exterior walls, doors and around windows.

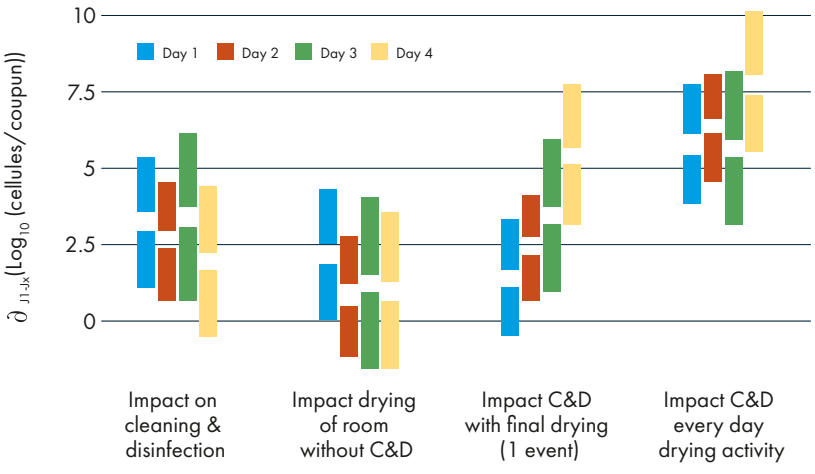
# Controlling moisture in manufacturing environments

Condensation control is an important aspect of food-processing facility design and operation. Reduction of moisture in the air will lower the dew point, help prevent condensation and reduce the potential for microorganism growth.

Temperature control is not enough, as some microbes can survive extreme temperatures. Humidity control, below 50% RH, will stop all microbial growth and reduce lipid envelope virus transmission.

Sanitation, temperature control and optimized Munters dehumidification will keep bacteria, and mold away.

**Cleaning, disinfection & dehumidification reduces the potential for microbial growth in 4 days**

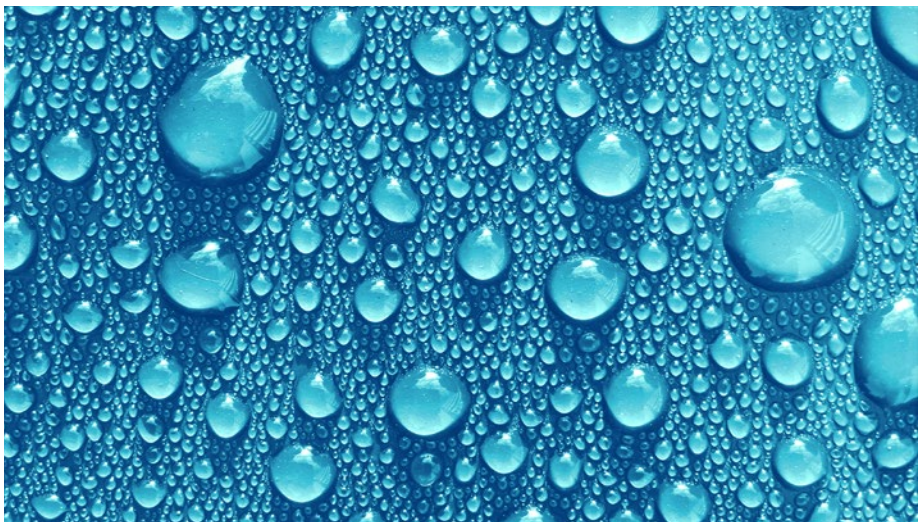



*Source: L´Université Paris Est et L´Ecole Doctorale ABIES.*

# Moisture in cold storage

Condensation forms when an area experiences high levels of relative humidity, poor ventilation and low temperatures on walls or surfaces. Cold storages are usually kept in the 2-8°C range and their relative humidity can be above 90% if not actively controlled.

If this happens then condensation can form on lighting fittings, ceilings or chiller units. These droplets can fall onto boxed product, and surfaces below. Mold, bacteria or yeast growths may be present in the water droplets, and lead to product contamination.



# Controlling moisture in cold storage

Undesirable moisture leads to waste and health risks. Melting ice or pooled condensation can damage product and possibly lead to bacterial growth. The result can be reduced profit margins and negative customer relations.

Remove moisture before it enters the cold storage. Eliminate maintenance events and shutdowns caused by uncontrolled humidity with a Munters dehumidification system. Optimized climate control improves product quality and increases output. Munters tailored dehumidification systems help to reduce contamination and keep cold storages working at maximum efficiency and safety.

## Customer validation

*"We installed a dehumidifier, supplying 2,000 $m^3$ per hour in a plant of 50,000 $m^3$"*

*"Since then, the visibility has been increased to 15 meters! We also wanted to prevent water droplets forming on the ceiling, following advice from the health authorities."*

*Oliver Bourhis, Factory Manager, Arrive Essart Poultry.*

# Selecting the right dehumidification solution

The desiccant rotor is the standard for all high performance industrial dehumidifiers. It allows the dehumidifier unit to remove moisture to the levels required by the process it has been designed to serve. Desiccant rotors are the most energy efficient technique for creating humidity controlled environments.

## How it works

Air passes through the flutes of the rotor contacting the desiccant. The incoming process airstream gives off its moisture to the desiccant. The process air is dry as it leaves the wheel. The humidity-laden wheel rotates slowly into a second, smaller airstream which has been heated.

This smaller exhaust airstream, known as reactivation air, warms the desiccant. The warmed desiccant gives off its moisture which is then carried away by the reactivation air. The newly dried desiccant material is rotated back into the process air, where it absorbs moisture once again.

## Why choose Munters?

Desiccant rotors all look similar, but when it comes to performance, they couldn't be more different. Munters has designed a rotor which absorbs more water and performs more consistently across all rotor speeds than the competition. This means better energy efficiency, a smaller physical footprint, and lower operating costs.