

Dear Customer,

Zernike wants to thank you for the confidence you placed in us with a brief document aimed at providing general information on the aging process, on the different existing methods and on the use of our QM 700/900/1500 technology.



THE DRY AGING

Dry aging is a **biochemical process** which spontaneously occurs in the animals skeletal

muscles right after the slaughter and modifies their structure making the meat tender and tasty in natural and safe way. In fact, right after the slaughter the meat is not edible because too hard. The dry aging activates biochemical

processes which make the meat good for consumption.

It may seem a complex topic, as defining in advance an exact duration for the dry aging, regardless of many other factors, can lead to big mistakes.

In fact, the duration of a dry aging process depends on many variables, such as: **the type of animal, its age when slaughtered, size and features of the meat cuts, temperature, humidity and ventilation levels**, as well as the living conditions of the animal and the way the slaughter was carried out.

Usually, it is the butcher's duty to make sure the meat dry ages long enough, adjusting the duration according to the meat reactions, but unfortunately this activity requires proper technologies, space, time and therefore costs, which are further increased by the loss of liquids and of weight affecting the meat during this period.

For this reason, in the mass distribution sector this process is not performed and, unfortunately, as a consequence improperly dry aged meat, which cannot express its full potential in terms of taste and quality, is sold for consumption.

In order to obtain a quality result it is necessary to respect some guidelines since the slaughter, a process after which meat undergoes the rigor mortis, that is a stiffening of the muscles characterized by a decrease of the pH level from an initial value of 7 to a value of 5,4. This is due to the hydrolysis of the glycogen (the more oxygen present in the muscles the more the glycogen) which turns into lactic acid.

The pH level reduction is fundamental to a good preservation of the meat, as it decreases the bacteria proliferation and favours the proteolysis of the meat enzymes, leading to relaxation of the muscle fibers which stiffened after the slaughter.

It is important that the glycogen (oxygen) be present in the muscles in great quantities so as to produce an adequate quantity of lactic acid, thus decreasing the pH level and facilitating the preservation and dry aging processes.

The more the meat is red, the higher the accumulation of lactic acid is and therefore the longer the stiffening period will be as well as the subsequent dry aging duration in order to obtain tender and flavored meat.

An elevated quantity of lactic acid benefits the meat quality in many ways, such as:

1. The muscle and connective tissues proteins denaturation, which makes the meat more tender.
2. The muscle proteins fragmentation by the enzymes, which enhance the meat aromas.
3. The inhibition of the bacterial flora proliferation, which allows longer preservation periods.

It is important to bear in mind how both the living conditions of the animal and the slaughter method are important factors in determining the level of glycogen in the animal fibers. Bad living conditions and a slaughter too stressful for the animal may result in a low level of glycogen, and a consequent lower accumulation of lactic acid preventing a proper pH reduction. This will negatively affect the meat which will turn dark red and dehydrated.

Another crucial element for the dry aging, especially for long duration ones, is the meat fat. The meat fat is constituted by the narrow white streaks which are commonly found on steaks. The pattern they form is called marbling. For high quality long term dry aging process it is very important to choose well-marbled meat.

During the dry aging process the external part of the meat turns darker (just a few millimeters thin layer) due to the contact with the air.

Therefore a well-aged meat cut does not have an inviting appearance: it will present a red dark tending to black surface with amber marbling. The meat surface will be as coarse as tree bark, but once the superficial millimeters are cut off, the meat will look great.

DRY AGING: DIFFERENT TECHNIQUES:

Nowadays the market proposes three main dry aging techniques:

1. The Anglo-American dry aging method;
2. The Italian dry aging method;
3. The wet aging method.

The Anglo-American dry aging method consists of aging bone-in-meat in an environment with oxygen, as this latter is able to block degenerative process which leads to meat contamination. This dry aging technique enhances the flavours, tenderness and juiciness of the meat, but causes a significant

weight loss (up to 20%). The meat will acquire great organoleptic qualities: it will be very aromatic and tender despite the drying. The colour will be dark red and the texture compact. The specialized literature stresses how the average process duration necessary to obtain an high quality aging result is around 30 days. Studies demonstrate also how an increase in the temperature results in a reduction of the aging process duration. Research and lab tests made it possible to establish the following indicative process durations:

1. 33 days at 0°C
2. 30 days at 1°C
3. 27 days at 2°C
4. 24 days at 3°C
5. 21 days at 4°C

It is very important to highlight how the results achievable with a 33 day long dry aging process using 0°C are similar, in terms of quality and tenderness, to those achieved in 21 days using 4°C. An accurate analysis of the qualitative result has shown that the 95% of the quality is achieved in about 30 days using 1°C, while extending the process further brings only marginal improvements.

The Anglo-American dry aging method uses very low humidity levels (around 75-80%) in order to obtain an higher concentration of flavours, but causing on the other hand bigger weight losses.

The Italian dry aging method, even if it shares the same basic principles of the Anglo American one, uses a higher humidity level (above 80%) and a lower temperature (around

0-1°C). These temperatures are required in order to make longer dry aging processes, even up to 100 days.

The wet aging method, unfortunately extensively used also in Italy, is the preservation in a refrigerated environment of boneless meat inside a vacuum bag. The anaerobic enzymes (which form due to the lack of oxygen) modify the meat. The hermetic sealing prevents the loss of liquids but turns the meat dark red and causes a contamination of the fat, which turns pink. The meat odour becomes more intense and its flavour presents bad metallic and acid aftertaste, due to the Sulphur created by the transformation of the hemoglobin.

The wet aging method is a fermentation and degradation process of the meat proteins. Its purpose is to make the meat tender and more tasty, but it is clear how it does not allow to reach the qualitative level achievable with a dry aging process.

DRY AGING WITH THE QM CABINETS: SLOW OR FAST?

The dry aging cabinet QM700/900/1500 is a patented technology allowing the user to perform different dry aging methods in complete biosafety.

The operator only has to tap on the icon related to the program chosen according to their desired results and the machine will do the rest, managing autonomously all the process phases. The control unit data logger keeps track of the temperature and humidity

values in order to have a report for quality controls or in case of inspections by food safety authorities.

With the term **Slow Aging** we refer to the preset programs for carrying out more than 30-day long, low temperature (0-1°C) biosafe dry aging processes. Slow aging dries the meat on the surface and makes it lose relatively more weight but at the same time enhances its tenderness, juiciness and flavours.

With the term **Fast Aging** we refer to the preset programs for carrying out higher temperature (3-4°C) biosafe dry aging process lasting less than 25 days. These programs allow you to shorten times and reduce the meat weight loss.

These parameters are purely illustrative because, as already explained, there are many internal and external factors influencing the quality and the duration of a dry aging process. In this context a crucial role is played by the correct assessment of the pH values, which provide information on the progress of the aging process.

It is worth remembering that, once the dry aging period is over and the pH is at the right level, in order to preserve the quality of the product it is important to store the meat in a refrigerator exclusively used for meat, because as the product underwent a liquid reduction it will tend to absorb other food's smell.

Not installing a pH probe inside the chamber was a deliberate choice as an internal probe can only measure a single meat cut. In this way, the data based on which the machine automatically adjusts its own parameters

would only refer to one of the several pieces which of course can be at different stages of the aging process and therefore have different pH values. On the contrary, our external probe makes everything more dynamic as it allows the user to measure the pH of every single cut and add or remove the pieces according to the aging state of each one. Furthermore, between measurements the probe needs to be stored in the storage cap containing the electrolytic gel in order to work properly.