

Document Title: Description, AN, Water Activity for Meat Snacks		Part # and Rev. 13903-01	
		Release Date:	
Rev.	Description	Revision By	Date
-01	Update to AU format	DDH	6/15/12

Production Filename: 13903 (In Product Library)

Path to Working Files: DecaDoc/Application Notes/Master/PTT/13903-01 Water Activity for Meat Snacks/13903-01 Water Activity for Meat Snacks

Dimensions: 8.5 inch wide, 11 inch tall

Material: Paper, 92 Bright White or better, 75g/m² or heavier


Colors: Color Print on White

Printer: HP Color LaserJet 8550-PS

Finish: None

Adhesive: None

Special Notes: Illustrations are Ref Only ** Not to Scale ** (Shown page 1 of 3)


Application Note

Water Activity for Meat Snacks

Ready-To-Eat (RTE) meat snacks, such as beef jerky and pepperoni, are popular shelf-stable products for time pressed consumers desiring a healthy, tasty, and nutritious meal. Many of these RTE meat products are produced using generations old recipes to provide unique flavors. The manufacturing process of RTE meat products destroys any pathogens present and reduces the water activity below minimum growth limits for these bacteria. The reduced water activity of the RTE products makes them shelf stable at room temperature and differentiates them from perishable fresh products.

Moisture Analysis
Traditionally, discussions on controlling water in products have focused on moisture content or the total amount of water in a system. Moisture content provides valuable information about product quality, but it is only one part of a complete moisture analysis. Water activity is the other important moisture measurement that defines the energy or 'available' water in a product. While both measurements are important, water activity provides the most valuable information about product safety and quality.

Water activity represents the energy status of the water in the system and is equal to the relative humidity of the air in equilibrium with a sample in a sealed chamber. It is based in thermodynamics and is defined as the vapor pressure of water (p) over a sample divided by the vapor pressure of pure water (p₀) at a given temperature. Though not scientifically correct, it may help to picture water activity as the amount of 'available' water. It is not determined by how much water is present, but is a comparison of how much the water in food resembles and behaves like pure water. Water activity values represent a scale that ranges from 0 (bone dry) to 1.0 (pure water). As water activity decreases, the water in a product decreases in energy, is less 'available', and behaves less and less like pure water.

Microbial Growth and Product Safety
The water activity concept has served microbiologists and food technologists for decades and is the most commonly used criterion for food safety and quality. Microorganisms have a limiting water activity below which they cannot grow. Water activity, not moisture content, determines the lower limit of 'available' water for microbial growth. Table 1 shows the growth limit for the common spoilage organisms for RTE products. These values were established under ideal conditions for microbial growth for all other growth factors such as pH and temperature. In other words, they represent the true lower water activity limit for growth under a worst case scenario.

The water activity level that limits the growth of the vast majority of pathogenic bacteria is 0.90, a water activity of 0.70 is the limit for spoilage molds, and the lower limit for all microorganisms is 0.60. The 2005 U.S. Food Code, in the definition of Non-Potentially Hazardous Food, has established two interactive tables involving water activity and pH levels critical for shelf stability. Heat-treated products with a water activity level of <0.92 or non-heat-treated products at <0.85 aw are considered shelf stable and do not need to be refrigerated. At water activity values less than 0.87, none of the potentially hazardous pathogens listed in Table 1 can grow. The only remaining microbial issue is molds which is controlled with preservatives or packaging. The USDA lists a more conservative water activity of <0.85 as safe in their Generic HACCP Model 10 Directive for RTE jerky products.

Many RTE producers and health inspectors assume that if 0.85 aw is safe, then a lower water activity is better because it is 'even safer'. The target water activity range is often set at 0.80 or 0.75 aw to maximize safety. However, there is no gain in safety by drying to water activities lower than 0.85 aw, because the growth of all pathogenic bacteria is limited at 0.87 aw (Keep in mind that at 0.85 aw, mold spoilage can occur, but is not

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